3.3.1 Number of research papers published per teacher in the Journals notified on UGC CARE list during the last five years								
Title of paper	**Name of the author/s**	**Department of the teacher**	**Name of journal**	**Calendar Year of publication**	**ISSN number**	**Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number**		
						Link to website of the Journal	**Link to article / paper / abstract of the article**	**Is it listed in UGC Care list**
Multi-objective covering salesman problem: a decomposition approach using grey wolf optimization	Indadul Khan, Krishnendu Basuli, and Manas Kumar Maiti	Mathematics	Knowledge and Information Systems	2022	Electronic ISSN: 0219-3116, Print ISSN: 0219-1377	Home | Knowledge and Information Systems (springer.com)	https://doi.org/10.1007/s10115-022-01752-y	Yes
A modified ACO with K-OPT for restricted covering salesman problems in different environments	Prasanta Dutta, Indadul Khan, Krishnendu Basuli, and Manas Kumar Maiti.	Mathematics	Soft Computing	2022	Electronic ISSN: 1433-7479, Print ISSN: 1432-7643	Home | Soft Computing (springer.com)	https://doi.org/10.1007/s00500-022-06978-0	Yes
Multi-objective generalized traveling salesman	Indadul Khan, Manas Kumar	Mathematics	Applied Intelligence	2022	Electronic ISSN: 1573-7497,	Home | Applied Intelligence (springer.com)	https://doi.org/10.1007/s10489-021-02989-w	Yes

problem: a decomposition approach	Maiti, and Krishnendu Basuli				Print ISSN: 0924-669X			
A deteriorating food preservation supply chain model with downstream delayed payment and upstream partial prepayment	Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey, and Samarjit Kar	Mathematics	RAIRO-Operations Research	2022	eISSN: 2804-7303	RAIRO - Operations Research (rairo-ro.org)	https://doi.org/10.1051/ro/2021172	Yes
A fuzzy imperfect production inventory model based on fuzzy differential and fuzzy integral method	Amalesh Kumar Manna, Leopoldo Eduardo Cárdenas-Barrón, Jayanta Kumar Dey, Shyamal Kumar Mondal, Ali Akbar Shaikh, Armando Céspedes-Mota, and Gerardo Treviño-Garza	Mathematics	Journal of Risk and Financial Management	2022	ISSN: 1911-8074	Journal of Risk and Financial Management | An Open Access Journal from MDPI	https://doi.org/10.3390/jrfm15060239	Yes
Higher-Order Antibunching of Light in Seven-Photon Interaction Process	Nitu Sahu, Samiran Kumar, and Dilip Kumar Giri	Physics	Journal of Russian Laser Research	2022	Electronic ISSN: 1573-8760, Print ISSN: 1071-2836	Home | Journal of Russian Laser Research (springer.com)	https://doi.org/10.1007/s10946-022-10051-4	Yes

A naphthalene-based azo armed molecular framework for selective sensing of Al 3+	Subhabrata Mabhai, Malay Dolai, Surya Kanta Dey, Sujata Maiti Choudhury, Bhriguram Das, Satyajit Dey, Atanu Jana, and Deb Ranjan Banerjee	Chemistry	New Journal of Chemistry	2022	Online ISSN: 1369-9261	New Journal of Chemistry (rsc.org)	https://doi.org/10.1039/D1NJ05869J	Yes
Multiple ion (Al3+, Cr3+, Fe3+, and Cu2+) sensing using a cell-compatible rhodamine-phenolphthalein-derived Schiff-base probe	Bhriguram Das, Avijit Ghosh, Dorothy Priyanka Dorairaj, Malay Dolai, Ramasamy Karvembu, Subhabrata Mabhai, Hyunsik Im, Satyajit Dey, Atanu Jana, and Ajay Misra	Chemistry	Journal of Molecular Liquids	2022	Print ISSN: 0167-7322, Online ISSN: 1873-3166	Journal of Molecular Liquids | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.molliq.2022.118824	Yes
A cell-compatible phenolphthalein-aminophenol scaffold for Al3+ sensing assisted by CHEF phenomenon	Bhriguram Das, Avijit Ghosh, Sabina Yesmin, Sk Jahir Abbas, Malay Dolai, Subhabrata Mabhai, Atanu Jana, Satyajit	Chemistry	Journal of Molecular Structure	2022	Online ISSN: 1872-8014, Print ISSN: 0022-2860	Journal of Molecular Structure | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.molstruc.2021.132295	Yes

	Dey, and Ajay Misra							
AgriStick: An IoT-Enabled Agricultural Appliance to Measure Growth of Jackfruit Using 2-Axis JoyStick	Anirbit Sengupta, Anwesha Mukherjee, Abhijit Das, and Debashis De	Computer Science	IEEE Instrumentation & Measurement Magazine	2022	Print ISSN: 1094-6969, Electronic ISSN: 1941-0123	The IEEE Instrumentation & Measurement Magazine | IEEE Instrumentation & Measurement Society (ieee-ims.org)	https://doi.org/10.1109/MIM.2022.9759351	Yes
STROVE: spatial data infrastructure enabled cloud–fog–edge computing framework for combating COVID-19 pandemic	Shreya Ghosh and Anwesha Mukherjee	Computer Science	Innovations in Systems and Software Engineering	2022	Electronic ISSN: 1614-5054, Print ISSN: 1614-5046	Home | Innovations in Systems and Software Engineering (springer.com)	https://doi.org/10.1007/s11334-022-00458-2	Yes
OrangeMusic: An orange computing-inspired recommender framework in internet of music things	Samarjit Roy, Anwesha Mukherjee, and Debashis De	Computer Science	Internet Technology Letters, Wiley	2022	Online ISSN:2476-1508	Internet Technology Letters - Wiley Online Library	https://doi.org/10.1002/itl2.331	Yes
RESCUE: Enabling green healthcare services using integrated IoT-edge-fog-cloud computing environments	Jaydeep Das, Shreya Ghosh, Anwesha Mukherjee, Soumya K. Ghosh, and Rajkumar Buyya	Computer Science	Software: Practice and Experience	2022	Online ISSN:1097-024X	Software: Practice and Experience - Wiley Online Library	https://doi.org/10.1002/spe.3078	Yes
Toxicological impacts of nanopolystyrene on zebrafish oocyte with	Ankit Chatterjee, Sukhendu Maity, Sambuddha	Zoology	Science of The Total Environment	2022	Online ISSN :1879-1026	STOTEN | Science of The Total Environment | Journal |	https://doi.org/10.1016/j.scitotenv.2022.154796	Yes

insight into the mechanism of action: An expression-based analysis	Banerjee, Shibsankar Dutta, Madhuchhanda Adhikari, Rajkumar Guchhait, Chayan Biswas, Sukanta De, and Kousik Pramanick					ScienceDirect.com by Elsevier		
Occurrence and distribution of micro/nanoplastics in soils and their phytotoxic effects: A review	Sukhendu Maity, Rajkumar Guchhait, Moumita Biswas Sarkar, and Kousik Pramanick	Zoology	Plant, Cell & Environment	2022	Online ISSN:1365-3040	Plant, Cell & Environment - Wiley Online Library	https://doi.org/10.1111/pce.14248	Yes
Credit policy for an inventory model of a deteriorating item having variable demand considering default risk	Rituparna Mondal, Prasenjit Pramanik, Ranjan Kumar Jana, and Manas Kumar Maiti	Mathematics	Scientia Iranica	2022	Print ISSN: 1026-3098, Online ISSN: 2345-3605	Scientia Iranica (sharif.edu)	https://doi.org/10.24200/sci.2022.56218.4607	Yes

Two-mode difference-squeezing in CARS and CAHRS processes	Samiran Kumar and Dilip Kumar Giri	Physics	Indian Journal of Physics	2022	Electronic ISSN: 0974-9845, Print ISSN: 0973-1458	Home | Indian Journal of Physics (springer.com)	https://doi.org/10.1007/s12648-022-02411-2	Yes
IoHMT: a probabilistic event-sensitive music analytics framework for low resource internet of humanitarian musical things	Samarjit Roy, Anwesha Mukherjee, and Debashis De	Computer Science	Innovations in Systems and Software Engineering	2022	Electronic ISSN: 1614-5054, Print ISSN: 1614-5046	Home | Innovations in Systems and Software Engineering (springer.com)	https://doi.org/10.1007/s11334-022-00499-7	Yes

MCG: Mobility-aware Computation Offloading in Edge using Weighted Majority Game	Anwesha Mukherjee, Shreya Ghosh, Debashis De, and Soumya K. Ghosh	Computer Science	IEEE Transactions on Network Science and Engineering	2022	Electronic ISSN: 2327-4697, CD: 2334-329X	IEEE Transactions on Network Science and Engineering | IEEE Communications Society (comsoc.org)	https://doi.org/10.1109/TNSE.2022.3198114	Yes
STOPPAGE: Spatio-temporal data driven cloud-fog-edge computing framework for pandemic monitoring and management	Shreya Ghosh, Anwesha Mukherjee, Soumya K Ghosh, Rajkumar Buyya	Computer Science	Software: Practice and Experience	2022	Online ISSN:1097-024X, Print ISSN:0038-0644	Software: Practice and Experience - Wiley Online Library	https://doi.org/10.1002/spe.3144	Yes

Melatonin mediated activation of MAP kinase pathway may reduce DNA damage stress in plants: A review	Sukhendu Maity, Rajkumar Guchhait, and Kousik Pramanick	Zoology	BioFactors	2022	Online ISSN:1872-8081	BioFactors - Wiley Online Library	https://doi.org/10.1002/biof.1882	Yes

Modal-data based simple statistical analysis as effective petrogenetic indicator: a case study from Kadavur Gabbro-Anorthosite Complex, Tamil Nadu, Southern India	Debaleena Sarkar and Jyotisankar Ray	Geology	Current Science	2022	ISSN: 0011-3891	Current Science	http://dx.doi.org/10.18520/cs/v123/i4/601-605	Yes

Petrogenetic implications of mineral chemistry and mode-based statistical studies of Sholayar alkaline syenite complex, Southern Granulite Terrane, India	Moumita Chowdhury, Jyotisankar Ray, Rohit Pandey, Debaleena Sarkar, and Paulomee Guha	Geology	Journal of Earth System Science	2022	Electronic ISSN: 0973-774X	Home | Journal of Earth System Science (springer.com)	http://dx.doi.org/10.1007/s12040-022-01932-y	Yes
A random-permutation based GA for generalized traveling salesman problem in imprecise environments	Indadul Khan, Manas Kumar Maiti, and Krishnendu Basuli	Mathematics	Evolutionary Intelligence	2021	Electronic ISSN: 1864-5917, Print ISSN: 1864-5909	Home | Evolutionary Intelligence (springer.com)	https://doi.org/10.1007/s12065-021-00651-5	Yes
A multi-item supply chain with multi-level trade credit policy under inflation: A mixed mode ABC approach	Nilesh Pakhira and Manas Kumar Maiti	Mathematics	Computers & Industrial Engineering	2021	Online ISSN: 1879-0550, Print ISSN: 0360-8352	Computers & Industrial Engineering | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.cie.2021.107412	Yes

Combined theoretical and experimental investigation of a DNA interactive poly-hydroxyl enamine tautomer exhibiting “turn on” sensing for Zn 2+ in pseudo-aqueous medium	Urmila Saha, Subhabrata Mabhai, Bhriguram Das, Gopinatha Suresh Kumar, Paula Brandao, and Malay Dolai	Chemistry	New Journal of Chemistry	2021	Online ISSN: 1369-9261	New Journal of Chemistry (rsc.org)	https://doi.org/10.1039/D1NJ03510J	Yes
A bio-compatible pyridine–pyrazole hydrazide based compartmental receptor for Al 3+ sensing and its application in cell imaging	Bhriguram Das, Malay Dolai, Avijit Ghosh, Anamika Dhara, Ananya Das Mahapatra, Debprasad Chattopadhyay, Subhabrata Mabhai, Atanu Jana, Satyajit Dey, and Ajay Misra	Chemistry	Analytical Methods	2021	Online only 2023 ISSN: 1759-9679	Analytical Methods journal (rsc.org)	https://doi.org/10.1039/D1AY00963J	Yes
Femtolet Based Low Power Hetnet Using Soft Fractional Frequency Reuse	Anwesha Mukherjee, Priti Deb, and Debashis De	Computer Science	Wireless Personal Communications	2021	Electronic ISSN: 1572-834X, Print ISSN: 0929-6212	Home | Wireless Personal Communications (springer.com)	https://doi.org/10.1007/s11277-021-08835-z	Yes
GrowFruit: An IoT-Based Radial Growth Rate Monitoring Device for Fruit	Anirbit Sengupta, Anwesha Mukherjee, Abhijit Das,	Computer Science	IEEE Consumer Electronics Magazine	2021	Print ISSN: 2162-2248, Electroni	IEEE Consumer Electronics Magazine - IEEE Consumer	https://doi.org/10.1109/MCE.2021.3119276	Yes

	and Debashis De				c ISSN: 2162-2256	Technology Society		
Toxic effects of cyanotoxins in teleost fish: a comprehensive review	Sambuddha Banerjee, Sukhendu Maity, Rajkumar Guchhait, Ankit Chatterjee, Chayan Biswas, Madhuchhanda Adhikari, and Kousik Pramanick	Zoology	Aquatic Toxicology	2021	Print ISSN: 0166-445X, Online ISSN: 1879-1514	Aquatic Toxicology | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.aquatox.2021.105971	Yes
Interaction of plastic particles with heavy metals and the resulting toxicological impacts: a review	Sukhendu Maity, Chayan Biswas, Sambuddha Banerjee, Rajkumar Guchhait, Madhuchhanda Adhikari, Ankit Chatterjee, and Kousik Pramanick	Zoology	Environmental Science and Pollution Research	2021	Electronic ISSN: 1614-7499	Home | Environmental Science and Pollution Research (springer.com)	https://doi.org/10.1007/s11356-021-16448-z	Yes

A random-permutation based GA for generalized traveling salesman problem in imprecise environments	Indadul Khan, Manas Kumar Maiti, and Krishnendu Basuli	Mathematics	Evolutionary Intelligence	2021	Electronic ISSN: 1864-5917, Print ISSN: 1864-5909	Home | Evolutionary Intelligence (springer.com)	https://doi.org/10.1007/s12065-021-00651-5	Yes
An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies	Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey, and Samarjit Kar	Mathematics	Journal of Management Analytics	2021	Print ISSN: 2327-0012 Online ISSN: 2327-0039	Journal of Management Analytics | Taylor & Francis Online (tandfonline.com)	https://doi.org/10.1080/23270012.2021.1882348	Yes

An imperfect production inventory model with advance payment and credit period in a two-echelon supply chain management	Barun Khara, Shyamal Kumar Mondal, and Jayanta Kumar Dey	Mathematics	RAIRO-Operations Research	2021	eISSN: 2804-7303	RAIRO - Operations Research (rairo-ro.org)	https://doi.org/10.1051/ro/2020137	Yes
Supply chain coordination model for green product with different payment strategies: A game theoretic approach	Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey, and Samarjit Kar	Mathematics	Journal of Cleaner Production	2021	Print ISSN: 0959-6526, Online ISSN: 1879-1786	Journal of Cleaner Production | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.jclepro.2020.125734	Yes

A cell-compatible red light-emitting multianalyte chemosensor via three birds, one stone strategy	Subhabrata Mabhai, Malay Dolai, Surya Kanta Dey, Anamika Dhara, Sujata Maiti Choudhury, Bhriguram Das, Satyajit Dey, Atanu Jana, and Deb Ranjan Banerjee	Chemistry	Journal of Photochemistry and Photobiology A: Chemistry	2021	Online ISSN: 1873-2666, Print ISSN: 1010-6030	Journal of Photochemistry and Photobiology A: Chemistry | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.jphotochem.2020.112889	Yes
Solvent-regulated fluorimetric differentiation of Al3+ and Zn2+ using an AIE-active single sensor	Bhriguram Das, Malay Dolai, Anamika Dhara, Avijit Ghosh, Subhabrata Mabhai, Ajay Misra, Satyajit Dey, and Atanu Jana	Chemistry	The Journal of Physical Chemistry A	2021	Print Edition ISSN: 1089-5639, Web Edition ISSN: 1520-5215	The Journal of Physical Chemistry A - ACS Publications	https://doi.org/10.1021/acs.jpca.0c10518	Yes

Acetate ion augmented fluorescence sensing of Zn2+ by Salen-based probe, AIE character, and application for picric acid detection	Bhriguram Das, Malay Dolai, Anamika Dhara, Subhabrata Mabhai, Atanu Jana, Satyajit Dey, and Ajay Misra	Chemistry	Analytical Science Advances	2021	Online ISSN: 2628-5452	Analytical Science Advances - Chemistry Europe - Wiley Online Library	https://doi.org/10.1002/ansa.202000165	Yes

Polyaniline and sulfonated graphene oxide supported bimetallic manganese cobalt oxides as an effective and non-precious cathode catalyst in air-cathode microbial fuel cells	Farhan Papiya, Prasanta Pattanayak, Abul Kalam Biswas, and Patit Paban Kundu	Chemistry	Journal of Environmental Chemical Engineering	2021	Print ISSN: 2213-2929, Online ISSN: 2213-3437	Journal of Environmental Chemical Engineering | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.jece.2021.105992	Yes

Functional interplay between plastic polymers and microbes: a comprehensive review	Sukhendu Maity, Sambuddha Banerjee, Chayan Biswas, Rajkumar Guchhait, Ankit Chatterjee, and Kousik Pramanick	Zoology	Biodegradation	2021	Electronic ISSN 1572-9729 Print ISSN 0923-9820	Home | Biodegradation (springer.com)	https://doi.org/10.1007/s10532-021-09954-x	Yes
Co-occurrence of co-contaminants: cyanotoxins and microplastics, in soil system and their health impacts on plant–a comprehensive review	Sukhendu Maity, Rajkumar Guchhait, Ankit Chatterjee, and Kousik Pramanick	Zoology	Science of the Total Environment	2021	Online ISSN: 1879-1026, Print ISSN: 0048-9697	STOTEN | Science of The Total Environment | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.scitotenv.2021.148752	Yes

Mafic volcanic rocks of western Iron Ore Group, Singhbhum Craton, eastern India: Geochemical evidence for ocean–continent conver gence	Madhuparna Paul, Jyotisankar Ray, C. Manikyamba, Sohini Ganguly, M. Rajanikanta Singh, Saraswati Pachal, and Debaleena Sarkar	Geology	Geological Journal	2021	Online ISSN:1099-1034 Print ISSN:0072-1050	Geological Journal - Wiley Online Library	https://doi.org/10.1002/gj.3944	Yes
Homes across the Water: Dislocation and Transcultural Kinship in Amitav Ghosh's The Glass Palace	Asis De, Anupam Roy	English	Drishti: the Sight	2021	ISSN: 2319-8281	Drishti – The Sight (drishtithesight.com)	https://www.drishtithesight.com/drishti-volume-ix-issue-ii/	Yes

Multi-objective traveling salesman problem: an ABC approach	Indadul Khan, Manas Kumar Maiti, and Krishnendu Basuli	Mathematics	Applied Intelligence	2020	Electronic ISSN: 1573-7497, Print ISSN: 0924-669X	Home | Applied Intelligence (springer.com)	https://doi.org/10.1007/s10489-020-01713-4	Yes
Effect of inspection errors on imperfect production inventory model with warranty and price discount dependent demand rate	Amalesh Kumar Manna, Jayanta Kumar Dey, and Shyamal Kumar Mondal	Mathematics	RAIRO-Operations Research	2020	eISSN: 2804-7303	RAIRO - Operations Research (rairo-ro.org)	https://doi.org/10.1051/ro/2019054	Yes
Samiran Kumar and Dilip Kumar Giri	Nonclassical states and total noise in five-wave interaction process	Physics	Journal of Optics	2020	Electronic ISSN: 0974-6900, Print ISSN: 0972-8821	Home | Journal of Optics (springer.com)	https://doi.org/10.1007/s12596-020-00657-9	Yes

FogIoHT: A Weighted Majority Game Theory based Energy-Efficient Delay-Sensitive Fog Network for Internet of Health Things	Anwesha Mukherjee, Debashis De, and Soumya K. Ghosh	Computer Science	Internet of Things	2020	Online ISSN: 2542-6605, Print ISSN: 2543-1536	Internet of Things | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.iot.2020.100181	Yes
Fractional frequency reuse based frequency allocation for 5G HetNet using master–slave algorithm	Priti Deb, Anwesha Mukherjee, and Debashis De	Computer Science	Physical Communication	2020	Print ISSN: 1874-4907, Online ISSN: 1876-3219	Physical Communication | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.phycom.2020.101158	Yes

Critical analysis of biophysicochemical parameters for qualitative improvement of phytogenic nanoparticles	Sukhendu Maity, Madhuchhanda Adhikari, Sambuddha Banerjee, Rajkumar Guchhait, Ankit Chatterjee, and Kousik Pramanick	Zoology	Biotechnology Progress	2020	Online ISSN:1520-6033 Print ISSN:8756-7938	Biotechnology Progress - Wiley Online Library	https://doi.org/10.1002/btpr.3114	Yes
Two-level supply chain for a deteriorating item with stock and promotional cost dependent demand under shortages.	Nilesh Pakhira, Manas Kumar Maiti, and Manoranjan Maiti	Mathematics	Iranian Journal of Fuzzy Systems	2020	Print ISSN: 1735-0654, Online ISSN: 2676-4334	Iranian Journal of Fuzzy Systems - About Journal (usb.ac.ir)	https://doi.org/10.22111/ijfs.2020.5109	Yes

Artificial bee colony optimization-inspired synergetic study of fractional-order economic production quantity model	Mostafijur Rahaman, Sankar Prasad Mondal, Ali Akbar Shaikh, Prasenjit Pramanik, Samarjit Roy, Manas Kumar Maiti, Rituparna Mondal, and Debashis De	Mathematics	Soft Computing	2020	Electronic ISSN: 1433-7479, Print ISSN: 1432-7643	Home | Soft Computing (springer.com)	https://doi.org/10.1007/s00500-020-04867-y	Yes

A two-warehouse multi-item supply chain with stock dependent promotional demand under joint replenishment policy: a mixed-mode ABC approach	Nilesh Pakhira, Manas Kumar Maiti, and Manoranjan Maiti	Mathematics	International Journal of Systems Science: Operations & Logistics	2020	Print ISSN: 2330-2674, Online ISSN: 2330-2682	International Journal of Systems Science: Operations & Logistics | Taylor & Francis Online (tandfonline.com)	https://doi.org/10.1080/23302674.2020.1753127	Yes

An integrated imperfect production system with advertisement dependent demand using branch and bound technique	Barun Khara, Jayanta Kumar Dey, and Shyamal Kumar Mondal	Mathematics	Flexible Services and Manufacturing Journal	2020	Electronic ISSN: 1936-6590, Print ISSN: 1936-6582	Home | Flexible Services and Manufacturing Journal (springer.com)	https://doi.org/10.1007/s10696-020-09377-5	Yes
Imperfect production inventory model with uncertain elapsed time	Prasanta Kumar Ghosh and Jayanta Kumar Dey	Mathematics	Decision Making: Applications in Management and Engineering	2020	Print ISSN: 2560-6018, Online ISSN: 2620-0104	Decision Making: Applications in Management and Engineering (dmame-journal.org)	https://doi.org/10.31181/dmame2003102g	Yes

Sustainable recycling in an imperfect production system with acceptance quality level dependent development cost and demand	Barun Khara, Jayanta Kumar Dey, and Shyamal Kumar Mondal	Mathematics	Computers & Industrial Engineering	2020	Online ISSN: 1879-0550, Print ISSN: 0360-8352	Computers & Industrial Engineering | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.cie.2020.106300	Yes

Realization of Nonclassical Effects of Light and Total Noise in Coherent Anti-Stokes Raman and Hyper-Raman Scatterings Up to the First-Order Hamiltonian Interaction	Samiran Kumar and Dilip Kumar Giri	Mathematics	Journal of Russian Laser Research	2020	Electronic ISSN: 1573-8760, Print ISSN: 1071-2836	Home | Journal of Russian Laser Research (springer.com)	https://doi.org/10.1007/s10946-020-09870-0	Yes

Internet of Health Things (IoHT) for personalized health care using integrated edge-fog-cloud network	Anwesha Mukherjee, Shreya Ghosh, Aabhas Behere, Soumya K. Ghosh, and Rajkumar Buyya	Computer Science	Journal of Ambient Intelligence and Humanized Computing	2020	Electronic ISSN: 1868-5145, Print ISSN: 1868-5137	Home | Journal of Ambient Intelligence and Humanized Computing (springer.com)	https://doi.org/10.1007/s12652-020-02113-9	Yes
Spatio-Fog: A green and timeliness-oriented fog computing model for geospatial query resolution	Jaydeep Das, Anwesha Mukherjee, Soumya K. Ghosh, and Rajkumar Buyya	Computer Science	Simulation Modelling Practice and Theory	2020	Print ISSN: 1569-190X, Online ISSN: 1878-1462	Simulation Modelling Practice and Theory | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.simpat.2019.102043	Yes

Power and Delay Efficient Multilevel Offloading Strategies for Mobile Cloud Computing	Debashis De, Anwesha Mukherjee, and Deepsubhra Guha Roy	Computer Science	Wireless Personal Communications	2020	Electronic ISSN: 1572-834X, Print ISSN: 0929-6212	Home | Wireless Personal Communications (springer.com)	https://doi.org/10.1007/s11277-020-07144-1	Yes
Functions of interleukin-6 in ovulation of female climbing perch, Anabas testudineus	Ankit Chatterjee, Rajkumar Guchhait, Sukhendu Maity, Dilip Mukherjee, and Kousik Pramanick	Zoology	Animal reproduction science	2020	Online ISSN: 1873-2232, Print ISSN: 0378-4320	Animal Reproduction Science | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.anireprosci.2020.106528	Yes

A supply chain of deteriorating items with variable demand	Nilesh Pakhira, Manas Kumar Maiti, and Manoranjan Maiti	Mathematics	Journal of Intelligent & Fuzzy Systems	2019	ISSN online: 1875-8967	JOURNAL OF INTELLIGENT & FUZZY SYSTEMS: APPLICATIONS IN ENGINEERING AND TECHNOLOGY Home (acm.org)	DOI: 10.3233/JIFS-16913	Yes
Note on: Supply chain inventory model for deteriorating items with maximum lifetime and partial trade credit to credit risk customers	Prasenjit Pramanik, Sarama Malik Das, and Manas Kumar Maiti	Mathematics	Journal of Industrial & Management Optimization	2019	ISSN: 1547-5816, eISSN: 1553-166X	Journal of Industrial and Management Optimization (aimsciences.org)	DOI: 10.3934/jimo.2018096	Yes

An inventory model for deteriorating items with inflation induced variable demand under two level partial trade credit: A hybrid ABC-GA approach	Prasenjit Pramanik and Manas Kumar Maiti	Mathematics	Engineering Applications of Artificial Intelligence	2019	Online ISSN: 1873-6769, Print ISSN: 0952-1976	Engineering Applications of Artificial Intelligence | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.engappai.2019.06.013	Yes
Trade credit policy of an inventory model with imprecise variable demand: an ABC-GA approach	Prasenjit Pramanik and Manas Kumar Maiti	Mathematics	Soft Computing	2019	Electronic ISSN: 1433-7479, Print ISSN: 1432-7643	Home | Soft Computing (springer.com)	https://doi.org/10.1007/s00500-019-04502-5	Yes

A hybrid PSO-GA algorithm for traveling salesman problems in different environments	Indadul Khan, Sova Pal, and Manas Kumar Maiti	Mathematics	International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems	2019	ISSN (print): 0218-4885 | ISSN (online): 1793-6411	International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems (worldscientific.com)	https://doi.org/10.1142/S0218488519500314	Yes
Effects of product reliability dependent demand in an EPQ model considering partially imperfect production	Barun Khara, Jayanta Kumar Dey, and Shyamal Kumar Mondal	Mathematics	International Journal of Mathematics in Operational Research	2019	ISSN online: 1757-5869, ISSN print: 1757-5850	International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems (worldscientific.com)	https://doi.org/10.1504/IJMOR.2019.101621	Yes

Multi-objective four dimensional imprecise TSP solved with a hybrid multi-objective ant colony optimization-genetic algorithm with diversity	Aditi Khanra, Tandra Pal, Manas Kumar Maiti, and Manoranjan Maiti	Mathematics	Journal of Intelligent & Fuzzy Systems	2019	ISSN online: 1875-8967	JOURNAL OF INTELLIGENT & FUZZY SYSTEMS: APPLICATIONS IN ENGINEERING AND TECHNOLOGY Home (acm.org)	DOI: 10.3233/JIFS-172127	Yes
A swap sequence based artificial bee colony algorithm for traveling salesman problem	Indadul Khan and Manas Kumar Maiti	Mathematics	Swarm and evolutionary computation	2019	Print ISSN: 2210-6502, Online ISSN: 2210-6510	Swarm and Evolutionary Computation | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.swevo.2018.05.006	Yes

An inventory model with variable demand incorporating unfaithfulness of customers under two-level trade credit	Prasenjit Pramanik and Manas Kumar Maiti	Mathematics	European Journal of Industrial Engineering	2019	ISSN online: 1751-5262, ISSN print: 1751-5254	European Journal of Industrial Engineering (EJIE) Inderscience Publishers - linking academia, business and industry through research	https://doi.org/10.1504/EJIE.2019.100957	Yes
Monte Carlo study with reweighting of uniaxial nematic liquid crystals composed of biaxial molecules	Nababrata Ghoshal, Soumyajit Pramanick, Sudeshna DasGupta, and Soumen Kumar Roy	Physics	Physical Review E	2019	Print ISSN: 2470-0045, Online ISSN: 2470-0053	Physical Review E (aps.org)	https://doi.org/10.1103/physreve.99.022703	Yes

Fluorescein derived Schiff base as fluorimetric zinc (II) sensor via ‘turn on’response and its application in live cell imaging	Bhriguram Das, Atanu Jana, Ananya Das Mahapatra, Debprasad Chattopadhyay, Anamika Dhara, Subhabrata Mabhai, and Satyajit Dey	Chemistry	Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy	2019	Print ISSN: 1386-1425, Online ISSN: 1873-3557	Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy | Journal | ScienceDirect.com by Elsevier	https://doi.org/10.1016/j.saa.2018.12.053	Yes

Oxyanion-binding in a bioinspired nanoparticle-assembled hybrid microsphere structure: effective removal of arsenate/chromate from water	Joydeb Manna, Nagaraju Shilpa, Arun Kumar Bandarapu, and Rohit Kumar Rana	Chemistry	ACS Applied Nano Materials	2019	Web Edition ISSN: 2574-0970	ACS Applied Nano Materials Journal - ACS Publications	https://doi.org/10.1021/acsanm.9b00003	Yes

Exploitation of the Nature and the Transformation of the Wild in Stephen Alter's In The Jungles Of The Night	Asis De and N. Maiti	English	New Academia: An International Journal of English Language and Literary Theory	2019	Online ISSN: 2347-2073	New Academia: Vol. VIII Issue II April 2019 - Interactions Forum	New Academia: Vol. VIII Issue II April 2019 - Interactions Forum	Yes
ANALYSIS OF LEAD TIME ON PERMISSIBLE DELAY IN PAYMENTS IN AN INVENTORY MODEL INCLUDING THE LEAD TIME CRASHING COST	Rabin Kumar Mallick, Shyamal Kumar Mondal, and Jayanta Kumar Dey	Mathematics	Advanced Mathematical Models & Applications	2018	ISSN: 2519-4445 (Online)	Jomard Publishing	http://jomardpublishing.com/UploadFiles/Files/journals/AMMAV1N1/V3N2/MallickRK.pdf	Yes

Pressure-induced phase transitions in liquid crystals: A molecular field approach	Sudeshna DasGupta, Sabana Shabnam, Soumyajit Pramanick, Nababrata Ghoshal, Ananda DasGupta, and Soumen Kumar Roy	Physics	Physical Review E	2018	Print ISSN: 2470-0045, Online ISSN: 2470-0053	Physical Review E (aps.org)	https://link.aps.org/doi/10.1103/PhysRevE.98.022701	Yes

Journal of Intelligent & Fuzzy Systems xx (20xx) x–xx
DOI:10.3233/JIFS-172127
IOS Press

Multi-objective four dimensional imprecise TSP solved with a hybrid multi-objective ant colony optimization-genetic algorithm with diversity

Aditi Khanra[a,*], Tandra Pal[b], Manas Kumar Maiti[c] and Manoranjan Maiti[d]
[a]*Bohichberia High School (H.S.), Bohichberia, Purba Medinipur, West Bengal, India*
[b]*Department of Computer Science & Engg., NIT, Durgapur, West Bengal, India*
[c]*Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, India*
[d]*Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, West Bengal, India*

Abstract. In real world, most of the combinatorial optimization problems are multi-objective and it is difficult to optimize them simultaneously. In the literature, some individual algorithms (ACO, GA, etc.) are available to solve such discrete multi-objective optimization problems (MOOPs), particularly travelling salesman problems (TSPs) . Here a hybrid algorithm combining ACO and GA with diversity is developed to solve discrete multi-objective TSPs and named MOACOGAD. Generally in TSP, routes for travel are not considered as lengths of routes remain unaltered. In real life, there may be several routes for travel from one destination to another and conditions of those routes may also be different such as good, rough, bad, etc. In practical, travel costs and travel times are not defined precisely and represented by fuzzy data. When fuzzy travel costs and fuzzy travel times per unit length are involved, the lengths and conditions of the routes along-with the types of conveyances for travel become important. In some cases, risk of travel is also involved. In this paper a four dimensional imprecise TSP including source, destination, conveyances and routes under some risk factors are formulated and solved by the developed MOACOGAD. The model is illustrated numerically. As particular cases three and two dimensional multi-objective imprecise TSPs are derived and solved.

Keywords: Ant colony optimization, Genetic Algorithm, fuzzy travel cost, fuzzy travel time, hybrid algorithm

1. Introduction

Travelling Salesman Problem (TSP) [3] is a NP-hard and also one of the most complex combinatorial optimization problem which cannot be solved exactly in polynomial time. Some investigations with respect to 2-dimensional TSP and 3-dimensional TSP or solid TSP are available in literature. The goal of TSPs is to find a shortest path, exactly once passing through each city in a given set of cities. When there is only one route and one conveyance for travel between any two cities are known as 2-dimensional TSP [17, 24]. 3-dimensional TSP [10] could be termed when several conveyances at each node/city are available.

Single objective classical TSPs [5, 14] can be solved by Ant Colony Optimization (ACO) algorithm which was introduced by Dorigo and Gambardella [16], inspired by the behaviour of ants in finding paths from nest to food. In 2012, Gaifang Dong et al.[14] proposed a cooperative genetic ant system for solving TSP. In 2013, Bai et al. [5] proposed a model for Asymmetric TSP which includes max-min ant colony optimization.

*Corresponding author. Aditi Khanra, Bohichberia High School (H.S.), Bohichberia, Purba Medinipur, West Bengal, India. Tel.: +91 9474978166; E-mails: ak.15CSE1505@phd.nitdgp.ac.in; tandra.pal@gmail.com (T. Pal), manasmaiti@yahoo.co.in (M. K. Maiti), mmaiti2005@yahoo.co.in (M. Maiti).

Swarm and Evolutionary Computation xxx (2018) 1–11

Contents lists available at ScienceDirect

Swarm and Evolutionary Computation

journal homepage: www.elsevier.com/locate/swevo

A swap sequence based Artificial Bee Colony algorithm for Traveling Salesman Problem

Indadul Khan [a,*], Manas Kumar Maiti [b]

[a] Department of Computer Science, Chandrakona Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal, 721201, India
[b] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, 721628, India

ARTICLE INFO

Keywords:
Traveling Salesmen Problem
Artificial Bee Colony Algorithm
Swap sequence
Swap operation
K-opt

ABSTRACT

In this research paper, Artificial Bee Colony algorithm is modified with multiple update rules and K-opt operation to solve the Traveling Salesman Problem. Here the features of swap sequences and swap operations on the sequence of cities (solution/path) of the problem are used to create different solution (path) update rules of the algorithm. Eight different rules are proposed to update solutions in the algorithm. Updation of a solution by an employed bee or by an onlooker bee is done by a randomly selected rule from the rule set using Roulette Wheel selection process. In the scout bee phase of the algorithm, the perturbation technique, K-opt operation is applied on any stagnant solution for a fixed number of times for the possible improvement of it. The K-opt operation is again used at the end of the search process to improve the quality of the final solution (if possible). Proposed method is tested with a set of benchmark test problems from TSPLIB and it is observed that the efficiency of the algorithm is adequate with respect to the accuracy and the consistency for solving standard TSPs (Symmetric as well as Asymmetric) compared to the existing algorithms in the literature.

1. Introduction

The Traveling Salesmen Problem (TSP) is one of the standard combinatorial discrete optimization problem. The problem consists of a set of N vertices (nodes/cities) where the distance between any two vertices is known. A salesman starts from a vertex, visits all the vertices exactly once and returned to the starting vertex in such a way that the total distance travelled is a minimum. So the goal of the problem is to find a shortest possible tour through the set of vertices such that each vertex is visited exactly once except for the starting vertex. It is a well known NP-hard problem, can't be solved exactly using any polynomial time algorithm [1,2]. In a TSP, when the distance between any two vertices x_i and x_j is equal to the distance between x_j and x_i then the problem is called Symmetric TSP (STSP) [3,4]. On the other hand, if the distance between the vertices x_i and x_j is not equal to the distance between x_j and x_i, for at least one pair of vertices then the problem belongs to Asymmetric TSP (ATSP) [5]. Generally, there are two approaches to solve a TSP: exact methods and heuristic methods. The exact methods require enormous time for larger N, thus the heuristic methods are typically used to solve a TSP. The exact methods include cutting plane [6], LP relaxation [7], branch and bound [8], branch and cut [9], etc. Only small size TSPs can be solved by exact methods in a reasonable time window. On the other hand, several TSPs have been solved using heuristics or soft computing based techniques such as Ant Colony Optimization (ACO) [3], local search [10], hybrid algorithm [11], Genetic Algorithm (GA) [12], Particle Swarm Optimization (PSO) [4], Artificial Bee Colony (ABC) [13], etc. There are several well established heuristics for STSP. Wang et al. [4] used concepts of swap operator and swap sequence, and redefined some operators of PSO on the basis of them to solve TSP. Combing the features of PSO, ACO and 3-opt a hybrid algorithm PSO-ACO-3-opt is presented by Mahi et al. [14] to solve standard TSPs. Akhand et al. [15] proposed PSO with partial search algorithm for solving TSPs. Akhand et al. [16] improved this algorithm to find solution of the TSPs and named it velocity tentative PSO. Geng et al. [17] proposed an effective local search algorithm based on Simulated Annealing (SA) and greedy search techniques to solve the TSPs. Jolai and Ghanbari [18] presented an improved Artificial Neural Network (ANN) approach for solving the TSPs. Dorigo et al. [3] proposed an Ant System to solve the TSPs. Dorigo and Gambardella [19] described an ACO capable of solving the TSPs. Bontoux and Feillet [20] proposed a hybrid algorithm to solve the TSPs. Beam-ACO algorithm, which is a hybrid method combining ACO with beam search was used to solve

* Corresponding author.
E-mail addresses: indadulkhan@gmail.com (I. Khan), manasmaiti@yahoo.co.in (M.K. Maiti).

https://doi.org/10.1016/j.swevo.2018.05.006
Received 22 November 2016; Received in revised form 19 May 2018; Accepted 19 May 2018
Available online XXX

Please cite this article in press as: I. Khan, M.K. Maiti, A swap sequence based Artificial Bee Colony algorithm for Traveling Salesman Problem, Swarm and Evolutionary Computation (2018), https://doi.org/10.1016/j.swevo.2018.05.006

An inventory model with variable demand incorporating unfaithfulness of customers under two-level trade credit

Prasenjit Pramanik*

Department of Applied Mathematics with
Oceanology and Computer Programming,
Vidyasagar University,
Midnapore, Paschim-Medinipur,
West Bengal 721102, India
Email: pramanik.prasenjit72@gmail.com
*Corresponding author

Manas Kumar Maiti

Department of Mathematics,
Mahishadal Raj College,
Mahishadal, Purba-Medinipur,
West Bengal 721628, India
Email: manasmaiti@yahoo.co.in

Abstract: In this research work, an inventory model has been developed under two-level trade credit policy with unfaithful customers. A percentage of the total customers are treated as unfaithful customers. Demand is influenced by customers' credit period, credit amount and selling price. Due to the vagueness of some parameters, the proposed model is formulated in both the crisp and fuzzy environments. The main purpose of this research work is to determine the optimal replenishment policy so that the total profit of the retailer is maximised. The existence of a solution to the problem is discussed theoretically and then some numerical experiments are undertaken. To find the marketing decision of a generalised model (when the number of variables increases) and for the fuzzy objectives, a soft computing technique is used. Some sensitivity analyses are performed to provide some managerial insights. Finally a conclusion is drawn and some future research directions are proposed. [Received: 14 November 2017; Accepted: 2 January 2019]

Keywords: inventory; trade credit; unfaithful customers; particle swarm optimisation; variable demand.

Reference to this paper should be made as follows: Pramanik, P. and Maiti, M.K. (2019) 'An inventory model with variable demand incorporating unfaithfulness of customers under two-level trade credit', *European J. Industrial Engineering*, Vol. 13, No. 4, pp.461–488.

Biographical notes: Prasenjit Pramanik received his MSc in Applied Mathematics from Vidyasagar University, India; MTech in Computer Science from I.I.T. Kharagpur, India and awarded PhD in Applied Mathematics

Advanced Mathematical Models & Applications
Vol.3, No.2, 2018, pp.142-163

ANALYSIS OF LEAD TIME ON PERMISSIBLE DELAY IN PAYMENTS IN AN INVENTORY MODEL INCLUDING THE LEAD TIME CRASHING COST

Rabin Kumar Mallick[1], **Shyamal Kumar Mondal**[1*], **Jayanta Kumar Dey**[2]

[1]Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, India
[2]Department of Mathematics, Mahishadal Raj College, Mahishadal, India

Abstract. In this article, the lead time on permissible delay in payments in an inventory model including lead time crashing cost is discussed where lead time and business period are the decision variables. Also, the lead time dependent credit period has been considered which has two parts one being fixed and other being dependent upon lead time. Here supplier offers the credit period to the retailer only when supplier supplies the order before the end of the business period. Here model has been considered in the parlance of infinite time horizon in such a way that the system gets the maximum profit. There are two main cases of inventory models to be studied here. Finally, three different illustrative examples have been added to determine the optimal policy of the model and the sensitivity analysis of some parameters has been added in this model.

Keywords: credit period, crashing cost, lead time, inventory model.
AMS Subject Classification: 90B05.
Corresponding author: Shyamal Kumar Mondal, Professor, Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore-721102, WB, India, 9433336686, e-mail: *shyamal_260180@yahoo.com*
Received: 03 March 2018; Revised: 04 July 2018; *Accepted: 19 July 2018*; *Published: 31 August 2018*

1 Introduction

Lead time is the time that elapses between the placement of an order and the receipt of the order into inventory. Lead time may influence customer service and impact inventory costs. From the literature, it is known that productivity of the company and its competitive position in the market depends on lead time. Traditionally, in an inventory models, minimization of total cost or, maximization of total profit has been considered as an objective function from either the supplier's or manufacturer's/retailer's side. In 1975, Das (1975) stated the effect of lead time on inventory and give a static analysis about it. Foote et al. (1988) presented a heuristic policies for inventory ordering problems with long and randomly varying lead times. Ouyang and Wu (1998) established a minimax distribution free procedure for mixed inventory model with variable lead time. Ben-Daya and Raouf (1994) presented an inventory models involving lead time as a decision variable. Glock (2012) discussed the inventory model in which customer service and responsiveness to production schedule changes can be improved by reduced lead time and reduction in safety stocks can be achieved. Hsiao (2008), He et al. (2005), Lan et al. (1999), Yang et al. (2005), Pan et al. (2004) stated that fixed lead time is not always appropriate for all inventory model in business, so they considered lead time as a decision variable. These authors have presented models which can be used to determine the length of lead time that minimizes the expected total relevant cost. Chopra et al. (2004) observed the effects of lead time uncertainty on safety stocks. Ouyang et al. (2004), Chang et al. (2006), and Wu (2004)

Monte Carlo study with reweighting of uniaxial nematic liquid crystals composed of biaxial molecules

Nababrata Ghoshal,[1] Soumyajit Pramanick,[2] Sudeshna DasGupta,[2] and Soumen Kumar Roy[3,*]
[1]*Department of Physics, Mahishadal Raj College, Mahishadal, Purba Medinipur, West Bengal, India*
[2]*Department of Physics, Lady Brabourne College, Kolkata 700 017, India*
[3]*Department of Physics, Jadavpur University, Kolkata 700 032, India*

(Received 18 February 2018; revised manuscript received 21 December 2018; published 11 February 2019)

We present a high accuracy Monte Carlo simulation study of the uniaxial nematic (N_U) to isotropic (I) phase transition of a lattice dispersion model of uniaxial nematics composed of biaxial molecules. The N_U-I coexistence curve terminating at the Landau critical point has been determined using the multiple histogram reweighting technique. A close investigation reveals a sharp departure in the nature of the N_U-I coexistence curve in the temperature-biaxiality parameter phase diagram in comparison to the earlier theoretical (either mean-field or computer simulation) predictions. The coexistence curve shows a change in curvature with increasing value of the degree of molecular biaxiality.

DOI: 10.1103/PhysRevE.99.022703

I. INTRODUCTION

In recent years, a great deal of attention has been devoted to investigations of the phase transformations in thermotropic liquid crystals composed of bent-core molecules [1,2]. Such molecules can be assumed to possess D_{2h} symmetry and are commonly referred to as biaxial molecules, in contrast to the conventional uniaxial molecules having $D_{\infty h}$ symmetry. It is well known from Landau–de Gennes (LDG) [3] and Maier-Saupe mean field (MF) theories that the isotropic to nematic phase transition in thermotropic liquid crystals (LCs) composed of cylindrically symmetric molecules is weakly first order. This has been confirmed by experiments [4,5] as well as by computer simulations [6,7]. In a more recent experimental study, Wiant *et al.* [8] observed that the isotropic (I) to the uniaxial nematic (N_U) transition for LCs composed of biaxial (bent-core) molecules is notably weaker than conventional thermotropic LCs formed from uniaxial molecules. These authors observed [8] that for nematics composed of bent-core molecules $T_{NI} - T^- \approx 0.4\,^\circ$C, whereas for typical calamitic (rod-shaped) liquid crystals $T_{NI} - T^- \geqslant 1\,^\circ$C. Here T_{NI} is the nematic-isotropic transition temperature and T^- is the supercooling limit of the nematic phase.

Bent-core molecules possess a high degree of molecular biaxiality. The possible effects of molecular biaxiality on nematic order have been studied theoretically using a number of techniques. These include molecular field treatments [9–16], computer simulation studies of lattice dispersion models [17–20] and the off-lattice biaxial Gay-Berne model [21,22]. All these studies predict sequences of phase transitions, from N_U to I at a higher temperature and from biaxial nematic (N_B) to uniaxial nematic (N_U) at a lower temperature. Also a direct N_B to I transition is predicted at a particular molecular geometry.

Apart from the above observations, molecular field studies [14,16] have shown that the increase in degree of molecular biaxiality influences the N_U-I transition in a number of ways. First, as the molecular biaxiality parameter λ (a measure of the molecular biaxiality and to be defined later) increases, the nematic order parameter S at the phase transition becomes smaller and thus the jump in S at the N_U-I transition decreases. Second, the transition temperature T_{NI} decreases monotonically with increase in λ. Third, the difference between the N_U-I transition temperature and the orientational spinodal temperature (T^-) decreases monotonically with increasing λ and finally these two temperatures merge as λ approaches its critical value $\lambda = \lambda_C = 1/\sqrt{6} = 0.40825$.

More recently, a Monte Carlo (MC) simulation study [23] based on a lattice dispersion model investigated the influences of molecular biaxiality on the N_U-I transition using the multiple histogram reweighting technique [24], and the relevant part of the free energy was generated for two different systems: one composed of uniaxial molecules and the other of biaxial molecules. Although the work reported in Ref. [23] emphasized the effect of an external field on uniaxial and biaxial molecules, from free energy analysis it was pointed out that molecular biaxiality weakens further the weak first-order N_U-I transition. The investigations presented in Ref. [23] were limited to only two values of molecular biaxiality parameter (0 and 0.20) and also the aim of the study was different, namely the effects of an external magnetic field on nematic order.

The fact that the increase in λ leads to weakening of N_U-I transition was also observed in a previous MC study [18] from the plots of order parameter and heat capacity, where the same dispersion model with three different values of λ (0.2, 0.3, and 0.40825) was used. However, to explore the effects of molecular biaxiality on the N_U-I transition and the associated pretransitional behavior, more accurate simulation technique is necessary.

In this paper we present an MC study using the reweighting technique [24] on a lattice dispersion model to investigate

*Corresponding author: roy.soumenkumar@gmail.com

Pressure-induced phase transitions in liquid crystals: A molecular field approach

Sudeshna DasGupta,[1,*] Sabana Shabnam,[1,†] Soumyajit Pramanick,[1,‡] Nababrata Ghoshal,[2,§] Ananda DasGupta,[3,‖] and Soumen Kumar Roy[4,¶]

[1]*Department of Physics, Lady Brabourne College, Kolkata 700017, India*
[2]*Department of Physics, Mahishadal Raj College, Mahishadal, Purba Medinipur, India*
[3]*Department of Physical Sciences, IISER Kolkata, Mohanpur 741246, India*
[4]*Department of Physics, Jadavpur University, Kolkata700032, India*

(Received 11 February 2018; revised manuscript received 16 July 2018; published 1 August 2018)

A rigorous microscopic treatment of a nematic fluid system based on a pairwise interaction potential is immensely complex. For studying such systems molecular field theories are often the standard method of choice. In this paper we have chosen a simple effective potential $U = \frac{u_4}{v^4} - \frac{u_2}{v^2} - \frac{Au_2}{v^2}\langle P_2\rangle P_2(\cos\vartheta)$ to study an isothermal-isobaric ensemble describing a liquid crystalline system. Using this we have studied in particular the pressure dependence of liquid crystalline phase transitions.

DOI: 10.1103/PhysRevE.98.022701

I. INTRODUCTION

Studies of phase transitions in liquid crystalline materials are of extreme importance because of their various important applications. For more than a century different experiments and corresponding theoretical studies have established the existence and behavior of different liquid crystalline phases. These studies involve the measurement of variation of different liquid crystalline properties such as orientational order parameter, dielectric constant, specific heat, isothermal compressibility, isobaric expansivity, etc. with the temperature [1–3]. Most of these thermodynamic measurements have been done on nematics at constant pressure, so that as temperature is varied, the molar volume also varies as a result of thermal expansion. The temperature dependence of orientational order in a nematic liquid crystal at constant molar volume was difficult to measure. This was first carried out by McColl and Shih [4]. They published their results of the temperature and volume variation of the orientational order parameter in para-azoxyanisole (PAA).

One of the first experiments investigating the effect of pressure on mesophase transitions were conducted by Hulett in 1899 [5] just about a decade after the discovery of liquid crystals. Most of the work involving pressure dependence had been done during 1970s [4,6–9]. Then in 1975, Shashidhar and Chandrashekhar [6] in their experimental work presented the pressure variation of liquid crystalline materials in detail and generated the phase diagrams, which clearly showed the liquid crystalline phases and the appearance of tricritical points. Horn [2,3], on the other hand, determined the dependence of orientational order parameter with temperature by measuring refractive index. Later Horn along with Faber explained these experimental data using a mean-field approach [7]. Wallis and Roy [8] again by the proton NMR spectrum study, studied the line width of proton resonance as function of temperature and pressure for the nematogens 5, 6, 7, and 8 CB and also for some other nematogens including PAA. They showed that the value of the orientational order parameter at the nematic-isotropic transition decreases with increasing pressure for 5, 7, and 8 CB but remained constant for 6 CB. The pressure and temperature dependence of the orientational order parameter for different sites in a mesogen were reported by Emsley *et al.* [9]. They showed that the quadrupolar splitting at the nematic isotropic transition temperatures is independent of pressure for different sites of the alkyl chain. In 1980, Luckhurst and Romano [10] considered an anisotropic part of the intermolecular potential along with the isotropic part and carried out computer simulation studies to find the phase diagram for some liquid crystals, but they had not considered any variation in pressure. In 1999, Hess and Su [11] used a generalization of the Lennard-Jones potential to study both the pressure and temperature variation of their liquid crystal model with density and observed a pseudotricritical point.

The stability of the nematic liquid crystal phase arises from the existence of strong interactions between pairs of the constituent molecules. This interaction between molecules leads to a long-range orientational order in the nematic phase. In most realistic situations, a rigorous microscopic treatment of a nematic fluid system based on a pairwise interaction potential becomes immensely complex. For systems of comparable complexity, mean-field theories are often the standard method of choice. The celebrated Maier-Saupe molecular field theory [12] (also referred to as mean-field theory; for a clarification of the terminology being used here see Ref. [13]) of nematic liquid crystals correctly predicts the existence of a first-order phase transition between the nematic and isotropic liquid states. However, there has been no significant molecular field study of the pressure dependence of liquid crystalline phase transitions to date. In the present paper we have presented a

*sudeshna.dasgupta10@gmail.com
†shabnam.sabana@gmail.com
‡soumyajit.pramanick@gmail.com
§ghoshaln@yahoo.co.in
‖adg@iiserkol.ac.in
¶roy.soumenkumar@gmail.com

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 212 (2019) 222–231

Contents lists available at ScienceDirect

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy

journal homepage: www.elsevier.com/locate/saa

Fluorescein derived Schiff base as fluorimetric zinc (II) sensor via 'turn on' response and its application in live cell imaging

Bhriguram Das [a], Atanu Jana [b,*], Ananya Das Mahapatra [c], Debprasad Chattopadhyay [c,d], Anamika Dhara [e], Subhabrata Mabhai [f], Satyajit Dey [a,*]

[a] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, West Bengal 721636, India
[b] Center for Superfunctional Materials, Department of Chemistry, School of Natural Science, Ulsan National Institute of Science and Technology (UNIST), Ulsan 44919, South Korea
[c] ICMR-Virus Unit, ID & BG Hospital Campus, 57 Dr Suresh C Banerjee Road, Beliaghata, Kolkata 700010, India
[d] ICMR-National Institute of Traditional Medicine, Nehru Nagar, Belagavi 590010, India
[e] Department of Chemistry, Jadavpur University, Raja S. C. Mallick Road, Kolkata 700032, India
[f] Department of Chemistry, Mahishadal Raj College, Purba Medinipur, Mahishadal, West Bengal 721628, India

ARTICLE INFO

Article history:
Received 6 August 2018
Received in revised form 20 December 2018
Accepted 30 December 2018
Available online 2 January 2019

Keywords:
Schiff base
Zn sensor
UV–Vis
PL and TCSPC
Molecular logic gate
Cell imaging

ABSTRACT

A novel Schiff base **L** composed of fluorescein hydrazine and a phenol functionalized moiety has been designed and prepared via cost-effective condensation reaction. The L is utilized for selective sensing of Zn^{2+} over other environmental and biological relevant metal ions in aqueous alcoholic solution under physiological pH range. The binding of Zn^{2+} to the receptor **L** is found to causes ~23 fold fluorescence enhancement of L. The 1:1 binding mode of the metal complex is established by combined UV–Vis, fluorescence, and HRMS (high-resolution mass spectroscopy) spectroscopic methods. The binding constant (K_a) for complexation and the limit of detection (LOD) of Zn^{2+} is calculated to be $2.86 \times 10^4\ M^{-1}$ and 1.59 μM, respectively. Further photophysical investigations including steady-state, time-resolved fluorescence analysis and spectral investigations including NMR (nuclear magnetic resonance), IR (infrared spectroscopy) suggest introduction of CHEF (chelation enhance fluorescence) with the suppression of C═N isomerization and PET (photo-induced electron transfer) mechanism for the strong fluorescent response towards Zn^{2+}. Finally, the sensor **L** is successfully employed to monitor a real-time detection of Zn^{2+} by means of TLC (thin layer chromatography) based paper strip. The **L** is used in the cell imaging study using African green monkey kidney cells (Vero cells) for the determination of exogenous Zn^{2+} by Immunofluorescence Assay (IFA) process.

1. Introduction

Zn (II) ion, the second most abundant transition metal in the human body plays a crucial role in many biological processes. This includes normal human growth and development, an additional signaling role in the central nervous system which contains high levels of zinc, gene transcription, brain function, and mammalian reproduction, co-factor in hundreds of enzymes [1,2]. Recent studies have identified labile zinc as being critically involved in human pathophysiology and neurology [3,4]. For instance, a failure in Zinc homeostasis is linked to development of prostate cancer and Alzheimer's disease. Deficiency of micronutrient zinc leads to impaired cognition, immune dysfunction, diarrhea, and death, particularly in children under the age of 5 years [5]. The human genome encodes two dozen Zn^{2+} specific transporters and many metal-buffering proteins, which are expressed in a tissue-specific manner [6]. Although Zn^{2+} is essential for cell function, accumulation of Zn^{2+} to toxic levels leads to cell death [7–9]. These factors thus trigger us for the detection and development of a new class of Zn (II) sensors. Schiff bases play a crucial role in host-guest chemistry as chemosensors being that the nitrogen atoms present exhibits a strong tendency to bind metal ions and implies its applications in recognition. Fluorescence sensors are powerful tools in the detection of ions/small molecules, because of their high sensitivity, excellent selectivity, and quick response speed. Such type of sensors normally contains two parts viz., a receptor that specially interacts with the target and a fluorophore that translates the molecular recognition to fluorescence signal. Fluorescent sensors based on Schiff base attract special attention owing to their easy synthesis, variable structures, and cheap raw materials. In recent years, the fluorescein and its derivatives were used as excellent fluorescence chemosensor for Zn^{2+} attract interest due to their short synthetic routes, high water solubility, noticeable fluorescence quantum yield and good photo-stability [10–18]. Out of the two distinctive form of fluorescein-based Schiff bases, the spirolactam (close) form is colorless and non-fluorescence. Some metal ions/species are capable to open up the ring-form accompanied with a change of its spectroscopic properties

* Corresponding authors.
E-mail addresses: atanujanaic@gmail.com (A. Jana), satyajitdeyoc@gmail.com (S. Dey).

https://doi.org/10.1016/j.saa.2018.12.053
1386-1425/

ACS APPLIED NANO MATERIALS
Cite This: ACS Appl. Nano Mater. 2019, 2, 1525−1532
Article
www.acsanm.org

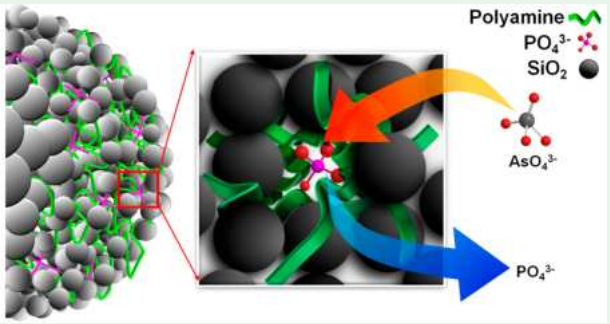
Oxyanion-Binding in a Bioinspired Nanoparticle-Assembled Hybrid Microsphere Structure: Effective Removal of Arsenate/Chromate From Water

Joydeb Manna,[†,‡] Nagaraju Shilpa,[†] Arun Kumar Bandarapu, and Rohit Kumar Rana*

Nanomaterials Laboratory, CSIR-Indian Institute of Chemical Technology, Tarnaka, Hyderabad 500007, India

Supporting Information

ABSTRACT: We demonstrate a bioinspired assembly wherein the specific interaction of polyamines with multivalent anions allows the assembly of silica nanoparticles to generate hybrid microsphere structures while this very phenomenon further provides ways for the microspheres to adsorb oxyanions like arsenate and chromate. In a typical method based on the biomineralization of diatomaceous biosilica structure, thus produced nanoparticle-assembled microspheres with a porous structure and hybrid functionalities exhibit efficient adsorption and separation of these toxic anions from water. The adsorption follows Freundlich isotherm with an inference for stronger interaction between adsorbate and adsorbent with nonuniform distribution of adsorption affinities. The opportunities to tune the composition with respect to the multivalent anion and their interaction with the polyamine, charge ratio, and so forth, illustrate the design of bioinspired robust structures with efficient oxyanion-binding property and recyclability. The consequence of competing anions shows that the binding selectivity follows the Hofmeister series of counterion interaction. Interestingly, in accordance with a molecular imprinting mechanism, the silica nanoparticle-assembled structure stabilizes and preserves the polyamine-anion nanostructure creating cavities/voids complementary to the adsorbing ions in shape, size, and functional groups. As a result, the polyamine with phosphate as the multivalent anion exhibits efficient binding and removal of these toxic contaminants, which is better than most of the other reported adsorbents.



KEYWORDS: *biomimetic chemistry, self-assembly, nanostructures, anion-binding, ion-imprinting*

INTRODUCTION

Despite the controversial conclusions that certain bacteria can grow in the presence of arsenate instead of phosphate, there has been continuous efforts to find biological or bioinspired solutions for arsenic remediation.[1,2] This includes investigations using organisms like Microalgae (phytoplankton), which are known to be the key contributors to arsenic cycling in the marine environment.[3] Other marine organisms, such as fish and invertebrates, have also been shown to facilitate accumulation of arsenic mainly in the form of organo-arsenicals. This bioaccumulation by a number of marine organisms certainly suggests that they have an affinity for the arsenic containing compounds.[4] Although the reason underlying this biological process is still a matter of discussion, mimicking these hybrid structures may provide clues not only for the phenomenon but also for the fabrication of advanced materials for the removal of these toxic anions from water.[5] Therefore, in the present work our focus is to explore the bioinspired structures, particularly those based on the Diatoms, which represent a type of microalgae that dominate the phytoplankton blooms. Via biosilicification processes, these marine species produce shells called frustules composed of silica and long-chain polyamine-containing proteins (silaffin) assembled together generating intricately designed structures. Thus, formed hybrid structure provides controlled porosity, large surface area, and mechanical protection.[6−8] Many efforts have been made not only to understand the biosilicification process but also to help develop bioinspired methods for the synthesis of advanced materials for various desirable applications.[9−13]

In the context of the groundwater contamination, the toxic oxyanions like arsenate and chromate are known to affect millions of people globally.[14−16] According to WHO (World Health Organization) guidelines, the maximum tolerable concentrations of arsenic and chromium in drinking water are <10 and <50 ppb, respectively. Both of arsenic and chromium exist in water mainly in their tetrahedral oxyanionic form.[17,18] Therefore, the removal of these oxyanions from drinking water either through natural biogeochemical processes or engineered approaches is imperative to mitigate its potential environmental and health risk. Conventionally, it is done by absorbing the ions

Received: January 1, 2019
Accepted: February 22, 2019
Published: February 22, 2019

DOI: 10.1021/acsanm.9b00003
ACS Appl. Nano Mater. 2019, 2, 1525−1532

Vidyasagar University Journal of Commerce
Vol. 24, 2019/ISSN 0973-5917

ASSESSMENT OF URBANIZATION IN CENSUS-UNITS THROUGH CONSTRUCTION OF A GENERALIZED URBANIZATION INDEX: A STUDY FOR ECONOMICALLY BACKWARD REGIONS OF WEST BENGAL DURING 1991 TO 2011

Subikash Mookherjee*
Sanjoy Kumar Pattanayek**
Debasish Mondal***

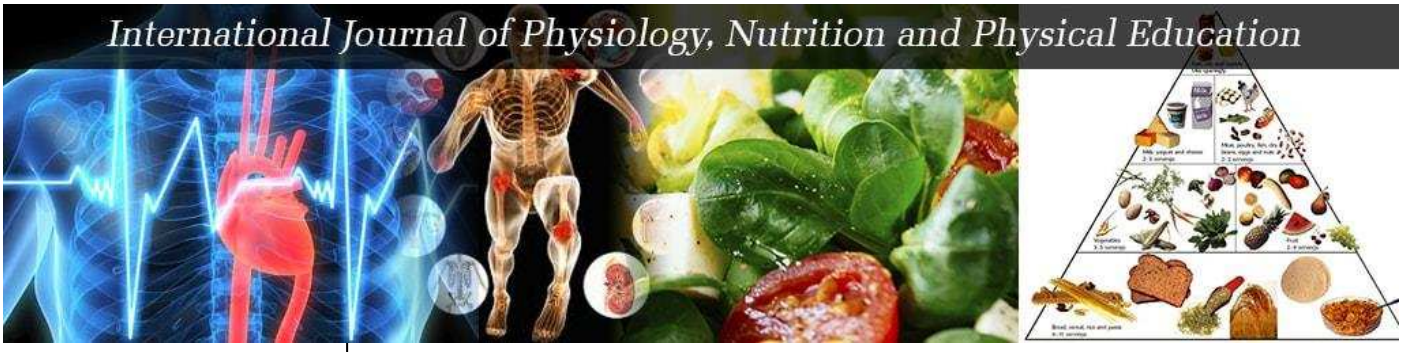
Abstract

The Census Authority of India usually provides data regarding the nature of a few urbane characteristics for all the village units and thereby classifies a place as Census Town, which is considered as the lowest unit of urbanization. From the perspective of urbanization, regions of any state, consisting of blocks can be classified as economically advanced or economically backward on the basis of existence of Census Towns in it as urban places are likely to bring more prosperity in terms of standard of living. However, proper assessment of urbanization in a single measurement scale, of all village units of a particular block is not done so far. An attempt in that direction is made in this article through construction of a Generalized Urbanization Index (GUI) for all the village units of some blocks, selected through systematic-stratified sampling, from three major districts of Paschim Medinipur, Bankura and Purulia, which are known as 'so called' backward regions. The proposed GUI for a census-unit is constructed with two components - the town criteria index and the amenities index and the relative weights of both the component-indices and the underlying dimension indices are determined through the application of Iterative Average Correlation Method indicating some movement towards actuality in comparison to prevailing two other methods of weight determination - the Equal Weights Principle and the Principal Component Analysis.

***Keywords**: Urbanization, Census Town, Backward Region, Index, Equal Weights, Principal Component Analysis, Average Correlation*

***JEL Classification Codes**: C51, H54, O18*

* Associate Professor, Department of Economics, Mahishadal Raj College, West Bengal, India and Research Scholar, Department of Economics, Vidyasagar University, Midnapore, West Bengal, India
**Faculty, Department of Economics, Raja N. L. Khan Women's College, West Bengal, India and Research Scholar, Department of Economics, Vidyasagar University, Midnapore, West Bengal, India
***Professor of Economics, Vidyasagar University, Midnapore, West Bengal, India
E-Mail: Dmondal_eco@yahoo.co.in



ISSN: 2456-0057
IJPNPE 2019; 4(1): 2558-2562

www.journalofsports.com
Received: 22-03-2019
Accepted: 29-04-2019

Joydeb Manna
Department of Chemistry,
Mahishadal Raj College,
Mahishadal, Purba Medinipur,
West Bengal, India

Corresponding Author:
Joydeb Manna
Department of Chemistry,
Mahishadal Raj College,
Mahishadal, Purba Medinipur,
West Bengal, India

Surface enhanced Raman scattering: Mechanism and suitable Nanomaterials for detection of trace molecules

Joydeb Manna

Abstract
SERS is becoming an important tool for detection of molecules in ultra-trace level. In this review, an overview of SERS and different types of SERS active substances are presented. The excessive use of metal and/or metal supported nanostructured materials have been used for making the SERS active substances. Along with pure metal nanoparticles, core-shell or hybrid nanoparticles also made their way as SERS active platform. Notably, unusual shapes such as nanostars or nanoplates have used for such purposes. Further, SERS were used for intracellular detection of biomolecules in different types of cells. It is believed that this review would be useful to further development of advanced SERS platform for various applications especially physiological detection of trace molecules.

Keywords: SERS, mechanism, Nanomaterials, intracellular, trace molecule

1. Introduction
Surface enhanced Raman spectroscopy (SERS) is a powerful vibrational spectroscopy technique that allows for highly sensitive structural detection of low concentration analytes through the amplification of electromagnetic fields generated by the excitation of localized surface plasmons [1]. SERS has progressed from studies of model systems on roughened electrodes to highly sophisticated studies, such as single molecule spectroscopy. We summarize the current state of knowledge concerning the mechanism of SERS and new substrate materials. We highlight recent applications of SERS including sensing, spectro-electrochemistry, single molecule SERS, and real-world applications. We also discuss contributions to the field from the Van Duyne group. This review concludes with a discussion of future directions for this field including biological probing with UV-SERS, tip-enhanced Raman spectroscopy, and ultrafast SERS [2]. A single metal nanoparticle typically offers SERS signal enhancements on the order of 10^2–10^6 [3]. However, when two nanoparticles are in close proximity, their dipoles can couple, leading to stronger overall field enhancements, reported to be as high as 10^{10}–10^{14} [4]. As such, nanoparticle aggregates are often considered an optimum SERS substrate, even though they lack well-defined structure [5]. For intracellular SERS imaging, these nano- particles must self-assemble into aggregates within the cell, since the aggregates are often too large to penetrate the external membrane or wall of the cell. As we shall see, the cells inherently promote this aggregation due to their primary mechanism of nanoparticle uptake; however, this can limit the access that the nanoparticles have to specific regions of the intracellular matrix.
In recent years, purposeful SERS applications have been performed by functionalizing the nanoparticles with antibodies or other bio molecules that have a special receptor [6]. The functionalized nanoparticles that also can be described as SERS targeting nanoprobes always contain Raman reporter molecules to highlight the positions of themselves by their high spectral specificity. More recently, this method has been successfully used in tumor detection on living animals [7]. However, the Raman reporter modified targeting nanoprobe provides only the signature of the reporters and tends to be an imaging instrument rather than a detection probe, like the role of a fluorescent reagent or quantum dot; the application of the latter in targeting research is already proving to be excellent. In fact, delivering molecular structural information from the target analyte is the most important characteristic or advantage of SERS, which until now has not been possible by any other technique.

NEW ACADEMIA: *An International Journal of English Language, Literature and Literary Theory*

Online ISSN 2347-2073 **Vol. VIII, Issue II, April 2019**

U.G.C. Journal No. 44829

EXPLOITATION OF THE NATURE AND THE TRANSFORMATION OF THE WILD IN STEPHEN ALTER'S *IN THE JUNGLES OF THE NIGHT*

Nirmalendu Maiti
Guest-Teacher,
Department of English, Mahishadal Raj College, and
PhD Research Scholar,
Vidyasagar University, West Bengal, India
&
Dr. Asis De
Associate Professor and Head, Department of English,
Mahishadal Raj College
Mahishadal, West Bengal, India

Abstract

The inclination towards human flesh as part of a daily diet is an 'unnatural' phenomenon for a predatory animal like tiger and leopard. But during the British Raj, the number of man-eaters was drastically increasing in the Kumaon and Garhwal regions of India. Strikingly, this was also the time when the rampant extraction of timber in the Terai forests saw the height of colonial exploitation. It is in this context that Stephen Alter has set his novel, In the Jungles of the Night (2016), which is included in this paper as the case-study. Alter's novel is a fictional recounting of Jim Corbett, who is depicted here as a hunter with the impulse of a naturalist and conservationist. Taking Corbett's experience in the account, as narrated by Alter in his novel, this paper would explore how man-eaters are not a natural selection, but a production of human experimentation and interference in the ecological system. How exploitation of the natural resources and encroachment in the vicinity of tigers and leopards threaten ecological balance, would also be the points of discussion for this paper. The paper would consider the colonial policies towards he wild life and investigate its role in the negative transformation of the ecosphere. Finally, the paper would draw its conclusion by reflecting upon the eco-literary consciousness in Alter's novel, suggesting how human beings can still avert ecological crisis by preserving what is left in the bio-diversity.

Keywords: Man-eater, extraction/ exploitation, encroachment, ecological crisis

In 1907 a man-eater commonly known as the Champawat tigress was shot dead by Jim Corbett. It was his first proclaimed hunting of a man-eater that had been terrorising the

LITERARY STUDIES

Volume 32 March 2019

LITERARY ASSOCIATION OF NEPAL

Contents

The Mystique Mountain: Nanda Devi in the Eyes of Bill Aitken, Hugh Thomson and Stephen Alter

Asis De and Maitrayee Misra

In literature, mountains usually stand for the supra-mundane. Its vastness, its altitude, the difficulty associated with the art of mountaineering — all contribute to the stature of the mountain as something beyond the ordinary. In English literature, the trend of using mountains as literary metaphors of strength, vastness, height and challenge is a common practice. In ancient Indian (Sanskrit *Kavya* poetry) and Chinese literature (*shan-shui* poetry), mountains and mountainscapes represent mostly religio-philosophical knowledge, spiritual truth and issues transcendental amid the wilderness of nature. It is usually observed that the western treatment of mountains in literary productions chiefly rely on the spatiality of the mountainscapes whereas the oriental attitude rests on the spirituality associated with the mountains and a subtle temporality in a tangent relationship with the consciousness of the transcendental. In European/ western literary productions, the crucial truth about the treatment of mountains—whether it was the depiction of Alps or the Andes, was not at all a positive one till the 17th century! Though Marjorie Hope Nicolson, in her book *Mountain Gloom and Mountain Glory: The Development of the Aesthetics of the Infinite* (1959), observes that human "response to mountains has been influenced by inherited conventions of literature and theology" (3), there is no denying that early European literatures— written both in the Classical periods and in the Christian era, had no relation with the depiction of mountains in them. In her book, Nicolson finds the Christian era till 17th century as the period of 'Mountain Gloom', when mountains had negative depiction in literary or theological texts:

"During the first seventeen centuries of the Christian era, 'Mountain Gloom' so clouded human eyes that never for a moment did poets see mountains in the full radiance to which our eyes have become accustomed. Within a century…all this was changed. The 'Mountain Glory' dawned, then shone full splendour. Why? It was not merely a matter of literary language and conventions….The change in human attitudes about mountains involved a reversal of many basic attitudes." (3)

As Nicolson admits here, there was a certain "change in human attitudes about mountains" in the Eurocentric world of literature and academia after the seventeenth century due to "a reversal of many basic attitudes". Nicolson also cites a reference to a poem of Alexander Pope, where the poet talks about the heights of Alps and wishes climbing up:

"So pleased at first the tow'ring Alps we try,
Mount o'er the vales, and seem to tread the sky." (qtd. in Nicolson 4)

ISSN 0976-9064

Litscape

JOURNAL OF VUETC

A National Level Peer-Reviewed Refereed Journal of Literature & Culture Studies

V Vidyasagar
U University
E English
T Teachers'
C Consortium

Special Issue • Indian Diasporic Literature

Vol. 11 • No. 1 • November 2018

Litscape, Journal of VUETC, Vol.11, No.1, 2018, ISSN: 0976-9064, Pages: 34-43

Transnational Kinship and Diasporic 'Relatedness' in David Dabydeen's *The Intended*

Asis De

The comparatively recent notion of 'relatedness' (Jallinoja and Widmer, 2011) in family sociology, its core concept of 'relationality' and dimensions like memory and the imaginary could be seen as useful tools in measuring the changing natures of kinship and family during transnational migration. Idea like transnational kinship dwells in constant flux. Issues like ethnicity, 'race', age and language are important vectors which substantially influence both the formation and termination of kinship during transnational dislocation. To elaborate upon this point, I would use David Dabydeen's novel *The Intended*(1991) as case study, which aptly emphasizes the young protagonist's making and remaking of transnational kinship in England alongside his memories of a diasporic Indian family in Guyana and an imaginary ethnic Indian root.

"The ideas of kinship, the kin-based society, the idiom of kinship, and the content of kinship are the received wisdom of today, as they have been almost from the beginnings of anthropology"— Thus begins David Murray Schneider's highly influential volume *A Critique of the Study of Kinship* (1984), which has initiated a rather new way of looking at kinship studies beyond the formalist tradition, by attempting cross-cultural analyses of kinship only three decades back. The propositions of Schneider's new anthropology of kinship, which he finds as "the received wisdom of today", rely heavily on the nature/culture interplay than the biologically determined structuralist way of assessing kinship. The inclusion of 'local' culture/s and community history as no less elemental determinants than the exclusive factors like progeny and ethnology in kinship studies, allowed a broader and more fluid conceptualization of kinship through comparative analyses of 'relationality' of the individual with the society and its culture.Janet Carsten, another key thinker of kinship studies, in her book *After Kinship* (2004) attempts to find out how "kinship is part of the pre-given, natural order of things and the extent to which it is

Associate Professor and Head, Department of English, Mahishadal Raj College, Purba Medinipur, West Bengal, India

ISSN : EISSN : 2231 - 2773

Ravenshaw Journal of Literary and Cultural Studies

Volume VIII 2018

Special issue on Life Writing

DEPARTMENT OF ENGLISH
RAVENSHAW UNIVERSITY, CUTTACK

The Aesthetics of Becoming a Being in Manoranjan Byapari's Bangla Dalit Autobiography *Itibritte Chandal Jivan*

Asis De

Manoranjan Byapari's *Itibritte Chandal Jivan* was published by a less-known Kolkata-based publishing house, 'ab prakashani' quite recently in January 2016. The quintessence of his life was the word that Byapari honours most—'*jijibisha*', meaning 'an extremely strong urge to live'. The first sentence of the first volume reads as: "Here I am." (*ICJ* 1: 19); the second volume ends with the sentence: "Those unexpressed words make him [the author-narrator] bleed." (*ICJ* 2: 397) [my translation]. Beginning with an emphatic 'I', which is an obvious condition of the genre, and ending with an oblique reference again to that 'I', the narrator-persona's 'bleeding' profusely due to inexpression of suffering and oppression. However, before exploring Manoranjan Byapari's two-volume autobiographical text some deliberations on the emergence of the autobiographical genre in Bengali literature and finally, of the literary space where a few personal narratives written by Dalit writers find their place is imperative.

iii Manoranjan Byapari's first ever composition, the short autobiographical piece entitled '*Rickshaw Chalai*' ('I Pull Rickshaw'), which was published in Mahasweta Devi'smagazine *Bartika* in 1981, was written under a pen-name Madan Dutta.

Work Cited

Bandopadhyay, Sekhar and Anasua Basu Ray Chaudhury. *In Search of Space: The Schedul Caste Movement in West Bengal after Partition*, Mahanirban Calcutta Research Group, Policies and Practices 59, 2014.

Byapari, Manoranjan. *Itibritte Chandal Jivan*. 2012. 2nd Ed. Vol. I. Kolkata Prokashon, 2013.

---. *Itibritte Chandal Jivan*. 2016. 1st Ed. Vol. II. ab Prakasani, 2016.

Byapari, Manoranjan. Personal interview. 23 Dec 2015.

Dasgupta, Sayantan. "Dalit Writing in Bangla: Repression and Resistance in Manoranjan Byapari and Manju Bala's Narratives." *Dalit Narratives and the Testimonial Genre in India*, edited by Subha Chakraborty Dasgupta. Spec. issue of *Jadavpur Journal of Comparative Literature*, Vol. 46 (2008-09), pp. 125-38.

Sen, Dwaipayan. "An absent-minded Casteism?" *The Politics of Caste in West Bengal*, edited by Uday Chandra, Geir Heierstad and Kenneth Bo Nielsen, Routledge, 2016, pp.103-124.

Singha, S. P. and I. Acharya, editors. Introduction. *Towards Social Change: Essays on Dalit Literature*. By Singha and Acharya, Orient Blackswan, 2014.

Woerkens, Martine van. "A Life less Ordinary: The Female Subaltern and Dalit Literature in Contemporary India." *Dalit Literatures in India*, edited by Joshil K. Abraham and Judith Misrahi-Barak., Routledge, 2016, pp. 224-237.

Iranian Journal of Fuzzy Systems

Volume 17, Number 1, (2020), pp. 29-52

University of Sistan and Baluchestan

Two-level supply chain for a deteriorating item with stock and promotional cost dependent demand under shortages

N. Pakhira[1], M. K. Maiti[2] and M. Maiti[3]

[1,3] *Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim Medinipur, West Bengal, 721102, India*

[2] *Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba Medinipur, West Bengal, 721628, India*

npakhira1@yahoo.com, manasmaiti@yahoo.co.in, mmaiti2005@yahoo.co.in

Abstract

In this research work, a wholesaler-retailer-customer supply chain model for a deteriorating item is considered, where the retailer's warehouse in the market place has a limited capacity. The retailer can rent an additional warehouse (rented warehouse) if needed, with a higher rent compared to the existing warehouse (own warehouse). The customers' demand of the item is linearly influenced by the stock level and in case of shortages the base demand is partially backlogged. Being the leader of the supply chain, the retailer introduces some promotional cost to boost the base demand of the item. To participate in joint marketing decision, the wholesaler shares a compromise part of this promotional cost. Goal of this research work is to maximize the individual profits (when the retailer is the leader and the wholesaler is the follower) as well as the channel profit (when the retailer and the wholesaler jointly make marketing decision) of the system. It is established that if the wholesaler shares a part of the promotional cost, then the channel profit as well as the individual profits increase. The supply chain model is also considered in imprecise environment, where different inventory parameters are fuzzy/rough in nature. In this case, the individual profits as well as the channel profit become fuzzy/rough in nature. As optimization of fuzzy/rough objective is not well defined, following credibility/trust measure of fuzzy/rough event, an approach is followed for comparison of fuzzy/rough objectives and a Particle Swarm Optimization algorithm is implemented to find the marketing decisions. Efficiency of the algorithm in solving the problem is statistically established. The existence of the joint marketing decision is established analytically and numerically (with illustration) in crisp as well as in imprecise environments.

Keywords: Deteriorating inventory, two-warehouse model, promotional cost, credibility measure, trust measure, particle swarm optimization.

1 Introduction

The classical inventory models on deteriorating items are normally developed with the common assumption that the capacity of the retailer's outlet is sufficient, i.e., the outlet has sufficient space to store the order quantity [2, 5, 30, 37, 43, 44]. However, in several real-life problems, this assumption may not appropriate. There are a number of factors which influence the marketing decisions in different ways. Sometimes these factors may force the retailer to buy more than his/her own warehouse (OW) capacity. The retailer may overcome the situation using an additional rented warehouse (RW), having sufficient capacity, normally with higher rent relative to the OW [8, 24].

Influence of displayed inventory level on the demand of any item is a well established phenomenon [12, 11]. Due to this reason, a retailer normally uses a decorated outlet at the market place to attract the customers and uses another storehouse near the outlet to stock the excess order quantity [23, 24, 29, 35]. Also inventory modelings of the deteriorating items draw significant attention by the researchers [2, 3, 5, 21, 26, 30, 41, 44]. During last two decades, several researchers on inventory control problems developed their models incorporating the above mentioned

Corresponding Author: N. Pakhira
Received: September 2017; Revised: October 2018; Accepted: April 2019.

Soft Computing
https://doi.org/10.1007/s00500-020-04867-y

METHODOLOGIES AND APPLICATION

Artificial bee colony optimization-inspired synergetic study of fractional-order economic production quantity model

Mostafijur Rahaman[1] · Sankar Prasad Mondal[2] · Ali Akbar Shaikh[3] · Prasenjit Pramanik[4] · Samarjit Roy[5] · Manas Kumar Maiti[6] · Rituparna Mondal[7] · Debashis De[5]

Abstract
Inventory control is one of the most widely recognized issues in the reality. This investigation manages the utilization of fractional derivatives and integration on an inventory control problem. The memory of a dynamical model is a highly concerned issue which is commonly neglected by the models described in terms of integer-order differential equation. The memory capturing the power of fractional derivative (in Caputo's sense) is utilized here to describe an economic production quantity model with deterioration when the demand depends on price and stock and production is stock dependent. Also, this study covers the integer-order model with the same assumptions as a memoryless model and a particular case of the fractional model. Due to the complex nature of the model, numerical optimization with the help of a modified artificial bee colony algorithm is done instead of the analytical approach of optimization. Finally, we have performed a sensitivity analysis in order to make a fruitful conclusion.

Keywords Fractional-order differential equation · EPQ model · Laplace transformation · ABC algorithm

1 Introduction

Fractional calculus (FC) is a branch of mathematics which old enough as the traditional integer-order calculus. In the late seventeenth century, the foundation stone for the establishment of FC was laid by the conversation between two famous mathematicians L'Hospital and Liebnitz. Liebnitz's response to the question of L'Hospital on the existence of derivative of $\frac{1}{2}$ the order was "an apparent paradox from which 1-day useful consequences will be drawn". Surprisingly, the application of FC in the practical field of science and technology is neglected for decades and centuries looking at the concept of FC as an abstract and absurd almost. But, it is proved through recent progress of the subject that the concept is not abstract. Rather, it can describe more accurately the dynamical behaviour of processes in nature and real world in comparison to integer-order calculus. So, these days, global excitement for FC as well as fractional-order system (FOS) has been seemingly exponential. Due to the different nice results of fractional derivatives, FC has attained much attention for modelling of the image processes, various fields of mathematics, economics, physics and engineering (Diethelm et al. 2012;

Communicated by V. Loia.

✉ Sankar Prasad Mondal
sankar.res07@gmail.com

[1] Department of Mathematics, Indian Institute of Engineering Science and Technology, Shibpur, Howrah 711103, India

[2] Department of Applied Science, Maulana Abul Kalam Azad University of Technology, West Bengal, Haringhata, Nadia, West Bengal 741249, India

[3] Department of Mathematics, University of Burdwan, Golapbag, Burdwan, West Bengal, India

[4] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim Medinipur, West Bengal, India

[5] Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, Haringhata, Nadia, West Bengal 741249, India

[6] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

[7] Applied Mathematics and Humanities Department, Sardar Vallabhbhai National Institute of Technology, Surat, Gujrat, India

Published online: 31 March 2020

INTERNATIONAL JOURNAL OF SYSTEMS SCIENCE: OPERATIONS & LOGISTICS
https://doi.org/10.1080/23302674.2020.1753127

A two-warehouse multi-item supply chain with stock dependent promotional demand under joint replenishment policy: a mixed-mode ABC approach

Nilesh Pakhira[a], Manas Kumar Maiti[b] and Manoranjan Maiti[a]

[a]Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Paschim-Medinipur, West Bengal, India; [b]Department of Mathematics, Mahishadal Raj College, Purba-Medinipur, West Bengal, India

ABSTRACT

A multi-item two-level supply chain model under promotional cost sharing is proposed and analysed in this investigation. Here, it is assumed that a retailer purchases different items from a wholesaler under joint replenishment policy and sells the items to its customers. Due to the scarcity of the market place, the retailer uses two rented warehouses to run the business – one with moderate capacity situated at the heart of the market place, namely RW_1 and another with sufficiently large capacity, a little away from the market place, namely RW_2. Items are ordered jointly using basic period (BP) policy, initially stored at RW_2 and transferred jointly to RW_1 for sale following another BP policy. Demands of the items depend on displayed inventory levels, selling prices as well as the frequencies of the advertisements. Total cost due to the reduced selling prices and the advertisements is considered as the promotional cost. The problem is formulated as a mixed-integer optimisation problem in crisp as well in imprecise environments. To solve such real-life problems, here artificial bee colony algorithm is modified, tested and used. Model is illustrated with some hypothetical test problems and some managerial insights are outlined.

ARTICLE HISTORY
Received 22 May 2019
Accepted 31 March 2020

KEYWORDS
Two-warehouse; joint replenishment; promotional cost sharing; mixed-mode ABC algorithm

1. Introduction

In any supply chain, profit of each party mostly depends on the market demand of the items involved in the chain. Though every item has some base demand in the market, goal of every supply chain is to improve this base demand to survive in the market. Displayed inventory level always influences the customers and accordingly retailers normally hire a showroom in the market place to attracts the customers. This investment is mainly done at the retailer level. Two other factors which highly influence the demand are – advertisement (Maiti & Maiti, 2006a; Manna et al., 2017) and selling price (Maiti & Maiti, 2006a; Pakhira et al., 2017; Paul et al., 2014; Wee, 1997). An item is supposed to be sold in the maximum retail price printed on the packet, but in reality it is observed that different retailers give different discounts to attract their customers. Sometimes packaging is made with some extra amount which basically decreases the unit price. Free gift/extra amount with a purchase is another approach of reducing the selling price. Again different multinationals, as well as small companies, use frequent advertisements to boost the demand of their products to the customers. Though this type of investment reduces the profit from per unit sale, the resultant profit of each party increases, as total demand improves significantly. But if only one party invests this promotional cost, then, he/she will be the sole decision maker (DM) of the system (Haseli et al., 2019), which may not satisfy the other party's interest. So a coordination is highly required among all the parties in such a manner that all the parties will share the promotional cost and take part in the marketing decision. Some research articles have already been published incorporating promotional cost sharing in supply chain (Cárdenas-Barrón & Sana, 2015; Pakhira et al., 2018a, 2018b, 2019; Pramanik et al., 2017a). In all these studies, it is assumed that a promotional effort influences the demand of an item and promotional cost is a function of this promotional effort. Thus, a research gap from these studies can be identified as follows:

It is neither clear how promotional effort actually improves the demand nor how the promotional cost function is estimated. Moreover, none of these studies considered the influence of displayed inventory on the demand, specially for a supply chain management (SCM) system under retailer's two-warehouse facility.

It has already been mentioned that the displayed inventory has significant role in drawing attention to the

CONTACT Nilesh Pakhira npakhira1@yahoo.com Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim-Medinipur, West Bengal 721102, India

Journal of Intelligent & Fuzzy Systems 37 (2019) 565–581
DOI:10.3233/JIFS-16913
IOS Press

A supply chain of deteriorating items with variable demand

Nilesh Pakhira[a,*], Manas Kumar Maiti[b] and Manoranjan Maiti[a]
[a]*Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim-Medinipur, West Bengal, India*
[b]*Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, India*

Abstract. Here two-level supply chain model is considered for a deteriorating item where the retailer's warehouse in the market place has a limited capacity. Therefore the retailer can rent a warehouse (RW) if needed with a higher cost compared to own warehouse (OW). This model includes one wholesaler and one retailer and our aim is to maximize the total profit. The demand rate in retailer is stock-dependent and in case of any shortages, the demand is partially backlogged. Retailer also introduces some promotional cost to boost the base demand of the item. It is established that if the wholesaler shares a part of promotional cost then channel profit as well as individual profit increase. The supply chain model is also considered for imprecise environment when different inventory parameters are fuzzy/rough in nature. In this case individual profits as well as channel profit become fuzzy/rough in nature. As optimization of fuzzy/rough objective is not well defined, following credibility/trust measure of fuzzy/rough event, an approach is proposed for comparison of fuzzy/rough objectives and a Particle Swarm Optimization (PSO) algorithm is used to find marketing decisions. Models are illustrated with numerical examples.

Keywords: Deterioration, Two-warehouse model, Promotional Cost, Credibility/Trust measure, Particle Swarm Optimization

1. Introduction

In the classical inventory model for deteriorating products, it is usually assumed that the warehouse has no limits in the capacity. However, in the real-life problem the situation is different. There are a number of factors which influence the optimum solution in different ways. Sometimes these factors may suggest retailers to buy more than their own warehouse (OW) capacity. In these situations, the retailers can benefit from a rented warehouse (RW).

Today's globalized and competitive markets drive companies to become more efficient and cost-effective. Usually, supply chain (SC) members optimize local decisions without considering the impact of their decision on the other member's performance and on the overall performance of SC [33]. Thus, a coordination mechanism may be necessary to motivate the members. SC members are dependent on each other and these members need to be coordinated efficiently by managing dependencies between each other. Jaber and Osman [15] considered a two-level supply chain with delay in payments and profit sharing. The ordering and advertising policies for a single-period commodity was presented by Chen [3] in a two-level supply chain. Wang [32] considered a two-level supply chain with multiple retailers and stochastic demand. Dong et al. [6] developed a model on multi-level supply chain.

Many researchers have discussed on inventory models for deteriorating items. Bhunia and Maiti [2] proposed a deterministic inventory model for

*Corresponding author. Nilesh Pakhira, Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim-Medinipur, West Bengal, 721102, India. E-mail: npakhira1@yahoo.com.

JOURNAL OF INDUSTRIAL AND
MANAGEMENT OPTIMIZATION
Volume **15**, Number **3**, July **2019**

doi:10.3934/jimo.2018096

pp. **1289–1315**

NOTE ON: SUPPLY CHAIN INVENTORY MODEL FOR DETERIORATING ITEMS WITH MAXIMUM LIFETIME AND PARTIAL TRADE CREDIT TO CREDIT RISK CUSTOMERS

Prasenjit Pramanik*

Department of Applied Mathematics with Oceanology and Computer Programming
Vidyasagar University, Midnapore, Paschim Medinipur, West Bengal 721102, India

Sarama Malik Das

Department of Mathematics, Calcutta Institute of Technology
Uluberia, Howrah, West Bengal 711316, India

Manas Kumar Maiti

Department of Mathematics, Mahishadal Raj College
Mahishadal, Purba Medinipur, West Bengal 721628, India

(Communicated by Changzhi Wu)

Abstract. In the recently published paper [Gour Chandra Mahata and Sujit Kumar De, Supply chain inventory model for deteriorating items with maximum lifetime and partial trade credit to credit-risk customers, International Journal of Management Science and Engineering Management, 2017, DOI:10.1080/17509653.2015.1109482], a supplier-retailer supply chain model of a deteriorating item with maximum lifetime and partial trade credit to credit risk customers is studied. In their study, unfortunately the amount of the payable bank interest due to the deteriorated units is omitted in the retailer's profit function for making the marketing decision. Some other unrealistic studies are also found in the numerical section of the paper. In this study those non-trivial flaws are identified and technically corrected. After correction, the theoretical existence of the optimal solutions of different scenarios are established and the solutions are derived using a soft computing technique.

1. **Introduction.** In a real life business environment there are several products such as fruits, vegetables, medicines, volatile liquids, blood in blood bank, high-tech products etc., which deteriorate continuously due to evaporation, spoilage, obsolescence, etc. In reality, it is not possible to prevent the deterioration of any deteriorating item fully in any business sector. Due to this reason the maintenance of inventory system of a deteriorating item is a crucial issue for the decision maker of the system. To overcome this difficulty in 1963, Ghare and Schrader[10] first explored an economic order quantity (EOQ) model for deteriorating items. After the novel invention of Ghare and Schrader[10], the researchers and the practitioners of inventory control system/ supply chain management developed various realistic models for deteriorating items considering constant deterioration rate[1, 3, 6, 8, 11,

2010 *Mathematics Subject Classification.* Primary: 90B05; Secondary 91B60.

Key words and phrases. Supply chain, EOQ model, deterioration, partial trade credit, maximum lifetime.

* Corresponding author.

Engineering Applications of Artificial Intelligence 85 (2019) 194–207

Contents lists available at ScienceDirect

Engineering Applications of Artificial Intelligence

journal homepage: www.elsevier.com/locate/engappai

An inventory model for deteriorating items with inflation induced variable demand under two level partial trade credit : A hybrid ABC-GA approach☆

Prasenjit Pramanik [a,*], Manas Kumar Maiti [b]

[a] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim-Medinipur, West Bengal 721102, India

[b] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

ARTICLE INFO

Keywords:
Inventory
Partial trade credit
Promotional effort
Inflation
Time value of money
Artificial bee Genetic algorithm (ABGA)

ABSTRACT

In this research work an inventory model of a deteriorating item is considered under two level partial trade credit policy incorporating inflation and time value of money in a finite planning horizon. Here it is assumed that a wholesaler offers a partial trade credit to a retailer i.e., trade credit period is offered on an portion of the total purchase amount. In turn the retailer also offers a partial trade credit to its customers. Demand of the item linearly decreases with time and influenced by unit selling price of the item. As selling price is influenced by the inflation and time value of money, so the base demand depends on inflation and bank interest rate also. The retailer also introduces some promotional cost to boost the demand of the item. Under this circumstances, marketing decisions are made to maximize the present value of the total profit. On the other hand combining the features of artificial bee colony (ABC) and genetic algorithm (GA), a hybrid algorithm, artificial bee genetic algorithm (ABGA) has been developed to find the most appropriate business strategies for the proposed model. Efficiency of this algorithm is tested and compared with some ABC variants using a set of benchmark test functions. The model has been illustrated with several numerical examples and some managerial insights are outlined.

1. Introduction and literature review

Due to huge and stiff competition among the business enterprises in the local as well as in the global market, the business enterprises adopt various tolls to sell their products efficiently. Trade credit policy is one of the most effective promotional tools to push a product, which indirectly reduce the selling price of the product. With the novel invention of Goyal (1985), trade credit policy is heavily used in inventory control systems. In Goyal (1985), it is assumed that a supplier offers some delay period in payment to a retailer. From this point of view the researchers and the practitioners of inventory control systems developed various models (Aggarwal and Jaggi, 1995; Chung and Liao, 2004; Huang, 2007a; Ouyang et al., 2009; Pramanik et al., 2017c). From these studies it is seen that a supplier/wholesaler offers a credit period to a retailer but in turn the retailer does not offer any credit opportunity to his/her customers, which is an unrealistic phenomenon. (Huang, 2003) first explore an inventory model under two level trade credit policy, where a supplier offers a credit period for payment to a retailer and in turn the retailer also offers a credit period to the customers. From this point of view there are several research works developed with different circumstances to make the models more realistic (Chung, 2011, 2013; Guchhait et al., 2014; Huang, 2006, 2007b; Lashgari and Taleizadeh, 2016; Maiti, 2011; Maiti and Maiti, 2007; Taleizadeh et al., 2016; Teng et al., 2013). Also to reduce the default credit risk the researchers of inventory control system develop their models (Huang and Hsu, 2008; Mahata, 2012; Ouyang et al., 2009) with partial credit policy under two level credit policy, where the supplier/wholesaler offers a full credit to the retailer but in turn the retailer offers a credit period to the customers on some portion of the total purchase amount and the remaining portion of the purchase amount has to pay as collateral deposit at the time of receiving the units of the item. Recently Pramanik et al. (2017a) have developed an economic order quantity (EOQ) model under three level trade credit policy with retailer's partial credit policy. Now-a-days, there are so many fake orders are made to the supplier in case of e-business. To mitigate the order cancellation risk, the researchers are devoted in the direction of advance payment scheme (full or partial) for the retailers and offers some credit period on some portion of the total purchase amount (Diabat et al., 2017; Lashgaria et al., 2016, 2018; Taleizadeh et al., 2018; Tavakoli and Taleizadeh; Zia and Taleizadeh, 2015). In

☆ No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to https://doi.org/10.1016/j.engappai.2019.06.013.

* Corresponding author.
E-mail addresses: pramanik.prasenjit72@gmail.com (P. Pramanik), manasmaiti@yahoo.co.in (M.K. Maiti).

https://doi.org/10.1016/j.engappai.2019.06.013
Received 23 March 2018; Received in revised form 10 November 2018; Accepted 19 June 2019
Available online xxxx
0952-1976/

Soft Computing
https://doi.org/10.1007/s00500-019-04502-5

METHODOLOGIES AND APPLICATION

Trade credit policy of an inventory model with imprecise variable demand: an ABC-GA approach

Prasenjit Pramanik[1] · **Manas Kumar Maiti**[2]

Abstract
In this research work, an inventory model with fuzzy promotional effort induced dynamic demand under two level partial trade credit policy has been developed in an imprecise planning horizon. Here, it is assumed that in the planning horizon a retailer completed a finite number full cycles. In each of the retailer's cycle, a wholesaler offers a credit period to the retailer on the full purchased amount and in turn the retailer offers a credit period to its customers on a part of his/her purchased amount. The imprecise marketing demand is influenced by the retailer's fuzzy promotional effort, customers' credit period, customers' credit amount and retail selling price. Goal of this study is to find the optimal business strategy for the retailer with respect to his/her total fuzzy financial gain from the system. Due to imprecise nature of the demand, the problem is mathematically represented following fuzzy differential equation and fuzzy Riemann integration and alpha-cut of the entire fuzzy gain from the system is derived. Its graded mean integration representation is computed and optimized with respect to customer's credit amount credit period, and retailer's order quantity for most appropriate marketing decision. Hence, the problem reduced to a multivariate crisp optimization problem and a heuristic, multichoice artificial bee genetic algorithm (MCABGA) has been proposed for it. The efficiency of MCABGA is tested against some other existing artificial bee colony variants using a list of benchmark test functions available in the literature. The model is illustrated with some hypothetical test problems and some managerial insights are outlined. Finally, a conclusion is drawn and some future research directions are proposed.

Keywords Inventory · Imprecise variable demand · Fuzzy differential equation · Artificial bee colony (ABC) · Genetic algorithm (GA)

1 Introduction

Trade credit policy is an important and effective promotional tool to push a product efficiently. Initiative work on the modelling of inventory problems incorporating trade credit option was made by Goyal(1985) and then the researchers and the practitioners of inventory problems proposed various models (economic order quantity (EOQ)/economic production quantity(EPQ)) incorporating trade credit options in different levels (customers' level, retailer level, wholesaler level, etc.) of a business chain. Since last two decade, several inventory models are developed by various researchers to maintain the inventory most appropriately in various circumstances under different trade credit policies, like, single level (wholesaler to retailer) credit opportunity (Aggarwal and Jaggi 1995; Chung and Liao 2004; Huang 2007; Ouyang et al. 2009; Pramanik et al. 2017c), two levels of trade option (wholesaler to retailer and retailer to customers) (Chung 2011, 2013; Guchhait et al. 2015; Huang 2003, 2006; Huang and Hsu 2008; Pramanik and Maiti 2019b; Pramanik et al. 2019; Teng 2009) and three levels of trade credit where credit opportunity exists for the wholesaler also from the supplier(Pal et al. 2015; Pramanik et al. 2017a, b). It is a real practice that in a business chain under two level credit opportunity wholesaler offers a credit period on full purchased amount to the retailer (named as

Communicated by V. Loia.

✉ Prasenjit Pramanik
pramanik.prasenjit72@gmail.com

Manas Kumar Maiti
manasmaiti@yahoo.co.in

[1] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore,Paschim-Medinipur, West Bengal 721102, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

Published online: 15 November 2019

International Journal of Uncertainty,
Fuzziness and Knowledge-Based Systems
Vol. 27, No. 5 (2019) 693–717

DOI: 10.1142/S0218488519500314

A Hybrid PSO-GA Algorithm for Traveling Salesman Problems in Different Environments

Indadul Khan
Department of Computer Science, Chandrakona Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal 721201, India
indadulkhan@gmail.com.

Sova Pal
Department of Computer Science, Y.S. Palpara Mahavidyalaya, Palpara, Purba-Medinipur, West Bengal 721458, India
sova_pal10@rediffmail.com

Manas Kumar Maiti
Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India
manasmaiti@yahoo.co.in

Received 17 November 2017
Revised 2 June 2018

In this study particle swarm optimization (PSO) is modified and hybridised with genetic algorithm (GA) using one's output as the other's input to solve Traveling Salesman Problem(TSP). Here multiple velocity update rules are introduced to modify the PSO and at the time of the movement of a solution, one rule is selected depending on its performances using roulette wheel selection process. Each velocity update rule and the corresponding solution update rule are defined using swap sequence (SS) and swap operation (SO). K-Opt operation is applied in a regular interval of iterations for the movement of any stagnant solution. GA is applied on the final output swarm of the PSO to search the optimal path of the large size TSPs. Roulette wheel selection process, multi-point cyclic crossover and the K-opt operation for the mutation are used in the GA phase. The algorithm is tested in crisp environment using different size benchmark test problems available in the TSPLIB. In the crisp environment the algorithm gives approximately 100% success rate for the test problems up to considerably large sizes. Efficiency of the algorithm is tested with some other existing algorithms in the literature using Friedman test. Some approaches are incorporated with this algorithm for finding solutions of the TSPs in imprecise (fuzzy/rough) environment. Imprecise problems are generated from the crisp problems randomly, solved and obtained results are discussed. It is observed that the performance of the proposed algorithm is better compared to the some other algorithms in the existing literature with respect to the accuracy and the consistency for the symmetric TSPs as well as the Asymmetric TSPs.

Keywords: Traveling Salesmen Problem; particle swarm optimization; multiple velocity update rules; genetic algorithm; K-Opt operation.

Flexible Services and Manufacturing Journal
https://doi.org/10.1007/s10696-020-09377-5

An integrated imperfect production system with advertisement dependent demand using branch and bound technique

Barun Khara[1] · Jayanta Kumar Dey[2] · Shyamal Kumar Mondal[1]

Abstract
This paper develops an integrated imperfect production-inventory system consisting of a retailer and a manufacturer who produces breakable items. As breakable items are very sensitive to transport, in this paper, to stimulate the retailer, the manufacturer offers (1) free transportation subject to the condition that the retailer must have to order a minimum replenishment quantity specified by the manufacturer and (2) a credit period depending on the replenishment quantity. Moreover, malfunctioning of the production system increases due to several kinds of problem and consequently it produces a mixture of perfect and imperfect quality items. So, to maintain the reliability of the production system, development cost has been incorporated. Also to aware the customer about the reliability of the production system, the manufacturer has paid attention to give a constant amount of advertisement regularly during his/her production period. Henceforth, the advertisement dependent demand has been considered here. Under such circumstances, an integrated profit function has been developed and solved by branch and bound technique to obtain the optimum values of the system. From numerical studies, it is revealed that in case of incorporation of the advertisement, the retailer's average profit, the manufacturer's average profit and the average integrated profit are higher than that in the case without advertisement.

Keywords Branch and bound technique · System reliability parameter · Replenishment quantity · Breakable rate · Credit period

✉ Barun Khara
barunkhara1710@gmail.com

Jayanta Kumar Dey
dey_jaykum@yahoo.com

Shyamal Kumar Mondal
shyamal_260180@yahoo.com

[1] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, W.B. 721102, India

[2] Department of Mathematics, Mahishadal Raj College, Purba Medinipur, W.B., India

Published online: 05 March 2020

Decision Making: Applications in Management and Engineering
Vol. 3, Issue 2, 2020, pp. 1-18.
ISSN: 2560-6018
eISSN: 2620-0104
DOI: https://doi.org/10.31181/dmame2003102g

IMPERFECT PRODUCTION INVENTORY MODEL WITH UNCERTAIN ELAPSED TIME

Prasanta Kumar Ghosh [1] and Jayanta Kumar Dey [2*]

[1] Yogoda Satsanga Palpara Mahavidyalaya, Purba Medinipur, West Bengal, India
[1] Mahishadal Raj College,Mahishadal, PurbaMedinipur, West Bengal, India

Received: 25 January 2019;
Accepted: 15 July 2019;
Available online: 23 August 2019.

Original scientific paper

***Abstract**: Most of the classical inventory control model assumes that all items received conform to quality characteristics. However, in practice, items may be damaged due to production conditions, transportation and environmental conditions. Modelling such real world problems involve various indeterminate phenomena which can be estimated through human beliefs. The uncertainty theory proposed by Liu (2015) is extensively regarded as an appropriate tool to deal with such uncertainty. This paper investigates the optimum production run time and optimum cost in an imperfect production process, where the rate of imperfect items are different in different states of the process. The process may be shifting from 'in-control' state to the 'out-of-control' state is an uncertain variable with certain uncertainty distribution. Some propositions are derived for the optimal production run time and optimized the expected total cost function per unit time. Finally, numerical examples have been illustrated to study the practical feasibility of the model.*

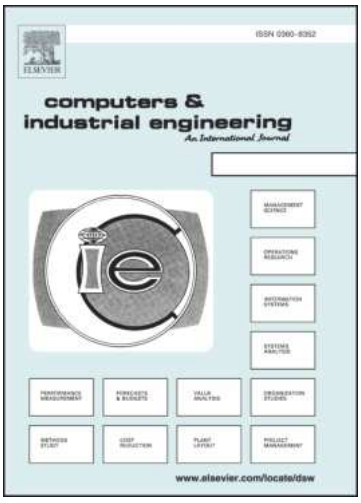
***Keywords:** Inventory, Imperfect production, Uncertain variables, Uncertain distribution, Expected value model.*

1. Introduction

In some real uncertain situation, we have to depend on domain experts to represent the belief degree when no samples are available to estimate a probability distribution. To deal with uncertainty in human belief, which is neither random nor fuzzy, Liu (2009), (2015), (2016) introduced uncertainty theory. It deals with modeling of uncertainty, based on normality, monotonicity, self-duality, countable sub-additivityand product measure axioms. Uncertain variable, uncertain set and uncertain measure are the basic tools to describe the uncertain phenomenon.

* Corresponding author.
E-mail addresses: prasantakumarghosh43@gmail.com (P.K. Ghosh), jkdey1971@gmail.com (J.K. Dey)

Journal Pre-proofs



Sustainable recycling in an imperfect production system with acceptance quality level dependent development cost and demand

Barun Khara, Jayanta Kumar Dey, Shyamal Kumar Mondal

PII: S0360-8352(20)30034-6
DOI: https://doi.org/10.1016/j.cie.2020.106300
Reference: CAIE 106300

To appear in: *Computers & Industrial Engineering*

Received Date: 11 July 2019
Revised Date: 16 December 2019
Accepted Date: 20 January 2020

Please cite this article as: Khara, B., Dey, J.K., Mondal, S.K., Sustainable recycling in an imperfect production system with acceptance quality level dependent development cost and demand, *Computers & Industrial Engineering* (2020), doi: https://doi.org/10.1016/j.cie.2020.106300

Sustainable recycling in an imperfect production system with acceptance quality level dependent development cost and demand.

Barun Khara[1]*, Jayanta Kumar Dey[2], Shyamal Kumar Mondal[1]

[1]Department of Applied Mathematics with Oceanology and Computer Programming,

Vidyasagar University, Midnapore -721 102,W.B., India,

[2]Mahishadal Raj College, Purba Medinipur, W.B, India,

E-mail: barunkhara1710@gmail.com, dey_jaykum@yahoo.com, shyamal_260180@yahoo.com

*Corresponding author: E-mail: barunkhara1710@gmail.com

Sustainable recycling in an imperfect production system with acceptance quality level dependent development cost and demand.

Abstract: This paper considers a closed-loop supply chain production inventory model consisting of a virgin raw material supplier, a manufacturer, a retailer and a collector who collects the used product from consumers at a return rate depending on acceptance quality level of the used product. Here, two types of products are produced : manufactured product using virgin raw materials and remanufactured product using used manufactured product. So, to make the model more realistic, here, the manufacturer incorporates two separate remanufacturing and manufacturing infrastructures to process simultaneously to produce remanufactured and manufactured items due to overcome the lost sale situation arisen in several published model. Again, since the quality of a product from a remanufacturing process mostly depends upon the acceptance quality level of the used product, hence an acceptance quality level dependent development cost has been considered in remanufacturing process. Also, both demand of the remanufactured products and procurement cost of the used products from collector to manufacturer have been considered as a function of acceptance quality level of returned items. Moreover, remanufacturing and manufacturing processes produce some defective items which are reworked within the same cycle. With these considerations, a mathematical model has been developed (i) to find out optimum acceptance quality level of the used manufactured product for recycling, (ii) to overcome the lost sale situation due to unsatisfied demand of remanufactured (manufactured) product at the time of manufacturing (remanufacturing) process and (iii) to obtain optimum number of deliveries from supplier to manufacturer, from manufacturer to retailer and from collector to manufacturer that maximize total integrated profit. To get the optimum solutions of the proposed model, sequential and global optimizations methods have been used. Finally, the

Effects of product reliability dependent demand in an EPQ model considering partially imperfect production

Barun Khara

Department of Applied Mathematics with Oceanology and Computer Programming,
Vidyasagar University,
Midnapore-721102, W.B., India
Email: barunkhara1710@gmail.com

Jayanta Kumar Dey*

Mahishadal Raj College,
Mahishadal-721628, W.B., India
Email: dey_jaykum@yahoo.com
*Corresponding author

Shyamal Kumar Mondal

Department of Applied Mathematics with Oceanology and Computer Programming,
Vidyasagar University,
Midnapore-721102, W.B., India
Email: shyamal_260180@yahoo.com

Abstract: In this article, an economic production quantity (EPQ) model with partially imperfect production system has been considered where both perfect and imperfect quality items are produced and demand of the product has been assumed as a function of selling price, reliability of the product and advertisement. Perfect quality items are ready for sale but imperfect quality items are reworked at a cost to become perfect one. Reworking cost, reliability of the product and reliability parameter of the manufacturing system can be improved by introducing the time dependent development cost and also by improving the quality of the raw material used in the production system. Under such circumstances, a profit function has been developed and maximised by optimising the reliability parameter of the manufacturing system, reliability of the product and duration of production. Finally, the model has been illustrated with some numerical examples.

Keywords: inventory; imperfect production; production time; reliability parameter; product reliability; development cost; rework; screening cost; raw material cost; advertisement; selling price.

DOI 10.1007/s10946-020-09870-0
Journal of Russian Laser Research, Volume 41, Number 3, May, 2020

REALIZATION OF NONCLASSICAL EFFECTS OF LIGHT AND TOTAL NOISE IN COHERENT ANTI-STOKES RAMAN AND HYPER-RAMAN SCATTERINGS UP TO THE FIRST-ORDER HAMILTONIAN INTERACTION

Samiran Kumar[1,2*] **and Dilip Kumar Giri**[3]

[1] *Department of Physics*
Mahishadal Raj College
Mahishadal 721628, India

[2] *University Department of Physics*
Vinoba Bhave University
Hazaribag 825301, India

[3] *University Department of Physics*
Binod Bihari Mahto Koyalanchal University
Dhanbad 828130, India

*Corresponding author e-mail: samiran892008@gmail.com
e-mail: dilipkumargiri@gmail.com

Abstract

In this paper, we give an overview of nonclassical effects, such as squeezing and sub-Poissonian states, of an optical field in coherent anti-Stokes Raman scattering and coherent anti-Stokes hyper-Raman scattering under the short time scale. We establish the coupled Heisenberg equations of motion of quadrature operators in terms of real and imaginary parts. We investigate the photon statistics of the pump mode in these processes and find that they are sub-Poissonian in nature. We demonstrate that squeezing and sub-Poissonian photon statistics are greater in coherent anti-Stokes hyper-Raman scattering (CAHRS) than in coherent anti-Stokes Raman scattering (CARS). The effect of the sub-Poissonian nature of an optical field in terms of total noise is also incorporated. We show that the depth of nonclassicality directly depends on the amount of total noise present in the system. This suggests that the more squeezed the state, the greater its total noise in the system.

Keywords: nonclassical light, queezing of radiation, sub-Poissonian photon statistics, coherent anti-Stokes Raman scattering, coherent anti-Stokes hyper-Raman scattering, photon number operator, total noise.

1. Introduction

Squeezing [1–3] and sub-Poissonian [4–6] behavior of light has recently attracted considerable attention owing to its low-noise property [7–9] with applications in high-quality telecommunication [9, 10] and cryptography [11, 12]. Squeezing means that the fluctuation in one of the two conjugate components (amplitude or phase) is suppressed while it is enhanced in the other. It is a purely quantum-mechanical

Manuscript submitted by the authors in English on February 24, 2020.

Journal of Ambient Intelligence and Humanized Computing
https://doi.org/10.1007/s12652-020-02113-9

ORIGINAL RESEARCH

Internet of Health Things (IoHT) for personalized health care using integrated edge-fog-cloud network

Anwesha Mukherjee[1] · Shreya Ghosh[2] · Aabhas Behere[2] · Soumya K. Ghosh[2] · Rajkumar Buyya[3]

Received: 31 December 2019 / Accepted: 11 May 2020

Abstract
This paper proposes a mobile healthcare framework based on edge-fog-cloud collaborative network. It uses edge and fog devices for parameterized health monitoring, and cloud for further health data analysis in case of abnormal health status. The continuous location change of users is a critical issue, and the connection interruption and delay in delivering health related data may be fatal in case of emergency. In this direction, in the proposed framework, mobility information of the users is considered and the users' mobility pattern detection is performed inside the cloud for advising the user regarding nearby health centre. From the theoretical analysis, it is observed that the proposed framework reduces the delay and energy consumption of user device by $\sim 28\%$ and $\sim 27\%$ respectively than the cloud only health care model. The proposed healthcare framework has been implemented in the laboratory and health data of few student volunteers are analyzed to predict their health status. The experimental analysis also shows that the proposed mobility prediction model has better precision, recall value and time-efficiency than the existing models.

Keywords Health monitoring · Edge-fog-cloud network · Mobility prediction · Internet of Health Things (IoHT)

1 Introduction

The rapid advances in sensor-based systems and Internet technologies have enabled a new dimension of health care technology namely Internet of Health Things (IoHT). IoHT is the exchange and processing of the data for health status monitoring of individuals by integrating sensor or IoT devices with advanced mobile technologies (da Costa et al. 2018). IoHT can become a demanding application for personalized health care leveraging on fog, edge and cloud computing. In a cloud based health care system, the health data are collected using body area network (BAN) or body sensor network (BSN) and then stored and processed inside the cloud servers. In BAN, there are several sensors attached with human body and varied health data e.g. body temperature, blood pressure etc are collected by these sensors.

With availability of several body sensors, it is possible to design and develop a low-cost wearable system to capture values of various health parameters of human body (e.g. blood pressure, heart/pulse rate, oxygen level, body temperature etc.) and to predict the health status of individuals based on the collected data and contextual information (e.g. atmospheric condition, user's location, activity etc.). These sensor nodes collect health parameter values and transmit to the connected smart phone. Next, the data is processed and health status is predited by the smartphones. But smart phones are resource hungry. Therefore, the computationally complex applications are difficult to execute in the resource-limited smart phones.

✉ Shreya Ghosh
shreya.cst@gmail.com

Anwesha Mukherjee
anweshamukherjee2011@gmail.com

Aabhas Behere
aabhas.bhr@gmail.com

Soumya K. Ghosh
skg@cse.iitkgp.ac.in

Rajkumar Buyya
rbuyya@unimelb.edu.au

[1] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal, India

[2] Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India

[3] Cloud Computing and Distributed Systems (CLOUDS) Lab, School of Computing and Information Systems, The University of Melbourne, Melbourne, Australia

Published online: 08 June 2020

Simulation Modelling Practice and Theory 100 (2020) 102043

Contents lists available at ScienceDirect

Simulation Modelling Practice and Theory

journal homepage: www.elsevier.com/locate/simpat

Spatio-Fog: A green and timeliness-oriented fog computing model for geospatial query resolution

Jaydeep Das*,[a], Anwesha Mukherjee[b], Soumya K. Ghosh[c], Rajkumar Buyya[d]

[a] Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, West Bengal 721302, India
[b] Department of Computer Science, Mahishadal Raj College, Garkamalpur, Mahishadal, Purba Medinipur, West Bengal 721628, India
[c] Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, West Bengal 721302, India
[d] Cloud Computing and Distributed Systems (CLOUDS) Laboratory, School of Computing and Information Systems, The University of Melbourne, VIC 3010, Australia

ARTICLE INFO

Keywords:
Geospatial query
Fog computing
Cloud computing
Delay-sensitive
Power-efficient

ABSTRACT

Geospatial data analysis is an emerging area of research today. Systems need to respond to user requests in a timely manner. In this paper we have proposed a fog computing framework namely Spatio-Fog, where the fog devices contain the geospatial data of their current region and process geospatial queries using resources in the proximity. The geospatial query resolution is performed by the fog device either itself or using cloud servers or fog device of other region depending on the geographical region related to the geospatial query. We have performed both empirical study and experimental analysis to demonstrate feasibility of our proposed approach. The empirical study illustrates that the proposed architecture Spatio-Fog reduces the power consumption and delay by approximately 43–47% and 47–83% respectively over the use of existing geospatial query resolution system. The experimental analysis demonstrates that the proposed framework reduces the power consumption and delay by 30–60% approximately than the existing geospatial query resolution system.

1. Introduction

Geospatial information storage, processing, and query resolution is a promising research area [1]. There are several industrial applications of geospatial data analysis such as mapping, telecom and network services, hot spot analysis, urban planning, transport services, environmental impact analysis, health and human services, disaster management, resource management, geology. Google Maps is a popular application of a web-based mapping solution on geospatial data, which is used for navigation services. Geospatial data analysis also helps in road traffic management, transport and urban planning. For risk assessment and disaster management geospatial data analysis also important. Usually, cloud servers are used to store and process the geospatial information [2]. However, as geospatial information is related to geographical regions, storing and processing large volume geospatial data inside the remote cloud servers can suffer from delay and energy consumption. Geospatial query processing involves geospatial data analysis along with different geospatial services, which have been discussed later in Section 3. While mobile devices request for any geospatial information, then to process the respective geospatial queries geospatial big data analysis is required. However, accessing geospatial data inside the remote cloud servers may degrade the quality of user experience by enhancing delay [3] and energy. Moreover,

* Corresponding author.
E-mail addresses: jaydeep@iitkgp.ac.in (J. Das), anweshamukherjee2011@gmail.com (A. Mukherjee), skg@cse.iitkgp.ac.in (S.K. Ghosh), rbuyya@unimelb.edu.au (R. Buyya).

https://doi.org/10.1016/j.simpat.2019.102043
Received 2 October 2019; Received in revised form 28 November 2019; Accepted 14 December 2019
Available online 16 December 2019
1569-190X/

Wireless Personal Communications
https://doi.org/10.1007/s11277-020-07144-1

Power and Delay Efficient Multilevel Offloading Strategies for Mobile Cloud Computing

Debashis De[1,2] · **Anwesha Mukherjee**[3] · **Deepsubhra Guha Roy**[4]

Abstract
Mobile cloud computing has introduced offloading to save the battery life of mobile devices. In mobile cloud computing optimization of power and delay for offloading has become a vital research scope. However, migration of the storage and computation from the mobile device to the remote cloud server enhances the delay and power consumption. To overcome this difficulty, cloudlet comes which is located nearby the mobile device. Since the cloudlet may not be able to fulfill all the offloading requests, sometimes remote public cloud server is used for the same. As a result the power and delay consumptions are increased. For solving this difficulty, private cloud server is used in our scheme along with the cloudlet and public cloud server. In this paper multilevel full and partial offloading strategies are proposed based on cloudlet, private and public cloud servers. The power and delay consumption in the proposed methods are determined and compared with the existing offloading methods. The theoretical and experimental analyses demonstrate that the proposed multilevel offloading methods are power and delay efficient. The simulation results show that the proposed multilevel full and partial offloading strategies reduce the power consumption by approximately 8–9% and 20% respectively than the existing methods.

Keywords Cloudlet · Delay aware · Multilevel · Offloading · Power optimization · Private cloud · Public cloud

Debashis De and Deepsubhra Guha Roy: Formerly, West Bengal University of Technology.

✉ Debashis De
dr.debashis.de@gmail.com; dr.debashis.de@ieee.org

Deepsubhra Guha Roy
roysubhraguha@gmail.com

[1] Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, B.F.-142, Sector-I, Salt Lake, Kolkata, West Bengal 700064, India

[2] Department of Physics, University of Western Australia, 35 Stirling Hwy, Crawley, WA 6009, Australia

[3] Department of Computer Science, Mahishadal Raj College, Garhkamalpur, Purba Medinipur, West Bengal 721628, India

[4] Department of Information Technology, Maulana Abul Kalam Azad University of Technology, West Bengal, B.F.-142, Sector-I, Salt Lake, Kolkata, West Bengal 700064, India

Published online: 22 January 2020

Animal Reproduction Science 219 (2020) 106528

Contents lists available at ScienceDirect

Animal Reproduction Science

journal homepage: www.elsevier.com/locate/anireprosci

Functions of interleukin-6 in ovulation of female climbing perch, *Anabas testudineus*

Ankit Chatterjee[a], Rajkumar Guchhait[a,c], Sukhendu Maity[a], Dilip Mukherjee[b], Kousik Pramanick[a,*]

[a] Integrative Biology Research Unit, Department of Life Sciences, Presidency University, 86/1, College Street, Kolkata 700073, India
[b] Endocrinology Laboratory, Department of Zoology, University of Kalyani, Kalyani, 741235, India
[c] P.G. Department of Zoology, Mahishadal Raj College, Purba Medinipur, India

ARTICLE INFO

Keywords:
Interleukin 6
Teleost fish
Ovulation
Gonadotropin
TNFα

ABSTRACT

In mammals, interleukin 6 (IL-6) has an important function during ovulation, however, the functions of IL-6 in fish have not been elucidated. In the present study, there was quantification of *de novo* synthesis of ovarian IL-6 and tumor necrosis factor-alpha (TNFα) in control and hCG-treated fish and results were compared with those from an *in vitro* study where there was evaluation of the regulatory functions of gonadotropins and TNFα of IL-6 secretions. Relatively greater concentrations of ovarian IL-6 at the post-GVBD (post-germinal vesicle breakdown) stage indicates IL-6 modulates ovulatory processes. The hCG-induced increase in relative abundance of *IL-6* (*in vitro*) mRNA transcript and secretion from the ovary were attenuated when there was administration of the inhibitor of TNFα secreting enzyme, TAPI-I, which indicates TNFα modulates IL-6 secretion. Treatments with IL-6 induced a marked increase in ovulation rate *in vitro* when there was induction of activating matrix metalloproteinase (MMP). Furthermore, treatment with IL-6 resulted in production of prostaglandin as indicated by the IL-6 induced increase in the abundance of *ptgs2* mRNA transcript in the ovary of *Anabas testudineus*. Furthermore, results indicate the source of IL-6 in the ovary is the granulosa cells with secretion of IL-6 being induced by the additions of hCG and TNFα in the medium. There was also an IL-6-induced increase in abundance of receptors (IL-6 Rα and gp130) to which it binds indicating IL-6 autoregulates this population of receptors. Results from this study, for the first time, elucidate the reproductive functions of IL-6 in a teleost fish.

1. Introduction

In teleost, the process of reproduction not only depends on the gonadotropins and steroids, but different cytokines also have important functions in regulation of the ovarian functions (Hoek et al., 1998; Salmassi et al., 2001; Richards et al., 2008; Liu et al., 2009; Sirotkin, 2011; Sauté et al., 2014; Stassi et al., 2017). It is well established that the ovulatory process is similar to the inflammatory responses (Xu et al., 2010; Wissing et al., 2014; Liu et al., 2017) and in the ovary, gonadotropins are the primary regulatory factors of ovulation (Richards et al., 2008; Smolikova et al., 2012). After the pre-ovulatory surge release of gonadotropins, ovarian cytokines have important functions in cumulus oocyte complex (COC) expansion (Liu et al., 2009) or prostaglandin (PG) production (Brannstrom and Norman, 1993).

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).

https://doi.org/10.1016/j.anireprosci.2020.106528
Received 1 February 2020; Received in revised form 8 June 2020; Accepted 9 June 2020
Available online 18 June 2020
0378-4320/

J. Environ. & Sociobiol. : **17**(1) : 39-42, 2020 Print : ISSN : 0973-0834
Received : 07 March, 2020 / Reviewed & Accepted : 16 June, 2020 / Uploaded Online : August, 2020

AN ASSESSMENT OF MACROPHYTE AND WATER CHARACTERISTICS OF PAHAR DIGHI, PURBA MEDINIPUR, WEST BENGAL

Soma Chanda* **and Bhaskar Bhowmik**
Department of Botany, Mahishadal Raj College, Purba Medinipur, West Bengal
*Corresponding author: somac10@gmail.com

ABSTRACT

A preliminary survey of macrophytic plant species and water quality of Pahar Dighi wetland of Mahishadal Raj Garh area, Purba Medinipur, West Bengal is conducted. Altogether 38 plant species belonging to 27 families have been documented and different physico-chemical parameters of water studied are reported.

Key words: *Macrophytes diversity, Water characteristics, Pahar Dighi, Mahishadal.*

INTRODUCTION

Mahishadal Raj Garh area is a place of historical importance and hence this preliminary work was undertaken to document macrophytic plant species and water characteristics of Pahar Dighi of Mahishadal Raj Garh area, Purba Medinipur, West Bengal in post monsoon season.

MATERIALS AND METHODS

Study site: Pahar Dighi situated in between 22.1814° N and 87.9898° E, is a manmade stagnant water body of about 0.137 ha in area, 162 ft. in length and 70 ft. in diameter under the mouza Garkamalpur, created by King Satis Prasad Gargh. It is an extended part of central canal system (the Raj *Parikha*), isolated from the main water body. The water body is surrounded by Madha Hingli in south, Khagra in west, Jagannathpur in east and Basulya in the north (Fig. 1).

Study methods: Several field surveys have been conducted during September to December, 2019. The phyto-resources have been documented with field notes and the herbarium sheets made for identification following standard literature (Cook, 1996; http//www.theplantlist.org; http://www.ipni.org) and kept in the Department of

Lost years of a nomad: Exploring Indian experience in Nuruddin Farah's oeuvre

Asis De

Lost years of a nomad: Exploring Indian experience in Nuruddin Farah's oeuvre

To honor Nuruddin Farah's fifty-year-long writing journey, this article explores his time in India (1966—69) and the influence it had on making him a leading postcolonial writer. My approach is largely biographical. I begin with his decision to turn down a scholarship at an American University, which some critics view as immature or even eccentric. I challenge this view of his choice instead to enroll for a degree in philosophy, literature and sociology at the Government College of Panjab University at Chandigarh in 1966 and to make what was then a country of poverty and even famine his first diasporic destination. I argue that this was a well-thought-out, politically correct and wise decision in the global context of international relationships in the 1960s. I also explore Farah's brief association with Indian culture and the knowledge he acquired of Indian philosophy and literature to explain his decision to adopt a feminist perspective to write on injustice against women and the powerless and religious intolerance rather than focus on issues such as independence realpolitik like leading African writers at the time. His first manuscript, published in 1970 as ***From a Crooked Rib,*** was a Penguin modern classic by 2004. I argue that this novel was importantly shaped by his Indian experience. I also explore the influence of two novels on the young Farah, on his personal life, ideology and writing even before he went to India: W. Somerset Maugham's novel ***The Razor's Edge*** (1944) and Thakazhi Sivasankara Pillai's classic ***Chemmeen*** (1956). This is the first substantial investigation of the effect of Farah's Indian experience. **Keywords:** biographical criticism, Indian experience, nomad, cosmopolitan.

When he was a schoolboy, long before Somalia gained its political independence from Britain and Italy, Nuruddin Farah Hasan (1945–) dreamt of becoming a writer. He is now about to celebrate the golden jubilee of his career as a writer. To date, Farah has published fourteen novels, a non-fiction book and several plays. He was named after a prince in *One Thousand and One Nights*. When he was being interviewed by Ahmed I. Samatar in 2001, he revealed that he used to delight in cutting out the name "Nuruddin" from pages in *One Thousand and One Nights* and gluing the small pieces of paper onto the cover pages of his exercise books (Samatar 87). He also enjoyed giving the animal characters in his English language textbooks human names and attributes. His linguistic talent was evident from an early age. As is well known, Farah assisted his mother to compose *buraanbur* or Somali oral poetry that is sung during social celebrations and community rituals. By the time he was a teenager, he was able to converse equally well in five languages: Somali, Arabic, Amharic, Italian and English. However, Farah found the local education system disappointingly alien. He comments sadly that "the textbooks we were taught from, belonged in the mind and culture of other people" ("Why I Write" 3). Though the mind and culture of "other people" initially shaped the vision of Somalia's first Anglophone writer, Farah has written about Somalia and Somali characters for most of his career. Several decades of diasporic separation have not weakened Farah's bond with Somalia and its people, just as almost fifty years of being away from Indian soil has not dimmed his memory of the people there.

His time as a graduate student at the Government College of Panjab University might have gone unnoticed had he not written his debut novel during his stay on this campus and later become one of the leading African writers of his generation. Those who knew him at the time would probably not have guessed that he would return to the campus at the age of seventy-two to receive an honorary doctorate from Panjab University in 2017. His success as a writer is often ascribed to two 'immature' decisions that he made. The first decision concerns his choice to enroll at Panjab University in India rather than take up a scholarship to study at the University of Wisconsin-Madison

Asis De is associate professor of English at Mahishadal Raj College, West Bengal, India, and has published extensively on transculturality, diaspora studies and ecological humanities in Anglophone literatures.
Email: ademrc@gmail.com
https://orcid.org/0000-0002-8018-4940

DOI: dx.doi.org/10.17159/2309-9070/tvl.v.57i1.8059

DATES:
Submitted: 27 May 2019; Accepted: 4 July 2019; Published: 28 April 2020

HPU

Indian Journal of Australian Studies

Volume 10

Special Issue on MULTICULTURALISM

I J A S

Centre for Australian and New Zealand Studies
Himachal Pradesh University, Shimla

2019

IJAS is an interdisciplinary journal published annually by the Centre for Australian and New Zealand Studies, Himachal Pradesh University, Shimla.

ISSN: 2229-7863
A Peer Reviewed Journal

Editor
Neelima Kanwar

Published by
Centre for Australian and New Zealand Studies
Himachal Pradesh University, Shimla 171 005 India

Printed at
New Era Graphics
Shimla 171 002 India

Annual Subscription
Institution: Rs. 200/- Aus $ 20 US $ 15
Individual: Rs. 150/- Aus $ 15 US $ 10

Bank Drafts should be in the name of Centre for Australian and New Zealand Studies, Himachal Pradesh University, Shimla.

IJAS
2019

HPU

Indian Journal of Australian Studies

Volume 10

Special Issue
on
MULTICULTURALISM

EDITOR
Neelima Kanwar

Centre for Australian and New Zealand Studies
Himachal Pradesh University, Shimla

Editorial Advisory Board

CONTENTS

Transnationality, Multiculturalism and 'New' Cosmopolitanism: Indo-Australian Interface in *of Sadhus and Spinners: Australian Encounters with India*

Asis De

At the beginning of the final decade of the twentieth century, the world has witnessed two very significant events shaping the politico-economic environment both in the West and in the East: the end of the Cold War (1947-1991) and the introduction of Globalization, or, in other words, 'economic liberalization'.In the post-Cold War era (following the collapse of the Soviet Union on 31 December 1991), precisely in the mid-nineties of the last century, Australia started adopting the policy of 'Look West' with a particular interest in the Indian Ocean Region (IOR)—specifically with India and South Africa expecting a rapid development in the economic relationship. India complements this Australian policy by openingwindows for bilateral cooperation in the field of trade and investment, on the issue of military and political security, on collaborative educational activities and cultural exchangein the 1990s after adopting economic liberalization. On the issue of academic and cultural exchange, the formation of the *Indian Association for the Study of Australia* in the year 2000 is preciselyan important step towards making different "facets of Australian society including culture, humanities, social sciences, international studies, media and literature" (cf. *Webpage of IASA*) familiar to the people in India. The IASA and the AIC (Australia-India Council), working in close association with India's premier Universities like Jawaharlal Nehru University, IGNOU in Delhi, the University of Madras in Chennai, or even Mohanlal Sukhadia University in Udaipur, have taken crucial roles in shaping the forums for the discussion of the cultural and literary interrelationship between India and Australia. So, it is undeniable that in the last twenty-five years, the Indo-Australian interface has taken a remarkably positive turn and a

ISSN-2231-5616

Sambalpur Studies in Literatures and Cultures

Series 5, 2019

Department of English

Sambalpur University

Odisha

INDIA

Cultural Ecotone and Transformation of the Human Geography in Mahasweta Devi's *Chotti Munda and His Arrow*

Asis De

It is by now a well-accepted historico-cultural reality that the imperial and mercantile aggression of European colonial enterprise has ruthlessly altered not only the bioregions of the colonized countries, but made substantial changes in the human geography on the planet as well. With the end of the twentieth century, more specifically saying, with the end of the European colonialism, the world has witnessed several historical changes in the value-systems, perceptions, thoughts and attitudes, which one may fairly assemble under the single umbrella term: 'postcolonialism'. Ecological consciousness could probably be seen as one of the major products of the post-colonial time. Apart from the scientific study of the relationship between the bio-organism and the environment, ecology now-a-days includes new disciplines like 'social ecology' or 'human ecology' which insist mostly on the changes in the 'human' environment. In his book *The Ecological Thought* (2010), Timothy Morton argues:

> Ecology isn't just about global warming, recycling and solar power—and also not just to do with everyday relationships between humans and nonhumans... It has to do with capitalism and with what might exist after capitalism.... It has to do with concepts of space and time.... It has to do with society. It has to do with coexistence. (2)

Taking this view as the basic premise I would like to argue that an ecological consciousness affects numerous aspects of human life, culture and community. Morton's opinion sounds quite proverbial when he says: "Human beings *are* each others' environment" (4; original emphasis). The interconnectedness and coexistence of human communities and cultures produce diverse landscapes, which can well be compared with the diversity of human geography and the notion of the 'ecotone' in ecology.

The idea of an 'ecotone' is primarily inspired by an ecological consciousness that tends to see the earthly paradigm as a cluster of 'biomes'[1] or specific climatic regions with particularly unique sets of living organisms and their biotic and abiotic environments. Environmental scientists like to see an 'ecotone' as a space that exists on the very 'border-edge' of two or more ecosystems. So, an ecotone is essentially an ecological frontier, where the most crucial reality is that of the border. But at the same time it should be equally clear that an ecotone is not only a space

ISSN 0972-6756 UGC CARE ENLISTED JOURNAL

Food, Festivals and Sweets: Creating Cultural Identity of Bengal in the 21st Century

Swati Basak

Assistant Professor, Mahishadal Raj College,

Abstract

Food is an important part of culture and creates our identity. The term multiculturalism is also associated with food. Food has some social significance also. Food is important for understandings our society and has deep impact on different rituals. It creates relationships between people and strengthens bonds. Modernization, nationalism is important while we discuss ritualistic food. We cannot get the real picture of the Bengali dishes if we don't give any description of sweets. From ancient times Bengalis prepared sweets and offered to Gods. On every occasion we prepare sweets. It creates our identity and differs us from others. From ancient period to modern times there are mention of preparing and consuming sweets by the Bengalis. Sweets are part of our different religious practises. In ancient or medieval times sweets were not prepared from channa or curdled milk. It was the Portuguese who first introduced channa in Bengal and sweets were prepared from it after that. We are grateful to Nabin Chandra Das who invented rosogolla in Bengal. Apart from that sandesh, pantua, makha sandesh, kalojam, kanchagolla etc are made and consumed by the sweet lovers of Bengal. 19th century is regarded as the golden age of Bengali sweets and from this time sweet creates the identity of the people of Bengal.

Food is not just to satiate our appetite but it is the expression of our cultural identity. We share our cultural tradition, identity, practices and customs with each other and create a new cultural identity and food is the medium of creating the identity. Like language food has the power to interact with each other belong to different cultural zones. It strengthens social bonds by expressing cultural identity. Sociologist Robin Fox pointed out that our religion, ethnicity and social classes all these are reflected in our food habits. Sometimes food creates · 'forge alliances' with others because sometimes we are compelled to stay in a situation and consume that kind of food with which we are not habituated with. Fox said "Food is almost always shared; people eat together; mealtimes are events when the whole family or settlement or village comes together. Food is an occasion for sharing- for the expression of altruism."[1]

Food creates multiculturalism, not only food but sometimes ritualistic

Evolutionary Intelligence
https://doi.org/10.1007/s12065-021-00651-5

RESEARCH PAPER

A random-permutation based GA for generalized traveling salesman problem in imprecise environments

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

Received: 15 September 2020 / Revised: 1 June 2021 / Accepted: 1 August 2021

Abstract
A random-permutation technique and the features of the genetic algorithm (GA) are combined together to develop a novel heuristic for solving generalized travelling salesman problem. Here, the random-permutation technique is used to find the sequence of clusters of a probable solution in which a complete tour to be commenced. The features of GA are used to select the cities from different clusters of the sequence. The algorithm has the ability to solve the problems in both the crisp as well as in the imprecise environments. A fuzzy membership-based selection process is proposed to select a solution for the mating pool. A general comparison rule of the solutions is proposed to rank the potential solutions of the population in imprecise environments. In the crisp environment, the efficiency of the proposed approach is tested against a set of different benchmark test problems from GTSPLIB having sizes up to 226 cities with 26 clusters. It is observed from the experimental results that the algorithm produces 100% accurate results for all the benchmark test problems under consideration. Imprecise test problems are generated from different benchmark crisp test problems of TSPLIB and are used to test the algorithm in the imprecise environments. It is also observed from the experimental results that the proposed approach finds multiple optimal paths (i.e, more than one path), if exists, for the problems in the crisp as well as in the imprecise environments.

Keywords Traveling salesmen problem · Genetic algorithm · Randomness · Triangular fuzzy number · Rough set

1 Introduction

A generalized form of the classical Traveling Salesman Problem (TSP), the generalized TSP (GTSP) was introduced by Henry-Labordere [11], Saksena [31], and Srivastava [33] in the context of computer record balancing and of visit sequencing through welfare agencies in 1960s. The problem consists of a set of n cities and a cost matrix $(c_{ij})_{n\times n}$, where, c_{ij} is the cost of travelling from city i to city j. The n cities are grouped into several clusters- $cl_1, cl_2, \ldots, cl_k$, where k is the number of clusters. Every city must belongs to at least one cluster. So, a city may belongs to more than one clusters. A salesman starts from a city of a cluster, visits one and only one city of every cluster and returns to the starting city with the minimum expenditure. So, the goal of the problem is to find the path/route of the salesman with the minimum cost covering all the clusters exactly once. There are several real-life applications of GTSP, such as, mail delivery [17], welfare agency routing [31], material flow system design [17], vehicle routing [17], and computer file sequencing [11], etc. The GTSP belongs to the class of NP-hard problems.

In most of the above-mentioned studies it is implicitly assumed that the travel cost, c_{ij} between any two cities i and j, is fixed and crisp in nature. But c_{ij} depends on the several factors, like, the quality of the vehicle used, condition of the roadways, duration of the travel, weather condition, etc. The travelling cost between any two cites mainly depends on the quality of transport used for the purpose. Sometimes it depends on the availability of the vehicle, condition of the road ways, etc., though its value normally lies in an interval.

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manasmaiti@yahoo.co.in

Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakon Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal 700126, India

Applied Intelligence
https://doi.org/10.1007/s10489-020-01713-4

Multi-objective traveling salesman problem: an ABC approach

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

Abstract

Using the concept of swap operation and swap sequence on the sequence of paths of a Traveling Salesman Problem(TSP) Artificial Bee Colony (ABC) algorithm is modified to solve multi-objective TSP. The fitness of a solution is determined using a rule following the dominance property of a multi-objective optimization problem. This fitness is used for the selection process of the onlooker bee phase of the algorithm. A set of rules is used to improve the solutions in each phase of the algorithm. Rules are selected according to their performance using the roulette wheel selection process. At the end of each iteration, the parent solution set and the solution sets after each phase of the ABC algorithm are combined to select a new solution set for the next iteration. The combined solution set is divided into different non-dominated fronts and then a new solution set, having cardinality of parent solution set, is selected from the upper-level non-dominated fronts. When some solutions are required to select from a particular front then crowding distances between the solutions of the front are measured and the isolated solutions are selected for the preservation of diversity. Different standard performance metrics are used to test the performance of the proposed approach. Different sizes standard benchmark test problems from TSPLIB are used for the purpose. Test results show that the proposed approach is efficient enough to solve multi-objective TSP.

Keywords Multi-objective traveling salesmen problem · Artificial bee colony algorithm · Swap operation · Pareto optimal solution · Performance metric

1 Introduction

Most of the real-life problems involve multiple conflicting goals, which leads to multi-objective optimizations, e.g., optimization of the profit of a company as well as the customer satisfaction; optimization of transportation time as well as transportation cost of a transport company; etc. In a multi-objective optimization problem (MOOP), as the objective functions are generally conflicting in nature, the concept of optimality does not hold; rather the concept of pareto optimality takes place. Two solutions are called pareto optimal if each solution is better than the other with respect to at least one objective. One solution is said to be better than another one if it is better or equal with respect to all the objectives and strictly better with respect to at least one objective. Different multi-objective evolutionary algorithms (MOEAs) are proposed by several researchers [7, 9, 12, 40, 48] in the past decades. For a complete survey on MOEAs please see [44].

The Traveling Salesmen Problem (TSP) is one of the standard combinatorial optimization problems and is a familiar NP-hard problem [28, 29]. The problem consists of a complete graph of n vertices (node/ cities) where each edge is associated with a parameter having known value (the distance /the travel time/ the travel risk etc., between the associated nodes). The aim of the problem is to find a Hamiltonian circuit having minimum value (the distance /the travel time/ the travel risk etc.). When there is only one parameter associated with each edge, then the problem is called single-objective TSP (SOTSP) [24–26]. On the other hand, when more than one parameters are associated with each edge, the problem is called Multi-Objective

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manaskr1969@gmail.com

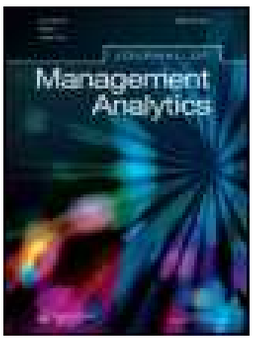
Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakon Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal, 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal, 700126, India

Published online: 06 July 2020



Journal of Management Analytics

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tjma20

An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies

Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey & Samarjit Kar

To cite this article: Prasanta Kumar Ghosh, Amalesh Kumar Manna, Jayanta Kumar Dey & Samarjit Kar (2021): An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies, Journal of Management Analytics, DOI: 10.1080/23270012.2021.1882348

To link to this article: https://doi.org/10.1080/23270012.2021.1882348

Published online: 23 Mar 2021.

Journal of Management Analytics, 2021
https://doi.org/10.1080/23270012.2021.1882348

An EOQ model with backordering for perishable items under multiple advanced and delayed payments policies

Prasanta Kumar Ghosh[a,d], Amalesh Kumar Manna[b], Jayanta Kumar Dey[c] and Samarjit Kar[a*]

[a]*Department of Mathematics, National Institute of Technology Durgapur, Durgapur, India;* [b]*Department of Mathematics, The University of Burdwan, Burdwan, India;* [c]*Department of Mathematics, Mahishadal Raj College, Purba Medinipur, India;* [d]*Department of Mathematics, Y. S. Palpara Mahavidyalaya, Purba Medinipur, India*

(*Received 14 January 2020; revised 7 September 2020; accepted 25 January 2021*)

This study investigated an economic order quantity (EOQ) model with complete backorder for fixed lifetime perishable items under multiple advance and delayed payments policies. Here, a new type of business policy is considered where supplier offers the retailer to pay a fraction of the purchasing cost before the order delivery by multiple equal installments starting from the ordering time and the rest amount after the delivery by multiple equal installments. Here, some theoretical results are illustrated to determine the conditions of existence and uniqueness of the optimal solutions. A closed form solution is determined to solve the proposed model under approximation. Some numerical examples are provided to examine the validity of the proposed model. Finally, sensitivity analyses are presented to obtain the effect of optimal policy and provide some managerial insights of the model.

Keywords: inventory; perishable item; expiry date; advance payment; delayed payment

1. Introduction

Payment policies of purchasing price for the items ordered and customer's reaction effect on out of stock of an item is the significant factor in the economic order quantity model. In 1913, F.W. Harris developed an EOQ (Economic Order Quantity) model, by considering with the assumption that the retailer or customer pays the whole amount of purchasing the item just when received the items. After that, many researcher and practitioners made their efforts to adjust the assumption to more realistic in inventory management. Based on the nature of payment of the purchase cost, there are three basic possibilities which are the following types: (i) payment before the receiving of delivery of the order quantity which is known as advance payment or prepayment. Several researchers, viz. Gupta, Bhunia, and Goyal (2009), Taleizadeh, Pentico, Jabalameli, and Aryanezhad (2013), Teng, Cárdenas-Barrón, Chang, Wu, and Hu (2016), Wu, Teng, and Chan (2017), Manna, Das, and Tiwari (2020) and others were reported interesting works in this area. (ii) payment just on the time of delivery (Ghosh, Manna, & Dey, 2017; Mallick, Manna, & Mondal, 2018; Shah & Cárdenas-Barrón, 2015), (iii) payment after the

*Corresponding author. Email: kar_s_k@yahoo.com

RAIRO-Oper. Res. 55 (2021) 189–211
https://doi.org/10.1051/ro/2020137

RAIRO Operations Research
www.rairo-ro.org

AN IMPERFECT PRODUCTION INVENTORY MODEL WITH ADVANCE PAYMENT AND CREDIT PERIOD IN A TWO-ECHELON SUPPLY CHAIN MANAGEMENT

Barun Khara[1], Shyamal Kumar Mondal[1] and Jayanta Kumar Dey[2,*]

Abstract. This paper presents an integrated imperfect production inventory model under two layer supply chain management. To ensure the orders, manufacturer convinces the retailer to pay a percentage of the purchasing cost prior to replenish the products and offers the facilities such as (i) delay in payment on the remaining part of the purchasing cost and (ii) free transportation on the basis of advance payment amount. Time dependent development cost is incurred to maintain the reliability of the production system and as a result it reduces the imperfectness of the product during production. Under such circumstances, an integrated profit function has been developed to find the optimum number of production cycle, optimum number of replenishment cycle and hence reliability parameter of the manufacturing system, replenishment quantity for the retailer which maximize the integrated profit. Branch and Bound technique is used to obtain the integer solutions. Furthermore, we derived some useful lemmas and algorithms to obtain the optimum solution. Finally, the model has been illustrated with some numerical examples exploring the sensitivity analysis with respect to some parameters and obtains some managerial insights.

Mathematics Subject Classification. 90B05, 90B30, 90B25, 90B50.

Received November 3, 2018. Accepted November 26, 2020.

1. Introduction

In present's competitive situation, supply chain management (SCM) plays a vital role in economy because it makes an integrated networking system among supplier, manufacturer, retailer and customer and learns how to survive in the present's competitive market through the co-operation among supplier, manufacturer, retailer and customer. It also co-ordinates a system of inter-related business process in order to procurement of raw materials, transportation of raw-materials, production of items, transportation of the finished product to the retailer for sale to satisfy their customers' demand. Along this direction, some previous research works to build an integrated SCM dates back to Bookbinder, Cachon and Zipkin [5], Agarwal *et al.* [1] and others. They have presented a production, distribution and inventory (PDI) planning system that integrated three supply

Keywords. Imperfect production, advance payment, replenishment cycle time, system reliability, credit period, branch and bound technique.

[1] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore 721102, West Bengal, India.

[2] Mahishadal Raj College, Purba Medinipur, West Bengal, India.

*Corresponding author: dey_jaykum@yahoo.com

Journal of Cleaner Production 290 (2021) 125734

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Supply chain coordination model for green product with different payment strategies: A game theoretic approach

Prasanta Kumar Ghosh [a, d], Amalesh Kumar Manna [b, *], Jayanta Kumar Dey [c], Samarjit Kar [a]

[a] Department of Mathematics, National Institute of Technology, Durgapur, 713209, India
[b] Department of Mathematics, The University of Burdwan, Barddhaman, 713104, India
[c] Department of Mathematics, Mahisadal Raj College, Mahisadal, 721628, WB, India
[d] Department of Mathematics, Y.S. Palpara Mahavidyalaya, Purba Midnapore, 721458, India

ARTICLE INFO

Article history:
Received 1 June 2020
Received in revised form
19 December 2020
Accepted 24 December 2020
Available online 4 January 2021

Handling editor. Dr Sandra Caeiro

Keywords:
Supply chain
Greenness of product
Sales effort
Delay-in-payment
Advance payment

ABSTRACT

In our world, pollution arising from various sources like factories and vehicles, threaten the very environment we live in. We should become more and more aware of the products that pose a threat to our environment because otherwise through our lack of awareness, we will ourselves contribute towards the distractions of our beloved and beautiful world. In this paper, we have bought into focus an work regarding making the supply chain of a product as green as we possibly can. We have developed a strategy based on the manufacturer's advanced payment policy as well as trade credit facility to the retailer. We have assumed that for any particular retailer, the customers' demand for his goods is a direct consequence of how green the goods are, along with the selling price and the effort put into the environment friendliness of a product. To this effect, the manufacturer also allows the retailer a credit period for the goods as also a discount that can imposed on the selling price. We have provided a model that optimizes the retailer's sales effort, the wholesale price demanded by the manufacturer, the green level of the product as well as the selling price effected by the retailers. This model is exemplified numerically of its practicality. We also perform some sensitivity analyses of the model by varying market demand, price elasticity coefficient, greening awareness level and sales effort and the corresponding performance shown by the model are also recorded.

1. Introduction

In recent times most of the world is under a threat from environmental pollution. Numerous researchers have dedicated their research time on green supply chain system (GSCS) to reduce the pollution in the environment. The concept of green supply chain system (GSCS) has been derived from traditional supply chain system (SCS) by embroilment of green activities in the supply chain. The aim of GSCS is sustainability on environmental front from suppliers to customer and manufacturer. Yadav and Pathak (2016) reported that most of the young customers will buy green (eco-friendly) products, which has been manufactured in an environmentally friendly fashion, and to create minimum havoc on the environment. To accommodate this situation manufacturers give attention to producing green products. Recently, Sana (2020) pointed out that the authorities in developed countries collects lower tax from green product manufacturers than non-green product manufacturers. He also considered green technology investment to reduce carbon emission of the firm. As such, many researchers, viz. Chan and Lau (2002), Zhu et al. (2005), Zhang and Liu (2013), Wood et al. (2016), Manna et al. (2017), Jamali and Rasti-Barzoki (2018), Panja and Mondal (2019), Zhang et al. (2020) and others have been working on green supply chain system (GSCS) that reduce environment pollution and earn maximum profit for the supply chain members.

In a competitive market, delay-in-payment scheme is a very important strategy to run the business smoothly. Generally, the supplier offers the retailer the opportunity for paying partial an

* Corresponding author.
E-mail addresses: pkghosh.yspm@gmail.com (P.K. Ghosh), akmanna1987@gmail.com (A.K. Manna), dey_jaykum@yahoo.com (J.K. Dey), kar_s_k@yahoo.com (S. Kar).

https://doi.org/10.1016/j.jclepro.2020.125734
0959-6526/

RAIRO-Oper. Res. 54 (2020) 1189–1213
https://doi.org/10.1051/ro/2019054

RAIRO Operations Research
www.rairo-ro.org

EFFECT OF INSPECTION ERRORS ON IMPERFECT PRODUCTION INVENTORY MODEL WITH WARRANTY AND PRICE DISCOUNT DEPENDENT DEMAND RATE

Amalesh Kumar Manna[1,*], Jayanta Kumar Dey[2] and Shyamal Kumar Mondal[1]

Abstract. This paper deals with selling price-discount and warranty period dependent demand in an imperfect production inventory model under the consideration of inspection errors and time dependent development cost. Normally, due to long-run, a production process deteriorates with time and here we assume that the process shifts from "in-control" to "out-of-control" state at any random time. A time dependent development cost has been constructed to increase the reliability of the production system *i.e.*, to decrease the deterioration of the system during the production process. As a result, a few items are rejected. Here, two types of inspection errors such as Type-I error and Type-II error, have been considered during the period of product inspection process. In Type-I error, an inspector may choose falsely a defective item as non-defective and in Type-II error an inspector may choose falsely a non-defective item as defective. Due to these phenomena, the inspection process would consist of the following costs: cost of inspection, cost of inspection errors. The purpose of this paper is to investigate the effects of time dependent development cost on the defective items, selling price-discount and warranty policy on the market demand and finally optimize the expected average profit under consideration of such inspection costs in infinite time horizon. Some numerical examples along with graphical illustrations and sensitivity analysis are provided to test the feasibility of the model.

Mathematics Subject Classification. 90B05, 90B15, 90B25, 90B30, 90B60.

Received February 22, 2019. Accepted May 6, 2019.

1. Introduction

In a real manufacturing system, a long-run production process shifts from "in-control" to "out-of-control" state due to different machinery problems, labor problems, etc. On the other hand, the production of defective units is a natural phenomenon to be occurred due to different difficulties arisen in a long-run production process. Normally, it is seen that a production process is initiated from "in-control" state, because every factors associated with the system are in well condition. Then due to continuous running of system, these factors gradually lose their perfectness. So, after some time, the production process may shift from "in-control" state to "out-of-control" state. For this reason, some imperfect items along with perfect items are produced in every

Keywords. Inventory, Stochastic, Inspection, Production models, warranty policy.

[1] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, 721102 Midnapore, West Bengal, India.
[2] Department of Mathematics, Mahishadal Raj College, 721628 Mahishadal, West Bengal, India.
*Corresponding author: akmanna1987@gmail.com

Article published by EDP Sciences

J Opt
https://doi.org/10.1007/s12596-020-00657-9

RESEARCH ARTICLE

Nonclassical states and total noise in five-wave interaction process

Samiran Kumar[1,2] · **Dilip Kumar Giri**[3]

Received: 9 May 2020 / Accepted: 16 September 2020

Abstract We investigated theoretically the squeezing, sub-Poissonian, and total noise of a quantum state in spontaneous and stimulated five-wave interaction process under short-time approximation. It has been found that the squeezing occurs in field amplitude, amplitude-squared in the fundamental mode in the process. It is shown that higher-order squeezing allows a much larger fractional noise reduction than lower-order squeezing. We observed that the squeezed states are associated with a large number of photons. It is shown that squeezing is greater in the stimulated interaction than the corresponding squeezing in the spontaneous interaction. The photon statistics of the fundamental mode in the process is investigated and found to be sub-Poissonian in nature. The effect of the sub-Poissonian nature of an optical field in terms of total noise is also incorporated. We showed that the depth of non-classicality directly depends on the amount of total noise present in the system. This suggests that the more squeezed the state is, the greater is its total noise in the system. It is found that a higher multi-photon absorption process is suitable for the generation of optimum squeezed light.

✉ Dilip Kumar Giri
dilipkumargiri@gmail.com

Samiran Kumar
samiran892008@gmail.com

[1] Department of Physics, Mahishadal Raj College, Mahishadal, West Bengal, India

[2] University Department of Physics, Vinoba Bhave University, Hazaribag, India

[3] University Department of Physics, Binod Bihari Mahto Koyalanchal University, Dhanbad, India

Keywords Multi-photon process · Squeezing · Sub-poissonian · Photon number · Total noise

Introduction

The idea of squeezing of the electromagnetic field was introduced by Hollenhorst [1] and Caves [2]. After that, D. F. Walls [3] has given a detailed review of squeezed states of light including the generation and detection of squeezed states as well as proposed potential applications. The concept of squeezing [4–10] in the quantized electromagnetic field has gained a great deal of importance in view of the possibility of reducing the noise of an optical signal below the shot-noise limit. R. E. Slusher et al. [11] have generated squeezed states of the electromagnetic field by non-degenerate four-wave mixing process and have measured with a balanced homodyne detector. Ling-Au Wu et al. [12] have generated squeezed states of light by parametric down-conversion in an optical cavity. Garraway et al. [13] have presented a simple scheme that allows the generation and detection of nonclassical states of the electromagnetic field with controllable photon number and phase distributions. Squeezing of radiation is a purely quantum mechanical phenomenon, and its low-noise property [14–16] has many attractive applications such as high-quality telecommunication [17] quantum cryptography [18, 19], and so on. The experimental detections and applications approve the importance of the theoretical investigations into various nonlinear optical processes such as Raman [20–22], Hyper-Raman [23], Harmonic Generation [24, 25], Multiwave-mixing processes [26–29], and so on. A squeezed state may exhibit sub-Poissonian photon statistics. The conversion of higher-order squeezed light into nonclassical light with higher-order sub-Poissonian

Published online: 08 October 2020

Journal of Photochemistry & Photobiology, A: Chemistry 404 (2021) 112889

Contents lists available at ScienceDirect

Journal of Photochemistry & Photobiology, A: Chemistry

journal homepage: www.elsevier.com/locate/jphotochem

A cell-compatible red light-emitting multianalyte chemosensor via three birds, one stone strategy

Subhabrata Mabhai [a,f,h], Malay Dolai [b], Surya Kanta Dey [c], Anamika Dhara [d], Sujata Maiti Choudhury [c], Bhriguram Das [e,f], Satyajit Dey [f,*], Atanu Jana [g,*], Deb Ranjan Banerjee [h,*]

[a] Department of Chemistry, Mahishadal Raj College, Purba Medinipur, Mahishadal, West Bengal, 721628, India
[b] Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721401, India
[c] Department of Human Physiology with Community Health, Vidyasagar University, Rangamati, Medinipur, West Bengal, 721102, India
[d] Department of Chemistry, Jadavpur University, Raja S. C. Mallick Road, Kolkata 700032, India
[e] Department of Chemistry and Chemical Technology, Vidyasagar University, Rangamati, Medinipur, West Bengal, 721102, India
[f] Department of Chemistry, Tamralipta Mahavidyalaya, East Midnapore, West Bengal, 721636, India
[g] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, South Korea
[h] Department of Chemistry, National Institute of Technology Durgapur, West Bengal, 713209, India

ARTICLE INFO

Keywords:
Rhodamine
Azobenzene
Chemosensor
PET – CHEF
Paramagnetic quenching

ABSTRACT

The design and synthesis of red light-emitting multianalyte chemosensors have always been a challenging task because of its specific requirement of coordination pocket and selective fluorescence mechanism. Herein, we develop a chemosensor via "three birds, one stone" strategy in which we can detect three metal ions with one ligand. A highly sensitive new azo functionalized rhodamine based luminescent sensor is synthesized for selective fluorogenic recognition of Al^{3+}, Cr^{3+}, and chromogenic recognition of Cu^{2+} in ethanol : H_2O medium in the red light-emitting zone. Among the guest metals, Cu^{2+} efficiently quenches the emission whereas Al^{3+} and Cr^{3+} induce increased luminescent 4.76 fold for Al^{3+} and 2.47 fold for Cr^{3+} through chelation-enhanced fluorescence (CHEF) and photo-induced electron transfer (PET) regulated mechanism with the formation of 1:1 complex. The restricted imine isomerization through complex formation inhibits ongoing PET process with the instantaneous onset of CHEF. The mechanism is in good consonance with NMR (^1H & ^{13}C), FT-IR, elemental analysis, DFT, TCSPC, and pH-dependent studies. Micromolar range detection of 1.1 μM, 1.3 μM, and 1.5 μM for Cu^{2+}, Al^{3+}, and Cr^{3+} respectively, easy penetration into HLCs cells and higher imaging resolution increase its potentiality to assess Al^{3+} and Cr^{3+} in vitro. Moreover, paper strip application increases its viability as an onsite naked-eye portable solid probe.

1. Introduction

Besides natural sources, various industrial activities and anthropogenic activity enrich the amount of Cu^{2+}, Al^{3+}, and Cr^{3+} in the environment. A living body requires a very low concentration of Cu^{2+}. Its toxicity through excessive accumulation brings the loss of activity in various Cu-dependent enzymes *viz.* tyrosinase co-oxidase, cytochrome, and superoxide dismutase which is responsible for the generation of in vivo reactive oxygen regulation by iron and causes Menkes disease by disturbing the development of the brain [1]. Wilson's disease, a Cu^{2+} related disease, is grown up by the excessive deposition of Cu^{2+} in the liver and brain through irregular transport [2]. Among the different oxidation state trace element chromium is less harmful in its trivalent (Cr^{3+}) state [3]. Balance concentration of chromium regulates the metabolism of fat lipids and carbohydrates by activating certain enzymes whereas insufficient dietary intake increases blood sugar by deactivating insulin, increases the risk of cardiovascular disease, and stops the formation of haemoglobin in the red blood cell [4]. Again diversified application of alumina includes not only industries like packaging, pharmaceuticals, food, and medicine but also in our daily life

* Corresponding authors.
E-mail addresses: satyajitdeyoc@gmail.com (S. Dey), atanujanaic@gmail.com, atanujana@dongguk.edu (A. Jana), debranjan.banerjee@ch.nitdgp.ac.in (D.R. Banerjee).

https://doi.org/10.1016/j.jphotochem.2020.112889
Received 14 June 2020; Received in revised form 28 August 2020; Accepted 2 September 2020
Available online 6 September 2020

THE JOURNAL OF PHYSICAL CHEMISTRY A
A JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

pubs.acs.org/JPCA Article

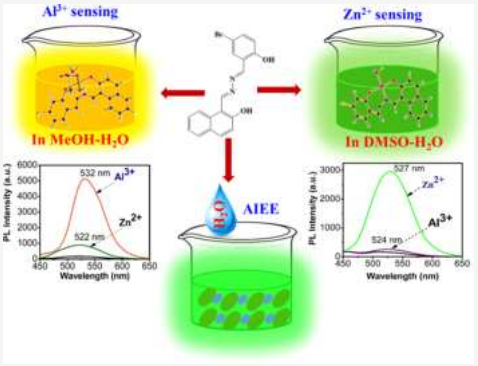
Solvent-Regulated Fluorimetric Differentiation of Al^{3+} and Zn^{2+} Using an AIE-Active Single Sensor

Bhriguram Das, Malay Dolai, Anamika Dhara, Avijit Ghosh, Subhabrata Mabhai, Ajay Misra,* Satyajit Dey,* and Atanu Jana*

Cite This: J. Phys. Chem. A 2021, 125, 1490−1504 Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The absence of d-orbital electrons or presence of full-filled d-orbital electrons in metal ions is a well-known Achilles' heel problem for the detection of these metal ions by a simple UV-visible study. For this reason, detection of metal ions such as Al^{3+} with no d-orbital electrons or Zn^{2+} with filled d-orbital electrons is a challenging task. Herein, we report a 2-naphthol-based fluorescent probe [1-((*E*)-((*E*)-(5-bromo-2-hydroxybenzylidene)hydrazono)methyl)naphthalen-2-ol] ($\mathbf{H_2L}$) that has been used to sense and discriminate Al^{3+} and Zn^{2+} via solvent regulation. The probe exhibits excellent selectivity and swift sensitivity toward Al^{3+} in MeOH−water (9:1, v/v) and toward Zn^{2+} in dimethyl sulfoxide (DMSO)−water (9:1, v/v) among various metal ions. The respective detection limit is found to be 9.78 and 3.65 μM. The sensing mechanism is attributed to multiple processes, viz., the inhibition of photo-induced electron transfer (PET) along with the introduction of chelation-enhanced emission (CHEF) and excited-state intramolecular proton transfer (ESIPT) inhibition, which are experimentally well verified by UV−vis absorption spectroscopy, emission spectroscopy, and NMR spectroscopy. The probe shows aggregation-induced emissive (AIE) response in ≥70% aqueous media as well as in the solid state. The experimental results are well corroborated by time-resolved photoluminescence (TRPL) and density functional theory (DFT) calculations. An advanced-level OR-AND-NOT logic gate has been constructed from a different chemical combinational input and emission output. The reversible recognition of both Al^{3+} in MeOH−water (9:1, v/v) and Zn^{2+} in DMSO−water (9:1, v/v) is also ascertained in the presence of Na_2EDTA, enabling the construction of a molecular memory device. The probe $\mathbf{H_2L}$ also detects intracellular Al^{3+}/Zn^{2+} ions in Hela cells. Altogether, our fundamental findings will pave the way for designing and synthesis of unique chemosensors that could be used for cell imaging studies as well as constructing molecular logic gates.



INTRODUCTION

Multitasking application of materials is an important and emerging field of science in the modern world. Such types of materials make a product cheap and user-friendly, and the time management issue provides an endeavor toward sustainable development.[1,2] A Schiff base is an example of such type of materials due to its versatile application in different applied fields of science including medicine and pharmacy (because of its properties, viz., antitumor, antiviral, antifungal, antibacterial, biocidal, and antimalarial properties), chemical synthesis and analysis, modern technological imaging systems, molecular memory storage, photochromic materials, and in colorimetric and fluorimetric ion/molecule sensors.[3−6] The sensing of ions/small molecules by a Schiff base has useful applications in several interdisciplinary sciences. Several analytical scientific strategies including chromatography, spectrometry, titrimetry, spectrophotometry, and electrochemical techniques have been developed for the detection of metal ions.[7,8] As the method mentioned above is complicated and time- and cost-consuming, simple but reliable methods for qualitative and quantitative as well as rapid and sensitive detection of metal ions are in extreme need. Among various strategies utilized, fluorescence signaling is one of the first choices as it is simpler and rapid, convenient, and profoundly sensitive for the recognition of biologically and environmentally relevant metal ions.[9,10]

The concentration of aluminum, which is the third most abundant element present in the earth's furthest layer, in soil or water increases during rain, which is perilous for growing plants.[11,12] The far-reaching uses of aluminum in our everyday life, for example, aluminum foil, vessels, and treat sheets; medications; the paper industry; food additives; and aluminum-based pharmaceutical antiperspirants, antiulcer agents, and antacids, result in its exposure to the environment.[13] Adverse effects of Al^{3+} influence the central nervous

Received: November 23, 2020
Revised: January 25, 2021
Published: February 10, 2021

https://dx.doi.org/10.1021/acs.jpca.0c10518
J. Phys. Chem. A 2021, 125, 1490−1504

Full Article
doi.org/10.1002/ansa.202000165

Chemistry Europe
European Chemical Societies Publishing

Received: 10 December 2020

Revised: 1 February 2021

Accepted: 3 February 2021

Acetate ion augmented fluorescence sensing of Zn^{2+} by Salen-based probe, AIE character, and application for picric acid detection

Bhriguram Das[1,2] | **Malay Dolai**[3] | **Anamika Dhara**[4] | **Subhabrata Mabhai**[5] | **Atanu Jana**[6] | **Satyajit Dey**[2] | **Ajay Misra**[1]

[1] Department of Chemistry, Vidyasagar University, Midnapore, West Bengal 721102, India

[2] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, West Bengal 721636, India

[3] Department of Chemistry, Prabhat Kumar College, Contai 721404, India

[4] Department of Chemistry, Hiralal Mazumdar Memorial College For Women, Dakshineswar, North 24 Parganas, Kolkata 700035, India

[5] Department of Chemistry, Mahishadal Raj College, Mahishadal 721628, India

[6] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, South Korea

Correspondence
Ajay Misra, Department of Chemistry , Vidyasagar University, Midnapore-721102, West Bengal, India.
Email: ajay@mail.vidyasagar.ac.in, ajaymsr@yahoo.co.in
Satyajit Dey, Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, West Bengal. 721636.
Email: satyajitdeyoc@gmail.com
Atanu Jana, Division of Physics and Semiconductor Science, Dongguk University, Seoul, 04620, South Korea.
Email: atanujanaic@gmail.com

Funding information
University Grants Commission, Grant/Award Number: Sanction letter No. PSW-155/14-15(ERO) ID No. WV6-027

Abstract

Counter anion-triggered metal ion detection has been rarely reported by fluorimetric method. To address this challenging issue, a fluorescent probe (**H_2L**) has been synthesized from bromo-salicylaldehyde and hydrazine hydrate, and structurally characterized by single crystal X-ray diffraction. The probe shows very weak fluorescence itself. However, its emission intensity increases in the presence of Zn^{2+} over other metal ions. Surprisingly, the emission profile of this probe in presence of Zn^{2+} is augmented only when acetate anion (OAcˊ) is present as counter anion, that allows for precise quantitative analysis by spectroscopic studies. The compositions and complexation among the probe, Zn^{2+} ion, and OAcˊ are supported by ESI-MS, ^{1}H-NMR, and Job's plot. Based on these studies, it is confirmed that the binding ratio between probe: metal is 1:2 and the detection limit (LOD) for the Zn^{2+} is 2.18 μM. The probe is capable of recognizing Zn^{2+} ion in the wide range of pH~6.5-9.5, and it could be efficiently recycled by EDTA. Furthermore, the combinatorial molecular logic gate and memory device have been constructed from the fluorescent behavior of **H_2L** with Zn^{2+}, OAcˊ, and EDTA input as based on NOT and AND gates. Interestingly, the aggregation-induced emission (AIEE) phenomenon is also perceived with greater than 50% water content in organic water mixtures, which are then useful for the detection of picric acid often used as explosive.

KEYWORDS
AIEE, counter anion, molecular logic gate, PET and CHEF, Picric acid, Schiff base, zinc sensor

1 | INTRODUCTION

Performing multiple tasks useful material is a significant and developing field of science in the cutting edge world. Such kind of materials makes an item modest, easy to use, and the time executives issue provides an endeavor and influence towards sustainable developments.[1,2] Schiff base is a reasonable example of such type of materials because of its versatile application in different field of applied science including medicine and pharmacy (viz., antifungal, antibacterial, biocidal, antitumor, antiviral, and antimalarial properties), chemical synthesis

Journal of Environmental Chemical Engineering 9 (2021) 105992

Contents lists available at ScienceDirect

Journal of Environmental Chemical Engineering

journal homepage: www.elsevier.com/locate/jece

Polyaniline and sulfonated graphene oxide supported bimetallic manganese cobalt oxides as an effective and non-precious cathode catalyst in air-cathode microbial fuel cells

Farhan Papiya [a], Prasanta Pattanayak [a], Abul Kalam Biswas [b], Patit Paban Kundu [a,c,*]

[a] Advanced Polymer Laboratory, Department of Polymer Science & Technology, University of Calcutta, 92, A.P.C. Road, Kolkata 700 009, India
[b] Department of Chemistry, Mahishadal Raj College, West Bengal 721628, India
[c] Department of Chemical Engineering, Indian Institute of Technology, Roorkee 247667, India

ARTICLE INFO

Editor: Dr. Zhang Xiwang

Keywords:
Single−chamber MFC
Cathode catalyst
Sulfonated graphene oxide, Mn−Co/SGO−PAni nanocomposite
Oxygen reduction reaction

ABSTRACT

This study examines the feasibility of the use of nanocomposite of polyaniline (PAni) grafted sulfonated graphene oxide (SGO) supported manganese cobalt oxide as a novel and effective cathode catalyst for single chamber microbial fuel cell (SC-MFC). The graphene oxide (GO) was sulfonated to SGO for the development of a significant increase in the hydrophilicity of GO to enhance the nano−catalyst dispersion. The structural properties of the prepared nanocomposite were studied by X-ray diffraction, X-ray photoelectron spectroscopy, and Raman spectroscopy. Morphological studies of the nanocomposite revealed a wrinkled paper−like structure of SGO and a spherical type structure of Mn−Co. Both cyclic voltammetry and electrochemical impedance spectroscopy showed a reduction current value of −1.04 mA, and charge-transfer resistance of 52.4 ohm, which exhibited a higher oxygen reduction reaction activity and good conductivity compared to Mn−Co/GO−PAni, Mn−Co/rGO−PAni and Pt/C catalyst. Electrochemical tests also suggest that the Mn−Co/SGO−PAni nanocomposite exhibited excellent durability among the other three cathodes. Furthermore, the MFCs equipped with Mn−Co/SGO−PAni nanocomposite modified electrode achieved power density of 1392.68 mW m^{-2} which is 2.89 times higher than state-of-art Pt/C (481.3 mWm^{-2}). The Electrochemical studies also displayed a similar result. The significant increase in power generation with Mn−Co/SGO−PAni nanocomposite as a cathode catalyst indicates that it can be used as a promising, inexpensive electrocatalyst for the long-term operation for MFC.

1. Introduction

Microbial fuel cell (MFC) is a novel, environmentally friendly and promising alternative energy source that produces bioelectricity from wastewater or biomass in which bacteria are used as catalysts to oxidize organic matter [1,2]. The bacteria in anode chamber produce protons, electrons, and CO_2 from the biodegradation of organic fuel by catabolic metabolism. The electron is transferred from the anode to the cathode through an external wire and then reduces oxygen in the air to form water and electric current [2,3]. The overall MFC performance is affected by several factors such as cell design, electrode materials, bacterial inoculum, substrate, and ion-selective membrane [4]. Unfortunately, the sluggish kinetics of the oxygen reduction reaction (ORR) has become the bottleneck of power generation in MFC. Hence, a number of studies have been employed to accelerate the sluggish kinetics of the ORR at the cathode [5]. Generally, high surface area, excellent electrical conductivity, high catalytic activity, good stability, and low cost are very necessary to enhance the ORR kinetics.

The most commonly employed cathode catalyst is platinum (Pt) and its alloys as they have good catalytic activity, stability, and resistance to corrosion [6–8]. Noble metal Pt is rare and expensive and has poor availability along with sensitivity to catalyst poisoning and these are the major hindrances to its commercial acceptance. Therefore, developing an alternative cost-effective non-platinum catalyst for ORR has stimulated wide research interests [9,10]. Several metal-based catalyst, i.e. CoO_x/FePc [11], Spinel−type Cu/Co [12], Co/Fe/N [13], α−Fe_2O_3/polyaniline [14], Ni−Co/SPAni [15], Cu_2O/RGO [16], Zn−Co/ZnO [17], V_2O_5/GO [18], δ−MnO_2 [19] and SGO−TiO_2–PAni

* Corresponding author at: Advanced Polymer Laboratory, Department of Polymer Science & Technology, University of Calcutta, 92, A.P.C. Road, Kolkata 700 009, India.
E-mail address: patit.kundu@ch.iitr.ac.in (P.P. Kundu).

https://doi.org/10.1016/j.jece.2021.105992
Received 18 January 2021; Received in revised form 27 June 2021; Accepted 1 July 2021
Available online 3 July 2021

Internet of Things 11 (2020) 100181

Contents lists available at ScienceDirect

Internet of Things

journal homepage: www.elsevier.com/locate/iot

Research article

FogIoHT: A weighted majority game theory based energy-efficient delay-sensitive fog network for internet of health things

Anwesha Mukherjee[a], Debashis De[b,*], Soumya K. Ghosh[c]

[a] Department of Computer Science, Mahishadal Raj College, Garhkamalpur, Mahishadal, Purba Medinipur, West Bengal, 721628, India
[b] Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, BF-142, Sector-I, Salt Lake, Kolkata, 700064, India
[c] Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, West Bengal, 721302, India

ARTICLE INFO

Article history:
Received 10 November 2019
Revised 20 January 2020
Accepted 17 February 2020
Available online 26 February 2020

Keywords:
Fog Computing
Mobile Heath
Energy Optimization
Game Theory

ABSTRACT

Internet of Health Things (IoHT) has become a demanding application of Internet of Things and cloud computing. In IoHT, the exchange and processing of health data are performed for monitoring the health status of patients. The health data collected using a body area network are stored and processed inside the cloud servers. The users can access the health data using their mobile devices as well as can receive health care advice. To reduce energy consumption and delay over the remote cloud servers, fog computing has been introduced. The health care system using fog computing is emerging due to the increasing need of energy and latency optimized health service provisioning. This article focuses on fog based Internet of Health Things for indoor as well as outdoor scenarios. In the proposed system the weighted majority game theory is used for selecting fog device in indoor and outdoor regions. Simulation results demonstrate that the proposed fog computing based system reduces the average delay, average jitter and energy consumption by approximately 15%, 20% and 15% respectively than the existing cloud only health care system.

1. Introduction

Electronic health (e-health) monitoring has become an emerging research field in the last few years [1]. The exponential growth in the number of smart phone users has made a remarkable change in the traditional e-health system and mobile health (m-health) monitoring has been introduced. Nowadays most of the smart phones have health related applications, which can detect user activity and predict health condition based on pulse rate, BMI etc. Samsung S Health, Apple Healthkit, Google Fit, Microsoft Health etc. are some of the popular applications. Health sensor devices are also available which can detect several health parameters like blood sugar level, pressure level, ECG etc. [1]. After collecting respective health parameter values these sensor nodes transmit the same to the connected smart phone. The smart phone can process the data and predict the health status. However, execution of exhaustive applications for processing health data may not be possible inside the smart phones due to resource constraints. Mobile cloud computing may resolve these challenges [2]. By executing

* Corresponding author.
E-mail addresses: anweshamukherjee2011@gmail.com (A. Mukherjee), dr.debashis.de@gmail.com, dr.debashis.de@ieee.org (D. De), skg@cse.iitkgp.ac.in (S.K. Ghosh).

https://doi.org/10.1016/j.iot.2020.100181
2542-6605/

Physical Communication 42 (2020) 101158

Contents lists available at ScienceDirect

Physical Communication

journal homepage: www.elsevier.com/locate/phycom

Full length article

Fractional frequency reuse based frequency allocation for 5G HetNet using master–slave algorithm

Priti Deb [a], Anwesha Mukherjee [b], Debashis De [a,c,*]

[a] Centre of Mobile Cloud Computing, Department of Computer Science & Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, Simhat, Haringhata Farm, West Bengal 741249, India
[b] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal 721628, India
[c] Department of Physics, University of Western Australia, 35 Stirling Hwy, Crawley WA 6009, Australia

ARTICLE INFO

Article history:
Received 13 December 2019
Received in revised form 12 May 2020
Accepted 25 June 2020
Available online 29 June 2020

Keywords:
FFR
Power consumption
SINR
Spectral efficiency
Micro-femtocell network
Master–slave algorithm

ABSTRACT

Frequency allocation in small cell-based green heterogeneous mobile networks is a demanding research domain nowadays. Femtocells are the essential components of small cell networks. In this paper, we propose a low power micro-femtocell network using the master–slave algorithm. In the master–slave algorithm, the master node allocates work to the slave nodes. When a slave ends its task given by a master node, it informs the master node, and it is being assigned a new workload. Slave nodes do not communicate with each other. In our approach, the microcell is divided into three sectors, and each sector is further categorized into three regions: inner region, outer region, and most-outer region. Femtocells are allocated in these three regions. According to the duty cycle, several femtocells are chosen as master femtocells. The rest of the femtocells are assigned under the supervision of the master femtocells. These femtocells are referred to as slave femtocells. The master femtocells communicate with the microcell, and the slave femtocells communicate with the corresponding master femtocell. Frequency allocation for this micro-femtocell network is proposed based on Fractional Frequency Reuse (FFR). The power consumption, signal-to-interference-plus-noise ratio (SINR), and spectral efficiency for the proposed network are calculated. The simulation results exemplify that the proposed scheme reduces the power consumption of the network by approximately 44%–80% than the conventional heterogeneous network. The simulation results also demonstrate that the proposed network has better SINR and spectral efficiency than the existing micro-femtocell network. For experimental analysis, vector signal generator (VSG) and vector signal analyzer (VSA) are used. The experimental results also show that the proposed network is greener compared to the existing micro-femtocell network.

1. Introduction

The increasing use of smartphones has elevated the requirement of introducing new approaches for giving good signal strength at the outdoor as well as an indoor area. Long Term Evolution (LTE) network has come into the scenario to enhance the speed of data communication and to boost the capability of the mobile network [1]. For better, indoor and outdoor coverage LTE network is followed by LTE-Advanced (LTE-A) network. LTE-A is primarily for small cell-based heterogeneous networks. Small cell serves as a critical component for low power cellular network [1–4]. Heterogeneous cellular network (HCN) or heterogeneous network (HetNet) is a combination of macrocell base station (MBS), microcell base station (MiBS), picocell base station (PBS) and femtocell base station (FBS) [2]. The HetNet is not only for third and fourth generation mobile networks but for the fifth-generation mobile network also. FBSs are allocated for giving better signal strength in the indoor region. FBS is a small cell base station, which can be deployed in a plug and play manner. The transmission power of an MBS or an MiBS is higher than that of an FBS. Deployment of several FBSs inside a macrocell or a microcell improves coverage [1]. An MiBS has lower transmission power than an MBS [4].

Hence, in this article, we use MiBS instead of MBS, where FBSs are allocated inside the microcell based on the master–slave algorithm. In the master–slave algorithm, the master node allocates work to the slave nodes. When a slave ends its task given by a master node, it informs the master node, and it is being assigned a new workload. Slave nodes do not communicate with each other. In our approach, FBSs are deployed under an MiBS. From these FBSs based on duty cycle, master FBSs are chosen,

* Corresponding author at: Centre of Mobile Cloud Computing, Department of Computer Science & Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, Simhat, Haringhata Farm, West Bengal 741249, India.
E-mail address: dr.debashis.de@gmail.com (D. De).

https://doi.org/10.1016/j.phycom.2020.101158
1874-4907/

Received: 26 September 2020 | Revised: 1 December 2020 | Accepted: 14 December 2020

DOI: 10.1002/btpr.3114

REVIEW

BIOTECHNOLOGY PROGRESS

Critical analysis of biophysicochemical parameters for qualitative improvement of phytogenic nanoparticles

Sukhendu Maity | Madhuchhanda Adhikari | Sambuddha Banerjee | Rajkumar Guchhait | Ankit Chatterjee | Kousik Pramanick

Integrative Biology Research Unit, Department of Life Sciences, Presidency University, Kolkata, India

Correspondence
Kousik Pramanick, Integrative Biology Research Unit, Department of Life Sciences, Presidency University, 86/1, College Street, Kolkata 700073, India.
Email: kousik.dbs@presiuniv.ac.in

Funding information
Council for Scientific and Industrial Research, India, Grant/Award Number: 08/155 (0075)/2019-EMR-I; Science and Engineering Research Board, Grant/Award Number: EEQ/2018/000275

Abstract

Conventional chemical approaches for synthesizing nanoparticles (NPs) may restrict their applicability as they are not eco-friendly, energetically efficient and often involve toxic reducing/capping agents; but phytonanotechnology enabled the synthesis of safe, inexpensive, highly biocompatible NPs. In this regard, thorough understanding of green components and the modulatory effects of different reaction conditions on the physicochemical parameters of green synthesized NPs would be a prerequisite, which is not depicted elsewhere. This review critically analyzes the relevant reaction conditions from their mechanistic viewpoints in plant-based synthesis of NPs arising fundamental issues which need to be determined carefully. The size, stability and surface chemistry of phytogenic NPs may be fabricated as a function of multiple interconnected reaction parameters and the plant species used. The therapeutic potential of phytogenic NPs may depend on the plant species used; and so the meticulous understanding of physicochemical parameters and the family wise shorting of elite plant species may potentially benefit the theranostic future of plant-based NPs.

KEYWORDS
green-synthesis, nanotechnology, phytochemicals, phytonanotechnology, plant-based nanoparticles, reducing/capping agents

1 | INTRODUCTION

Cancer is an emerging health concern due to its high rate of global occurrence in every year and associated therapeutic complications.[1-4] The waned enhanced permeability and retention (EPR) effects of chemotherapeutic agents, underdeveloped drug delivery systems for tissue/organs/organelles specific targeting and the deficit of original bioavailability would be the major technological limitations subduing the therapeutic efficiency of chemotherapeutants.

The advent of nanotechnology has opened up a new horizon to the treatment of many deadly ailments including cancer.[5-7] The present physical and chemical methods (including both top-down and bottom-up approaches) for nanoparticles (NP) synthesis still have to depend on the use of a lot of toxic and environmentally hazardous reagents, which might impose severe detrimental effects on the environment, ecosystem and public health; and are labor intensive, energetically inefficient and expensive.[8-15] These hurdles compelled researchers to think another way and to make use of biomolecules for NPs synthesis aiming to develop facile, inexpensive, energetically efficient and eco-friendly technologies (green technology) for biocompatible NPs synthesis (Figure 1).

The phytomining approach of NPs recovery depends on the sequestration of biocompatible NPs from the plants which can bioaccumulate the metals ions and are able to reduce them making NPs in vivo; but this process is time consuming and cannot monitor the size and shape of synthesized NPs.[16] In this way, the in vitro approach for plant-based synthesis of NPs (bottom-up approach) has been developed. The green synthesis of NPs involves the biomolecules of plants,

Biodegradation (2021) 32:487–510
https://doi.org/10.1007/s10532-021-09954-x

REVIEW PAPER

Functional interplay between plastic polymers and microbes: a comprehensive review

Sukhendu Maity · Sambuddha Banerjee · Chayan Biswas · Rajkumar Guchhait · Ankit Chatterjee · Kousik Pramanick

Received: 22 February 2021 / Accepted: 26 May 2021 / Published online: 4 June 2021

Abstract Escalated production of plastic, their worldwide distribution and persistent nature finally results into their environmental accumulation causing severe threats to the ecological environment and biotic health. Thus, development of suitable measurements for environmental remediation of plastic may be an urgent issue in this plastic age. Some recent reviews have categorized the microbial species able to degrade different plastic polymers and the different factors effecting bio-degradation of plastic are poorly understood. This review comprehensively discusses bio-degradation of traditional and biodegradable plastic polymers both in natural and biological environment (gut microbes and fungi) to understand different factors regulating their degradation, and also shows how degradation of plastic polymers under abiotic factors influence subsequent biological degradation. Different physicochemical modifications like - breaking large polymers into small fragments by pre-treatment, functional groups enrichment, identifying potent microbial species (consortia) and engineering microbial enzymes might be crucial for bio-degradations of plastic. Effects of micro/nanoplastic and other chemical intermediates, formed during the bio-degradation of plastic, on species composition, abundance, growth, metabolism and enzymatic systems of microbes involved in the bio-degradation of plastic should be determined in future research.

Keywords Bio-degradation · Pre-treatment · Functional groups · Biotic-abiotic factors · Microbial enzymes · Composting

Introduction

Global production rate of plastic production is increasing every year since 1950 s due to their wide range of applications in different sectors such as agriculture, packaging, construction, automotive industry, biomedicine etc. Increasing annual production of plastic and their improper waste management collectively results in higher environmental accumulation. The global production of plastic reached 368 million tons in 2019 and 51% of this total production was contributed by Asia (Plastics—the facts 2020 by Plastic Europe). Eriksen et al. (2014) showed the improper waste management system to be accounted for floating of >5 trillion plastic pieces

Sukhendu Maity, Sambuddha Banerjee and Chayan Biswashave contributed equally to this work.

S. Maity · S. Banerjee · C. Biswas · R. Guchhait · A. Chatterjee · K. Pramanick (✉)
Integrative Biology Research Unit (IBRU), Department of Life Sciences, Presidency University, Kolkata, India
e-mail: kousik.dbs@presiuniv.ac.in

R. Guchhait
Department of Zoology, Mahishadal Raj College, Purba Medinipur, India

Science of the Total Environment 794 (2021) 148752

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Review

Co-occurrence of co-contaminants: Cyanotoxins and microplastics, in soil system and their health impacts on plant – A comprehensive review

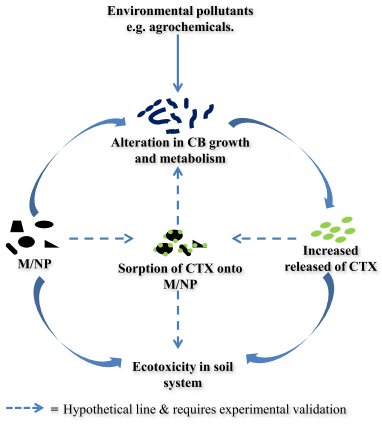
Sukhendu Maity [a], Rajkumar Guchhait [a,b], Ankit Chatterjee [a], Kousik Pramanick [a,*]

[a] Integrative Biology Research Unit (IBRU), Presidency University, Kolkata, West Bengal, India
[b] Department of zoology, Mahishadal Raj College, Purba Medinipur, West Bengal, India

HIGHLIGHTS

- Cyanotoxin and micro/nanoplastics may be emerging co-contaminants in soils.
- Phytotoxic effects of cyanotoxin and its mixture are poorly understood.
- Co-occurrence in soil suggests sorption of cyanotoxin onto micro/nanoplastics.
- Distinct lack of combined effects of cyanotoxin & micro/nanoplastics.
- Ecotoxicity should be measured using environmentally relevant doses.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 13 May 2021
Received in revised form 25 June 2021
Accepted 25 June 2021
Available online 29 June 2021

Editor: Qilin Wang

Keywords:
Cyanobacteria
Cyanotoxin
Micro/nanoplastics
Co-contaminant
Soil
Sorption
Phytotoxicity

ABSTRACT

Cyanotoxins (CTX) and micro/nanoplastics (M/NP) are ubiquitously distributed in every environmental compartment. But the distribution, abundance and associated ecological risks of CTX are still poorly understood in soil system. On the other hand, M/NP could serve as vectors for persistent organic/inorganic pollutants in the natural environment through the sorption of pollutants onto them. Thus, co-occurrence of CTX and M/NP in soils suggests the sorption of CTX onto M/NP. So, major aim of this review is to understand the relevance of CTX and M/NP in soils as co-contaminants, possible interactions between them and ecological risks of CTX in terms of phytotoxicity. In this study, we comprehensively discuss different sources and fate of CTX and the sorption of CTX onto M/NP in soil system, considering the partition coefficient of different phases of soil and mass balance. Phytotoxicity of CTX, CTX mixture and co-contaminants has also been discussed with insights on the mechanism of action. This study indicates the need for the evaluation of sorption between co-contaminants, especially CTX and M/NP, and their phytotoxicity assessment using environmentally relevant concentrations.

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).

https://doi.org/10.1016/j.scitotenv.2021.148752
0048-9697/

J. Indian Chem. Soc.,
Vol. 97, No. 9b, September 2020, pp. 1498-1506

Solvato(fluoro)chromism, investigation of quenching mechanism and thermodynamic binding parameter of two azine based chemosensor for Cu^{2+} ion, application in onsite detection

Bhriguram Das[a,d], Anamika Dhara[b], Subhabrata Mabhai[c] and Satyajit Dey*[a]

[a]Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur-721 636, West Bengal, India

[b]Department of Chemistry, Jadavpur University, Kolkata-700 032, India

[c]Department of Chemistry, Mahisadal Raj College, Purba Medinipur-721 628, West Bengal, India

[d]Subhaspalli Kunjabehari Vidyabhaban, Heria, Purba Medinipur-721 430, West Bengal, India

E-mail: satyajitdeyoc@gmail.com

Manuscript received online 29 July 2020, accepted 25 August 2020

Two solvatochromic fluorescent azine derivative 1-((*E*)-((*Z*)-(4-(diethylamino)-2-hydroxybenzylidene)hydrazono)methyl) naphthalen-2-ol (**L1**) and (*E*)-2-((4-(diethylamino)-2-hydroxybenzylidene)amino)-3′,6′-dihydroxyspiro[isoindoline-1,9′-xanthen]-3-one (**L2**) was synthesized via Schiff base condensation. The introduction of an electron-donating diethylamino group and an electron-accepting fluorophore unit into the pi-conjugated system of **L1** and **L2** endowed a prominent solvatochromic emission property. In contrast with the very little changes of absorption spectra in the different solvents, the emission was strongly dependent on the solvent polarity and could be tuned from blue region to red region by changing the solvent from less polar tetrahydrofuran to highly polar water. Both the ligand **L1** and **L2** were able to binds Cu^{2+} ion selectively via fluorescence turn-off process. The limit of detection (LOD) for Cu^{2+} was found to be 1.9 μM and 1.62 μM with **L1** and **L2**, respectively. The photophysical experimental results reveal that the Cu^{2+} ions quenched the intrinsic fluorescence of both **L1** and **L2** by forming the ligand-metal complexes, but the quenching process different (static or dynamic) for the two probes. In addition, the binding spontaneity was mainly entropy-driven. Again both ligands successfully detect Cu^{2+} by means of TLC paper as well as simple filter paper based strips and hence, they would be very useful for onsite detection purpose.

Keywords: Solvato(fluoro)chromism, Cu^{2+} ion, quenching, LOD, thermodynamic spontaneity, paper strips.

Introduction

Luminescent materials derived from Schiff base compounds have attracted great attention in the past few decades owing to their potential applications in the fields of organic electronics, optoelectronics, sensors and informational displays[1]. It is well known that the absorption and emission spectral responses of chemical compounds may be influenced by the surrounding medium and that medium can bring about a change in the position, intensity, and shape of absorption and/or emission bands. Hantz schlater termed this phenomenon solvatochromism[2,3]. The term often solvatofluorchromism was defined for the emission position change upon solvent polarity variation. Obviously, this phenomenon is caused by differential solvation of the ground and first excited state of the light-absorbing molecule (or its chromophore). Differential solvation of these two states is responsible for the solvent influence on emission spectra[4]. In general, molecules with a large change in their permanent dipole moment upon excitation exhibit a strong solvatochromic behaviour[5]. Besides the dipole moment change on excitation, the ability of a solute to donate or to accept hydrogen bonds to or from surrounding solvent molecules in its ground and Franck-Condon excited state determines further the extent and sign of its solvatochromism[4,6,7].

Fluorescent molecules possessing solvatochromic properties display different emission spectra depending on solvent polarity whose fluorescence intensity, color, and wavelength are sensitive to the environment[5,8]. The absolute value of the red shift depends, usually linearly, on the solvent polarity. The more polar solvent with a higher static dipole moment polarizes molecules more strongly, the stronger the red shift. Due to their sensitivity to polarity and hydration,

Received: 8 January 2020 | Revised: 15 May 2020 | Accepted: 28 June 2020

DOI: 10.1002/gj.3944

WILEY

RESEARCH ARTICLE

Mafic volcanic rocks of western Iron Ore Group, Singhbhum Craton, eastern India: Geochemical evidence for ocean–continent convergence

Madhuparna Paul[1] | Jyotisankar Ray[1] | C. Manikyamba[2] | Sohini Ganguly[3] | M. Rajanikanta Singh[2] | Saraswati Pachal[1] | Debaleena Sarkar[1]

[1]Department of Geology, University of Calcutta, Kolkata, India

[2]National Geophysical Research Institute (Council of Scientific and Industrial Research), Hyderabad, India

[3]School of Earth, Ocean and Atmospheric Sciences, Goa University, Taleigao Plateau, Goa, India

Correspondence
Jyotisankar Ray, Department of Geology, University of Calcutta, 35 Ballygunge Circular Road, Kolkata 700019, India.
Email: jsray65@hotmail.com

Funding information
Department of Science and Technology, Grant/Award Number: SR/S4/ES-510/2010; GeoMet, Grant/Award Number: MLP 0002 FBR2-EVSSKB

Handling Editor: N.V. Chalapathi Rao

Precambrian mafic magmatism is an important global episode which played a significant role in the crustal evolution. In India, Singhbhum Craton being the oldest craton, witnessed significant occurrences of Precambrian geological activity, marked by several episodes of volcanism, plutonism, sedimentation spanning from Palaeoarchean to Mesoproterozoic age. Here we present petrological and geochemical characteristics of Precambrian mafic volcanic rocks (occurring in western Iron Ore Group (IOG), Singhbhum Craton, eastern India) to evaluate their petrogenetic aspects, tectonic setting, and magma generation. The mafic volcanic rocks are porphyritic in nature with the phenocrysts of plagioclase and groundmass composed of clinopyroxene, plagioclase, ilmenite, and volcanic glass. These rocks are mostly tholeiitic, sometimes with a transitional behaviour towards calc-alkaline nature and display basalt-basaltic andesite affinity. These mafic volcanic rocks also preserve geochemical signatures (high Nb/U, Nb/La, [Nb/Th]pm ratios) in support of Nb-enriched basalts and are classified as Nb-enriched basalts (NEB; Nb > 7 ppm) and high-Nb basalts (HNB; Nb > 20 ppm) on the basis of Nb concentrations and mantle normalized Nb/La ratios (>0.5). The NEBs and HNBs are marked by lesser magnitude of negative Nb anomalies with high (Nb/Th)pm, (Nb/La)pm, and Nb/U ratios as compared to normal arc basalts. Several major element oxides, trace elements, and selected element ratios (like SiO_2, CaO/Al_2O_3, Y, V/Cr, Zr/Nb, and $\sum$REE) show systematic variations with MgO which suggests role of magmatic fractionation. Chondrite-normalized REE patterns for NEB and HNB rocks exhibit uniform LREE enrichment with distinct Eu negative anomalies while primitive mantle-normalized incompatible trace element patterns reflect enrichment in LILE and LREE with prominent Nb-Ta anomalies. Different HFSE ratios corroborate a subduction related setting for magma generation formed by ~10%–20% melting in the domain of garnet lherzolite. Relative enrichment of LILE and LREE with depleted HFSE characteristics attest a garnet-bearing mantle source and melt extraction with garnet in the residue. Geochemical signatures suggest that the genesis of NEB and HNB is attributable to slab-melting and wedge hybridization processes

Homes across the Water: Dislocation and Transcultural Kinship in Amitav Ghosh's *The Glass Palace*

Dr. Asis De
Associate Professor of English, Mahishadal Raj College
(ademarc@gmail.com)

Anupam Roy
Ph. D Research Scholar, Vidyasagar University

Abstract:

Kinship studies, a key area of anthropology since the late nineteenth century, implies human relationships based on consanguinity and biological affinity, where blood-relationships play an essential role in the social grouping of people and identity formation. The essentialist idea of kinship insists on a universal assumption—'Blood is thicker than water'. However, this idea has been challenged by modern cultural anthropologists in the late twentieth century (David M. Schneider and Marilyn Strathern) and early twenty-first century (Janet Carsten) since it does not take into consideration multiple cultural factors in the formation of kinship in this modern age of transnational migration and dislocation. Setting the 'blood-related', 'natural' or biological kinship aside, they advocated for the 'cultural' dimensions of kinship configured by regional specificity, community, ethno-nationality, language, marriage and even diasporic dislocation. In this article, we attempt an exploration of transcultural kinship concerning diasporic individuals and their families constituted by members with different ethno-cultural identities. Taking Amitav Ghosh's The Glass Palace *(2000) as case-study, this essay would examine how dislocation beyond the familiar cultural space opens up avenues for re-imagining kinship beyond the bonds of community and often leads to the establishment of families across the "water" (metaphoric of diasporic mobility). We also attempt to investigate how cultural hybridity and transculturality reconfigure family-ties situating an individual in a newer pattern of kinship; how a relationship like close friendship or mentorship turns into strong kinship bonds resembling family-ties.*

Keywords*: Migration, Dislocation, Identity, Borders, Negotiation, Kinship, Family-ties*

"The ideas of kinship, the kin-based society, the idiom of kinship, and the content of kinship are the received wisdom of today, as they have been almost from the beginnings of anthropology."

A Critique of the Study of Kinship (1984): David Murray Schneider

-With this proposition, Schneider's influential volume *A Critique of the Study of Kinship* (1984) initiates a relatively new way of looking at kinship studies beyond the formalist tradition, by attempting cross-cultural analyses of kinship only three decades back. The inception of kinship studies is attributed to Lewis Henry Morgan and his 'magnum opus' *Systems of Consanguinity and Affinity of the Human Family* (1871) which centres around the essentialist idea of kinship based on blood relationships and biological affinity. The propositions of Schneider's new anthropology of kinship, which he finds as "the received wisdom of today" (3), rely heavily on nature/culture interplay than the biologically determined structuralist way of assessing kinship. The inclusion of 'local' culture/s and community history as no less essential determinants than the exclusive factors like progeny and ethnology in kinship studies, has allowed a broader and more fluid conceptualization of

the eventual birth of Ilongo is a strong example of transcultural kinship in dislocation. The ending of the novel is significant since it shows how lack of wealth, homelessness and dislocation transform people. Despite their mutual antipathy, the redemptive love brings Rajkumar and Uma together to dissolve the borders between them. The crossing of borders not only liberates the 'self' from a confined space but also situates it in a global network of kinship that paves the way for re-imagining community and a home across the water.

End Note:

[1.] Ghosh's narrator indulges in a fanciful reference to botanical kinship while reflecting over the relationship between teak and mint: "Teak is a relative of mint, *tectona grandis*, born of the same genus" (70), and "there was an unmistakable kinship, a palpably familial link" (71).

Works Cited:

Carsten, Janet. Ed. Introduction.*Ghosts of Memory: Essays on Remembrance and Relatedness*. Blackwell Publishing Ltd., 2007.

————. *After Kinship*. Cambridge University Press, 2004.

De, Asis. "Empire and Exile: Representation of the Burmese Royal Family across the Border in Amitav Ghosh's *The Glass Palace* and Sudha Shah's *The King in Exile*". *Beyond Borders and Boundaries: Diasporic Images and Re-presentations in Literature and Cinema*. Edited by Nilufer Bharucha, Sreedhar Rajeswaran and KlausStierstorfer. Indian Diaspora Centre, 2018, pp.132-147.

Ghosh, Amitav. *The Glass Palace* (2000). HarperCollins Publishers India, 2005.

Jallinoja, Riitta & E. D. Widmer. Eds. *Families and Kinship in Contemporary Europe: Rules and Practices of Relatedness*. Palgrave Macmillan, 2011.

Schneider, David M. *A Critique of the Study of Kinship* (1984). The University of Michigan Press, 1998.

Smart, Carol. "Relationality and Socio-Cultural Theories of Family Life."*Families and Kinship in Contemporary Europe: Rules and Practices of Relatedness.*Edited by Riitta Jallinoja & E. D. Widmer. Palgrave Macmillan, 2011, pp. 13-28.

Strathern, Marilyn. *After Nature: English Kinship in the late Twentieth Century*. Cambridge University Press, 1992.

Thieme, John. "Amitav Ghosh." *A Companion to Indian Fiction in English*.Edited by Pier Paolo Piciucco. Atlantic, 2004. pp. 251-275.

ISSN 2789-4258

Journal of History & Civilization

Volume 1
Number 1
July-December 2020

DEPARTMENT OF ISLAMIC HISTORY & CULTURE
Faculty of Arts
Jagannath University
Dhaka-1100

Journal of History and Civilization Volume 1 Number 1 July-December 2010 Page 193-201
ISSN 1789 4256

Indigenous People: Evolution of Concept and Rights in Post-Colonial International Phenomena

Prakash Bisui*

Abstract: In the post-colonial era, democratic pluralistic societies and nation-states developed, along with the concept of human rights. Holding hands of postmodern thinkers, international organizations such as the International Labour Organization and the United Nations continued to be driven by the notion of pluralistic human rights. As a result, issues such as international law, human rights, protection of marginalized people, etc., have become international issues, in which the protection of tribes and their rights became one of the issues in the international arena. In this research paper, I shall discuss how the protection of the rights of the people, who were accustomed to a somewhat primitive and natural way of life and maintained their own characteristics across the region, became important in the international arena and what were their rights. On the other hand, environmentalist thinkers felt the urge to protect their way of life, keeping in mind the protection of the environment because the tribes have been protecting the environment for a long time in pursuit of their own way of life and in the mainstream society and state system, whenever they wanted to violate their way of life and rights, they have become protesters, thus the tribal environmentalist movement has developed.

Methodology: In composing this article, a comparative discussion of various research papers and various declarations of the international laws, the United Nations and the International Labour Organization regarding the tribes have been intensively tried and evaluated.

Objective: The principal objective of this study is to create an idea in the readership about the tribes and their rights, to create the model of a society that is in harmony with the pluralistic society and environment. In today's society, human rights violations, environmental destruction, marginalization of surfaced people, etc. are becoming common phenomena all over the world, then the more the researchers and academicians discuss such issues, the more the issues like protection of rights, respect for citizens, protection of marginalized people, protection of environment will increase.

Interdiction: Debating tribes and tribal beings have attained quite significant in today's discussions of social science. They are referred to by varied nomenclature

* Assistant Professor, Department of History, Mahishadal Raj College, Mahishadal, Purbo Medinipur, West Bengal, India

PRINT: ISSN 0970-9274 ONLINE: ISSN 2456-6608
J Hum Ecol, 71(1-3): 254-265 (2020)
DOI: 10.31901/24566608.2020/71.1-3.3270

International Migration of Women from Darjeeling District: The Question of Empowerment

Ashlesha Rai

Mahishadal Raj College, Medinipur, West Bengal, India
Telephone: 917679711401, E-mail: ashleey20@gmail.com

KEYWORDS Darjeeling. Empowerment.International Migration. Patriarchy. Women

ABSTRACT The phenomenon of migration flows is not a new process in Darjeeling district.It has evolved time and again with diversified patterns in terms of class, caste and gender specifics. Historical evidences addressed in hill studies show that the pattern of migration from Darjeeling district was mainly dominant by the male migrants who were migrating to the metropolitan cities to work in private sectors. But the recent trends in migration from this region are of women migrating independently to work in informal sectors mostly as a domestic worker to countries like Gulf countries, Middle East countries and South East Asian countries. They have become active economic agents as well as inspiration for aspirant migrants in the home country. Thus, on the basis of this context, exploratory research has been conducted in Darjeeling district in an attempt to study the patterns and impact of women's international migration and examine socio-cultural implications that caters towards the empowerment of women in Darjeeling district.

INTRODUCTION

Migration is a universal phenomenon concerning people's movement from one place to another for multiple reasons and having manifold connotations. International Organisation for Migration defines migration as, "the movement of a person, whatever its length, composition and causes, and it includes migration of refugees, displaced persons, economic migrants and persons moving for other purposes, including family reunification" (Bhardwaj and Sawant 2015). Donald (1979) defines migration as a "rationally planned action, which is the result of conscious decisions taken after a consideration or calculation of the advantages and disadvantages of moving and staying". In the simplest form, international migration can be defined as the movement of people across borders and staying in the host country on a temporal or permanent basis.

Conceptualising the historical trend of migration, the phrase "migrants" was used only as a code for male migrants while women migrants have always been linked with marriage and other associational reasons. While, with the oil boom in Gulf countries, the emergence of newly industrialising economies, expansion of the service economy, high demand of skilled and unskilled labour in the developed regions has intensified a much broader pattern of international migration incorporating women migrants as well. Apparently, females represent half of the international migrants in developed regions whereby "the phrase feminisation of migration" is gaining prominence in the field of research studies.

Of the above issues of significance, international migration from Darjeeling District is a topic worth studying. International migration from this region is readily enforced and reshaped by the radical changes in the demographic pattern during the last one hundred and fifty years. The structural changes of the region are concomitant with the historic migration between and from neighbouring countries with the resultant effect of colonial regime during the early and mid- nineteenth century[1]. The widespread influx of Nepalese of Nepal has not only affected the socio-economic profile of the region but also constantly blurred their (Indian Nepalese) national identities and thwarted their protracted demand of autonomy (Gorkhaland Movement), which has been a controversial issue till date. By the time of the second Census of India in 1881, the Nepalese formed the absolute majority not only in the three hill sub-divisions but also in the whole district of Darjeeling" (Dasgupta 1999).

Moreover, if one looks at the socio-economic profile of Darjeeling district, half of the population is agriculturist and majority of them are engaged in tea plantation works. Since its in-

NEW ACADEMIA: *An International Journal of English Language, Literature and Literary Theory*

(Peer reviewed and Refereed Journal)

Online ISSN 2347-2073 **Vol. IX, Issue IV, Oct. 2020**

REPRESENTATION OF TRIBAL WOMEN, MARGINALITY AND TRANSFORMATION IN HANSDA SOWVENDRA SHEKHAR'S *THE MYSTERIOUS AILMENT OF RUPI BASKEY*

Deepmala Mahato
M.A., SET
State Aided College Teacher
Department of English (UG and PG)
Mahishadal Raj College (NAAC Accredited 'A' Grade College)
Purba Medinipur, West Bengal

Abstract

India, being a culturally diverse country, treasures numerous ethno-cultural communities. Santhal community is one of them, due to their sizeable population. Santhals of Chotanagpur region, like any other tribal community believes in numerous myths and legends, often these beliefs consider 'mysterious' and beyond the border of reason, 'dahni-bidya' or witchcraft is one of them. This eerie knowledge of spirits is practiced by few Santhal women to gain benefit from others by causing them harm. The damaging nature of such knowledge made Santhals avoid those women who participate in it, thus making them socially marginalized in their own community. On the other hand Santhals have their own set of socio-cultural and religious practices which considered under-civilized by main-stream Indians, consequently making them unequal 'other' and marginalized.

Both the socio-ethnic marginalization of the tribals due to cultural difference outside the border of the community, and the marginalization of the women empowered by the knowledge of witchcraft inside the community find sharp literary representation in Hansda Sowvendra Shekhar's debut novel The Mysterious ailment of Rupi Baskey (2014). The present paper will focus on the portrayal of the Santhal women who are the victims and practitioners of 'dahni-bidya' and marginalization as well as those who are benefitted by such practices. The paper will further convey how globalization has influenced the lives Santhals women and the future of 'dahni-bidya' in the age of 'modern' medical sciences as represented in the novel.

Key words: Ethno-cultural difference, Tribal culture, Marginality, Transformation etc.

Tribal culture treasures numerous myths, legends and folklores. Epistemologically, the socio-cultural practices in tribal are often shaped by so-called 'mysterious' beliefs which seem to be rooted beyond the border of logic and reason. People of the Santhal tribal community, like

www.TLHjournal.com Literary Herald ISSN: 2454-3365
An International Refereed/Peer-reviewed English e-Journal
Impact Factor: 4.727 (SJIF)

The Sacred and the Secular: Post-Colonial Mythopoeia and Cultural Identity in R. K. Narayan's *The Man-eater of Malgudi*

ABANTIKA CHAKRABORTY
State Aided College Teacher
Department of English (UG and PG)
Mahishadal Raj College
(NAAC Accredited 'A' Grade College)
West Bengal, India

ABSTRACT

In the post-colonial Indian Anglophone literary scenario, the urge to represent a distinctly Indian cultural identity is the effect of both modernist experimentation and a nationalist assertion. Mythopoeia, mainly a post-religious literary aesthetic, becomes a favourite trope for certain Indian litterateurs, as it conveys an intermediate perspective between the doctrinal sacred and the liberal secular. The retelling of ancient Indian myths in the context of contemporary post-colonial reality becomes trendy in literary imagination and functional in asserting an Indian cultural identity in the second half of the previous century. To bring home the point, I would consider R.K. Narayan's *The Man-eater of Malgudi* as a case study, which, in the words of John Thieme, is the "most mythic novel" (120) among all the fourteen novels he has written. This paper would explore Narayan's dexterous and subtle use of religio-cultural references from ancient Indian mythology as found in the epics and the Puranas, and establish the point that Narayan's mythopoeic treatment is essentially secular. This paper attempts to challenge the superficial reception of the character of Vasu as archetypally "demonic," as Nataraj's assistant Sastri finds him. Even Vasu's death at the end of the novel, which Sastri finds resembling the destruction of the mythical Bhasmasura in the 'Shiva Purana', may be seen from a post-religious perspective: justifying the death of the despicable. This paper finally aims to establish that Narayan's representation of Indian cultural identity relies more on the minute delineation of the Malgudi society, its culture and people rather than on Nataraj's campaign of the 'sacred'.

Keywords: Sacred, Secular, Mythopoeia, Post-colonial, Cultural Identity

Thieme, John. *R. K. Narayan* (Contemporary World Writers), New Delhi: Viva Books, 1st Indian Edition, 2010.

Volná, Ludmila. 'Commodification against Indianness: Symbolism of Things in R. K. Narayan's *The Man-Eater of Malgudi*' in *The Silent Life of Things: Reading and Representing Commodified Objecthood*, Eds. by Daniela Rogobete, Jonathan P. A. Sell and Alan Munton, Newcastle upon Tyne: Cambridge Scholars Publishing, 2015, 153-161.

Walsh, William. *R. K. Narayan: A Critical Appreciation.* London: Heinemann, 1962.

Walther, Sundhya. 'The Nation's Taxidermist: Ungovernable Bodies in R.K. Narayan's *The Man-Eater of Malgudi*.' University of Toronto Quarterly, 84 (4), 2015, pp. 74-89. Doi: 10.3138/utq.84.4.06.

Woodcock, George. 'Two Great Commonwealth Novelists: R. K. Narayan and V. S. Naipaul.' *The Sewanee Review,* 87 (1979): 1-28.

Soft Computing (2022) 26:5773–5803
https://doi.org/10.1007/s00500-022-06978-0

OPTIMIZATION

A modified ACO with K-Opt for restricted covering salesman problems in different environments

Prasanta Dutta[1] · **Indadul Khan**[2] · **Krishnendu Basuli**[3] · **Manas Kumar Maiti**[4]

Accepted: 3 March 2022 / Published online: 8 April 2022

Abstract
In this study, the ant colony optimization (ACO) algorithm is modified with the K-Opt operation to solve the covering salesman problem (CSP) under one restriction in crisp and imprecise (fuzzy, rough) environments. A CSP involves two phases—the division of cities into groups with the selection of the visiting cities and searching of the Hamiltonian circuit through the visiting cities. But, none of the studies in the literature is made following the direct approach. Also, none of the studies in the literature gives attention to reduce the total travel distance of the unvisited cities from the visited city of a group. Moreover, there is no algorithm in the literature which provides the solution of a CSP with the specified coverage range r. Also, none has introduced any algorithm to solve CSPs in imprecise environments. Though algorithms are available to solve the Traveling Salesman Problems in the imprecise environments, the approach cannot deal with the problems involving fuzzy data with nonlinear membership functions or the problems involving rough data where the rough estimation can not be done using Lebesgue measure. The well-established algorithm for any routing problem is the ACO, but not much attention has been paid to solve the CSP using ACOs. To overcome these limitations on the studies of the ACO on the CSPs, here, an algorithm is proposed for the division of groups of the set of cities depending upon the maximum number of cities in a group and the total number of groups. Then, ACO is used to find the shortest/minimum-cost path of the problem by selecting only one visiting the city from each group without violating the restriction of the specified coverage range r of the location of the unvisited cities. K-Opt operation is applied periodically at the end of ACO operation to improve the quality of the best found solution so far by the ACO algorithm and to arrest any premature convergence. For the restricted problems, paths are searched in such a manner that the total distance/travel cost of different unvisited cities of a group from the visited city of the group should not exceed a predefined upper limit. To solve the problem in an imprecise environment, some approach is followed so that the tour is searched without transferring the imprecise optimisation problem into an equivalent crisp optimisation problem. Also, the simulation approaches in fuzzy and rough environments are proposed to deal with the CSPs with any type of estimation of the imprecise data set. Algorithm is tested with the standard benchmark crisp problems available in the literature. To test the algorithm in the imprecise environments, the imprecise instances are derived randomly from the standard crisp instances using a specified rule. Test results imply that the proposed algorithm is efficient enough in solving the CSPs in the crisp as well as in the imprecise environments.

Keywords Covering salesmen problem · Ant colony optimization · K-Opt operation · Fuzzy simulation · Rough simulation

1 Introduction

A covering salesman problem (CSP) is a complete weighted graph, consists of a set of vertices, called cities, and a weight matrix, called distance (cost) matrix which consists of the distance (travelling cost) between any two cities. The goal of the problem is to find the different clusters (groups) of the cities and then find a minimum cost Hamiltonian circuit visiting only one city in each cluster so that each unvisited city in a cluster should be located in a predefined cover-

✉ Indadul Khan
indadulkhan@gmail.com

1 Debra Thana S.K.S MV, Gangaramchak, P.O. Chakshyampur, Paschim Medinipur, India

2 Chandrakona Vidyasagar MV, Chandrakona Town, Paschim Medinipur, India

3 West Bengal Sate University, Kolkata, India

4 Mahishadal Raj College, Mahishadal, India

Applied Intelligence (2021) 52:11755–11783
https://doi.org/10.1007/s10489-021-02989-w

Multi-objective generalized traveling salesman problem: A decomposition approach

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

Accepted: 8 November 2021 / Published online: 29 January 2022

Abstract

Using the features of shuffle, re-generation, and 4-opt operation, a novel heuristic has been proposed based on the decomposition approach for the multi-objective generalized traveling salesman problems. A three-layer solution updating mechanism, namely, a shuffle layer, a layer for re-generation, and a layer for 4-opt operation, has been designed for the same. The shuffle and re-generation operations are specially designed to solve this problem. The shuffle operation is applied to a solution sequence (complete path/tour) to improve the corresponding objectives. The re-generation operation consists of two phases- in the first phase, the objectives are improved by interchanging a few portions of the groups/clusters sequence, and in the second phase, the same is done by replacing some cities from the corresponding groups. Finally, the solution and the corresponding groups are rearranged using the 4-opt operation for the betterment of the same. Problems with varying sizes from the generalized traveling salesman problem library are solved using the proposed approach to verify its performance and for the illustration. Some widely used performance metrics for multi-objective solution methodologies have been applied to the proposed heuristic to measure its performance. Various well-established heuristics have been modified according to this problem and are implemented to compare the efficiency of the proposed heuristic. Based on the performance metrics values of the computational outputs, a conclusion can be drawn that the proposed heuristic, named SR4-MOEA/D, is the best compared to the other heuristics implemented for the same. Also, every test instance of the proposed algorithm provides the best pareto optimal front, which is distributed over the whole true pareto front of the respective problem.

Keywords Multi-objective generalized traveling salesmen problem · Shuffle operation · Re-generation operation · 4-Opt operation · Decomposition approach on multi-objective heuristics

1 Introduction

A significant portion of the research work on NP-hard combinatorial optimization problems is captured by the Traveling Salesman Problem (TSP) due to its applicability in the areas of applied sciences [22]. An extension of TSP, the generalized traveling salesman problem (GTSP), was proposed by Henry-Labordere [1], Saksena [36], and Srivastava [40] in the 1960s and has received gradual attention in the social welfare services, like, rural health care, disaster management, rationing system, etc. A standard GTSP involves a node set that is divided into some disjoint subsets, and a weight is associated with each pair of nodes. The objective of the problem is to search a Hamiltonian circuit with minimum weight by visiting one and only one node of each subset. Normally, a node represents a destination or city, and weight represents the travel length between the two associated cities. So, a GTSP can be described as a complete weighted graph (V, E, W), where a member of $V = \{1, 2, .., N\}$ defines a destination/city, the member $e_{ij} \in E$ is associated with the destination i and the destination j indicates the path between the destination i and the destination j, the member $d_{ij} \in W = (d_{ij})_{N\times N}$ is associated with e_{ij} and indicates

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manaskr1969@gmail.com

Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakona Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal, 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal, 700126, India

Evolutionary Intelligence
https://doi.org/10.1007/s12065-021-00651-5

RESEARCH PAPER

A random-permutation based GA for generalized traveling salesman problem in imprecise environments

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

Received: 15 September 2020 / Revised: 1 June 2021 / Accepted: 1 August 2021

Abstract
A random-permutation technique and the features of the genetic algorithm (GA) are combined together to develop a novel heuristic for solving generalized travelling salesman problem. Here, the random-permutation technique is used to find the sequence of clusters of a probable solution in which a complete tour to be commenced. The features of GA are used to select the cities from different clusters of the sequence. The algorithm has the ability to solve the problems in both the crisp as well as in the imprecise environments. A fuzzy membership-based selection process is proposed to select a solution for the mating pool. A general comparison rule of the solutions is proposed to rank the potential solutions of the population in imprecise environments. In the crisp environment, the efficiency of the proposed approach is tested against a set of different benchmark test problems from GTSPLIB having sizes up to 226 cities with 26 clusters. It is observed from the experimental results that the algorithm produces 100% accurate results for all the benchmark test problems under consideration. Imprecise test problems are generated from different benchmark crisp test problems of TSPLIB and are used to test the algorithm in the imprecise environments. It is also observed from the experimental results that the proposed approach finds multiple optimal paths (i.e, more than one path), if exists, for the problems in the crisp as well as in the imprecise environments.

Keywords Traveling salesmen problem · Genetic algorithm · Randomness · Triangular fuzzy number · Rough set

1 Introduction

A generalized form of the classical Traveling Salesman Problem (TSP), the generalized TSP (GTSP) was introduced by Henry-Labordere [11], Saksena [31], and Srivastava [33] in the context of computer record balancing and of visit sequencing through welfare agencies in 1960s. The problem consists of a set of n cities and a cost matrix $(c_{ij})_{n\times n}$, where, c_{ij} is the cost of travelling from city i to city j. The n cities are grouped into several clusters- $cl_1, cl_2, \ldots, cl_k$, where k is the number of clusters. Every city must belongs to at least one cluster. So, a city may belongs to more than one clusters. A salesman starts from a city of a cluster, visits one and only one city of every cluster and returns to the starting city with the minimum expenditure. So, the goal of the problem is to find the path/route of the salesman with the minimum cost covering all the clusters exactly once. There are several real-life applications of GTSP, such as, mail delivery [17], welfare agency routing [31], material flow system design [17], vehicle routing [17], and computer file sequencing [11], etc. The GTSP belongs to the class of NP-hard problems.

In most of the above-mentioned studies it is implicitly assumed that the travel cost, c_{ij} between any two cities i and j, is fixed and crisp in nature. But c_{ij} depends on the several factors, like, the quality of the vehicle used, condition of the roadways, duration of the travel, weather condition, etc. The travelling cost between any two cites mainly depends on the quality of transport used for the purpose. Sometimes it depends on the availability of the vehicle, condition of the road ways, etc., though its value normally lies in an interval.

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manasmaiti@yahoo.co.in

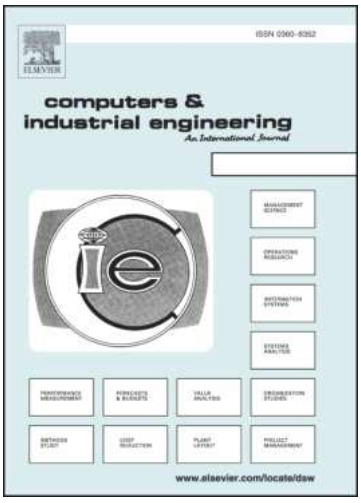
Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakon Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal 700126, India

Journal Pre-proofs



A multi-item supply chain with multi-level trade credit policy under inflation: A mixed mode ABC approach

Nilesh Pakhira, Manas Kumar Maiti

PII: S0360-8352(21)00316-8
DOI: https://doi.org/10.1016/j.cie.2021.107412
Reference: CAIE 107412

To appear in: *Computers & Industrial Engineering*

Received Date: 16 May 2018
Accepted Date: 20 May 2021

Please cite this article as: Pakhira, N., Maiti, M.K., A multi-item supply chain with multi-level trade credit policy under inflation: A mixed mode ABC approach, *Computers & Industrial Engineering* (2021), doi: https://doi.org/10.1016/j.cie.2021.107412

A MULTI-ITEM SUPPLY CHAIN WITH MULTI-LEVEL TRADE CREDIT POLICY UNDER INFLATION: A MIXED MODE ABC APPROACH

Nilesh Pakhira[1], Manas Kumar Maiti[2]

[1]Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, W.B. 721102, India
Email: npakhira1@yahoo.com (N. Pakhira)
[2]Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba Medinipur, W.B. 721628, India
Email: manasmaiti@yahoo.co.in (M.K. Maiti)

A MULTI-ITEM SUPPLY CHAIN WITH MULTI-LEVEL TRADE CREDIT POLICY UNDER INFLATION: A MIXED MODE ABC APPROACH

ABSTRACT. In this study, a multi-item supplier-wholesaler-retailer-customers supply chain with partial trade credit policy at each level under inflationary effect for a fixed planning horizon is developed and analysed. Here the wholesaler receives a partial credit period from the supplier, i.e., a credit period on a portion of the amount of units purchased. Wholesaler also offers a partial credit period to its retailer and in turn the retailer also offers a partial credit period to its customers to boost the base demand of any item. Here, credit period induced base demand of any item decreases linearly with time. Demand of the items are also influenced by the respective selling prices. The retailer introduces some promotional cost against advertisement and price discount to improve the demand of the items. Here, it is established that if the wholesaler shares a portion of this promotional cost then the profits of both the retailer and the wholesaler improve. Model is formulated as a mixed-integer profit maximization problem and is analysed in crisp as well as in imprecise (fuzzy/rough) environment and some managerial insights are outlined. To find the marketing decision of such a real-life supply chain model, here, a new variant of ABC is proposed for mixed-integer optimization problems. The algorithm is tested against a set of benchmark test problems available in the literature and its efficiency to solve such problems is well established.

Key words : Supply chain; Partial trade credit period; Inflation; Promotional cost sharing; Artificial Bee Colony.

1. Introduction

In any supply chain, profit of each party mostly depends on the market demand of the items involved in the chain, though, each party offers some sort of credit period to its purchaser to improve his/her sale amount. In reality, sale of each party mainly depends on the base demand of the item to the customers. This phenomenon as well as the credit opportunity from the wholesaler influences the retailer to offer some sort of credit facility to its customers. But the customers are basically floating in nature and there is no guarantee that all the customers will obey the business ethics. A portion of the customers may not pay the credit amount at the end of the credit period. This credit risk forces the retailer to offer only partial credit period to its customers, i.e., credit opportunity is offered on a portion of the amount purchased by any customer. On the other hand, to improve the demand, the retailer uses some promotional activities, like, local advertisement, offering price discount, free gift, etc., and the cost of these activities is known as the promotional cost. During the last decade, several research papers have been published reflecting

RAIRO-Oper. Res. 56 (2022) 331–348
https://doi.org/10.1051/ro/2021172

RAIRO Operations Research
www.rairo-ro.org

A DETERIORATING FOOD PRESERVATION SUPPLY CHAIN MODEL WITH DOWNSTREAM DELAYED PAYMENT AND UPSTREAM PARTIAL PREPAYMENT

Prasanta Kumar Ghosh[1,4], Amalesh Kumar Manna[2], Jayanta Kumar Dey[3] and Samarjit Kar[1,*]

Abstract. This paper investigates a food supply chain model consisting of the supplier, food producer and multi-retailer of a deteriorating item under fully delay-in-payment and partial advance payment scheme. The deterioration rate of raw material is dependent on temperature and other environmental factors with respect to time. Here, the food producer prepares food after collecting the raw material from the supplier and then storing it in cold storage. The refrigeration cost is dependent on the occupied volume in the cold storage (where the products are preserved for freshness) and power consumption. The supplier offers delay-in-payment to stimulate the food producer to buy more raw material (which minimizes the holding cost and earns more revenues), whereas the food producer takes the partial advance payment on purchase cost from the retailers to ensure the order quantity. A mathematical model is developed to obtain optimal production time and the optimal number of deliveries so that the average profit of the food producer is maximum. Finally, a numerical example and sensitivity analysis of the key parameters are provided to illustrate and test the feasibility of the proposed model.

Mathematics Subject Classification. 90B05, 90B15, 90B25, 90B30, 90B50.

Received October 23, 2019. Accepted November 21, 2021.

1. Introduction

In this world, food deterioration is a common phenomenon in developing countries and may cause economic loss. In many countries, food supply chain management affronts a huge challenge of food quality, food safety, public health, demand, price variability and weather-related variability etc. On the other hand, perishable products are important in inventory management because customers strive for quality. According to Ferguson and Katzenberg [11], 15% (approximately) of foods deteriorates in the food retailing sector. Also, more than 25% of fruit and vegetables are deteriorated in China during transportation, at wholesale markets and in shops (*cf.* [22]). Food products are the most delicate goods on the market due to insufficient storage, the wrong

Keywords. Supply chain, deteriorating items, delay-in-payment, advance payment.

[1] Department of Mathematics, National Institute of Technology Durgapur, Durgapur 713209, India.
[2] Department of Mathematics, The University of Burdwan, Burdwan 713104, India.
[3] Department of Mathematics, Mahisadal Raj College, Mahisadal 721628, India.
[4] Department of Mathematics, Y.S. Palpara Mahavidyalaya, Purba Midnapore 721458, India.
*Corresponding author: kar_s_k@yahoo.com

Journal of
Risk and Financial Management

MDPI

Article

A Fuzzy Imperfect Production Inventory Model Based on Fuzzy Differential and Fuzzy Integral Method

Amalesh Kumar Manna [1,2], Leopoldo Eduardo Cárdenas-Barrón [3,*], Jayanta Kumar Dey [4], Shyamal Kumar Mondal [1], Ali Akbar Shaikh [2], Armando Céspedes-Mota [3] and Gerardo Treviño-Garza [3]

1 Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore 721102, India; akmanna1987@gmail.com (A.K.M.); shyamal_260180@yahoo.com (S.K.M.)
2 Department of Mathematics, The University of Burdwan, Burdwan 713104, India; aliashaikh@math.buruniv.ac.in
3 Tecnologico de Monterrey, School of Engineering and Sciences, Ave. Eugenio Garza Sada 2501, Monterrey, N.L., México 64849, Mexico; acespede@tec.mx (A.C.-M.); trevino@tec.mx (G.T.-G.)
4 Department of Mathematics, Mahishadal Raj College, Mahishadal 721628, India; dey_jaykum@yahoo.com
* Correspondence: lecarden@tec.mx

Abstract: In the inventory theory, to treat the uncertainty, the fuzzy set concept is used in order to provide a feasible approach to deal with the uncertainty problem. In this research work, a fuzzy economic production quantity model with interactive fuzzy demands is proposed. In a production process, in the beginning, the system is assumed to be in a controlled state in which only perfect items are manufactured. Later, the manufacturing production process shifts to be an out-of-control-state system; producing both perfect and imperfect items simultaneously, this is considered as a fuzzy state. The defective production rate is also taken into account as a fuzzy state. Here, the selection process of produced items is realized during the production period. With the aim of studying the practical feasibility of the fuzzy economic production inventory model along with a sensitivity analysis of some parameters, different numerical examples are illustrated.

Keywords: fuzzy economic production quantity; fuzzy imperfect production process; fuzzy integral method; fuzzy demand; fuzzy programming technique

check for updates

Citation: Manna, Amalesh Kumar, Leopoldo Eduardo Cárdenas-Barrón, Jayanta Kumar Dey, Shyamal Kumar Mondal, Ali Akbar Shaikh, Armando Céspedes-Mota, and Gerardo Treviño-Garza. 2022. A Fuzzy Imperfect Production Inventory Model Based on Fuzzy Differential and Fuzzy Integral Method. *Journal of Risk and Financial Management* 15: 239. https://doi.org/10.3390/jrfm15060239

Academic Editor: Hari Mohan Srivastava

Received: 24 September 2021
Accepted: 28 April 2022
Published: 27 May 2022

1. Introduction

It is well known that the fuzzy set concept is applied into the inventory models to treat the uncertainty. The fuzzy set theory was introduced by (Zadeh 1965) with the aim of providing a feasible approach to deal with the fuzzy uncertainty problem. In the literature, the fuzzy set theory, also known as uncertain sets, has attracted attention for treating uncertainty in a variety of circumstances. For example, fuzzy inventory costs in the economic order quantity model are used in (Park 1987; Priyan and Uthayakumar 2016). Obtaining the economic production quantity when the quantity of demand is uncertain is analyzed in (Chang 1999). To treat the inventory problem considering all the parameters and variables being fuzzy numbers, a fuzzy economic production model is established by (Chen and Hsieh 2000). Different types of production inventory models for fuzzy environments are proposed by studies such as (Dey et al. 2005; Hsieh 2002; Lee and Yao 1998; Lin and Yao 2000; Manna et al. 2014, 2017a). Furthermore, other, different research works solve uncertainty issues using fuzzy set theory, such as (Das et al. 2015; Soni and Joshi 2015). Bera and Jana (2017) developed an imperfect production inventory model for multi-items under bi-fuzzy environments. (Dey 2019) introduced an imperfect production inventory problem under a fuzzy random environment. Recently, (Maiti 2021) incorporated the demand-dependent production rate into an inventory model with imperfect production process under a cloudy fuzzy environment.

Traditional economic production quantity (EPQ) models assume that in manufacturing systems, all items are made of perfect quality. However, in the real world, due to many

DOI 10.1007/s10946-022-10051-4
Journal of Russian Laser Research, Volume 43, Number 3, May, 2022

HIGHER-ORDER ANTIBUNCHING OF LIGHT IN SEVEN-PHOTON INTERACTION PROCESS

Nitu Sahu,[1,3] Samiran Kumar,[1,3] and Dilip Kumar Giri[4*]

[1] *Department of Education, Bokaro Steel City College Bokaro, Jharkhand, India*

[2] *Department of Physics, Mahishadal Raj College Mahishadal 721628, W.B., India*

[3] *University Department of Physics, Vinoba Bhave University Hazaribag, India*

[4] *University Department of Physics, Binod Bihari Mahto Koyalanchal University Dhanbad, India*

*Corresponding author e-mail: dilipkumargiri@gmail.com

Abstract

We study higher-order antibunching of light and the possibility of observing it in all modes in two and three-photon absorption seven-photon interaction processes. We solve the generalized interaction Hamiltonian for several particular cases in the Heisenberg picture and investigate the possibility of observing antibunching using the short-time approximation technique. We demonstrate that the antibunching of light in the initial pump field is directly dependent on coupling of the field between the modes and short-time interaction, as well as the quantity of photons. With the same number of photons, we find that the third-order antibunching is more prominent, followed by the second-and-first-order antibunching. In these systems, we discover that antibunching is not observed for the Stokes and signal modes in this process. We show that a higher-multiphoton-absorption technique is the best for producing optimum antibunched light.

Keywords: higher-order antibunching, seven-photon interaction process, photon number operator, short-time approximation.

1. Introduction

A nonclassical phenomenon [1,2], such as photon antibunching [3–12] of the field, is currently of great interest in the context of quantum teleportation [13, 14], quantum computation [15–19], and quantum cryptography [20–22], using a single-photon source as unconditional security [23–25]. Single-photon sources are light sources that emit light as single particles or photons and give rise to an effectively one-photon number state, i.e., the probability of emitting a single photon is larger than the probability of emitting two, three, four, or more photons simultaneously. The rate of simultaneous emission of two or more photons is lower in the antibunched state than it is in the single-photon state, indicating that the likelihood of detecting a single-photon source is larger than the probability of detecting a two or more-photon source in a bunch. Antibunching arises in pump modes, which lose energy, while bunching appears in signal modes, which absorb energy from the pump. In other words, as energy increases, more noise increases, and vice versa, as energy decreases, noise decreases [26–29].

Manuscript submitted by the authors in English on March 28, 2022.

NJC

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal | View Issue

Cite this: *New J. Chem.*, 2022, **46**, 6885

A naphthalene-based azo armed molecular framework for selective sensing of Al^{3+}†

Subhabrata Mabhai,[abc] Malay Dolai,[d] Surya Kanta Dey,[e] Sujata Maiti Choudhury,[e] Bhriguram Das,[bf] Satyajit Dey,*[b] Atanu Jana*[g] and Deb Ranjan Banerjee*[c]

Received 9th December 2021,
Accepted 1st March 2022

DOI: 10.1039/d1nj05869j

rsc.li/njc

An azo armed Schiff base chemosensor was synthesized based on a naphthalene fluorophore, which transduces greenish-yellow emission by complexing with Al^{3+}. It emits greenish-yellow fluorescence through restricted C=N isomerization, chelation-enhanced fluorescence, and the photo-induced electron transfer mechanism. The clear visible transformation of the achromatic ligand to a chromatic ligand by the 1 : 1 complexation with Al^{3+} is substantiated by ESI-MS spectra. ^{1}H NMR, ^{13}C NMR, and FTIR spectroscopies are used to characterize the **HL**. The selectivity of the **HL** for Al^{3+} in the presence of other metal ions was investigated through absorbance and fluorescence spectroscopies. The average lifetimes of **HL** and **L–Al^{3+}** have been evaluated using a time-resolved photoluminescence experiment to explore the sensing mechanism. The Al^{3+} sensing mechanism was also established by density functional theory calculations. A reversibility experiment was performed, demonstrating that Al^{3+} binding to **HL** is reversible. The pH variation on luminescence affirms that the **HL** can survive in physiological pH. Finally, the lower limit of detection of 5.4×10^{-7} and a good response in a cytotoxicity and cell imaging study confirm the usability of the ligand as an indelible signature of an effective biosensor for target Al^{3+}.

Introduction

In supramolecular chemistry, one of the challenging areas of development is developing a photochromic compound that can detect ions under the influence of external stimuli *via* photo-induced switching.[1] Although there are many analytical techniques for detecting ions, their operation demands skilled operators, high equipment costs, and complex preparatory processes.[2–6] A transition metal is an integral part of an enzyme that regulates biological activity, yet it can be detrimental to the environment and human life; thus, it is a real paradox of the environment.[7] Aluminium, when absorbed in our body from various sources such as aluminium-based utensils and medicines, circulates to almost all tissue, reaches plasma through iron-binding protein, and is stored in the brain. Alzheimer's disease due to aluminium-induced oxidative deterioration in the CNS (central nervous system) can happen even with a minimum dose of chronic exposure to aluminium from drinking water.[8] It is also believed to be the causative factor of smoking-related diseases, bone softening, chronic renal failure, and Parkinson's disease.[9] Therefore, to understand the mechanism of aluminium-induced adverse effects and to determine the concentration of Al^{3+} according to the WHO, researchers have been spurred to track aluminium more efficiently.[10] Because of their operational simplicity in detecting metal ions *via* chromogenic and fluorogenic sensing, chemosensors based on Schiff bases have piqued the interest of researchers in environmental and biomedical fields.[11] The most common mode of sensing operation in a chemosensor is that the photon interacting fluorophore site forms a communication with the receptor site after being attached with a metal ion and produces a 'turn-on' signal. Azomethine (CH=N) Schiff base derivatives armed with a suitable fluorophore moiety are considered classical ligands for detecting metal ions due to their elite coordination toward target metal ions, and ease of synthesis in combination with good photophysical properties.[12,13] A large number of sensory probes have been developed, taking

[a] *Department of Chemistry, Mahishadal Raj College, East Midnapore, Mahishadal, West Bengal, Pin No. 721628, India*
[b] *Department of Chemistry, Tamralipta Mahavidyalaya, East Midnapore, West Bengal, Pin No. 721636, India. E-mail: satyajitdeyoc@gmail.com*
[c] *Department of Chemistry, National Institute of Technology, Durgapur, WB, PIN-713209, India. E-mail: debranjan.banerjee@ch.nitdgp.ac.in*
[d] *Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721401, India*
[e] *Department of Human Physiology with Community Health; Vidyasagar University, Rangamati, Medinipur, West Bengal, Pin No. 721102, India*
[f] *Department of Chemistry, Vidyasagar University, Medinipur, West Bengal, Pin No. 721102, India*
[g] *Division of Physics and Semiconductor Science, Dongguk University, Seoul, 04620, South Korea. E-mail: atanujanaic@gmail.com*

† Electronic supplementary information (ESI) available. See DOI: 10.1039/d1nj05869j

Journal of Molecular Liquids 354 (2022) 118824

Contents lists available at ScienceDirect

Journal of Molecular Liquids

journal homepage: www.elsevier.com/locate/molliq

Multiple ion (Al^{3+}, Cr^{3+}, Fe^{3+}, and Cu^{2+}) sensing using a cell-compatible rhodamine-phenolphthalein-derived Schiff-base probe

Bhriguram Das [a,b], Avijit Ghosh [c], Dorothy Priyanka Dorairaj [d], Malay Dolai [e], Ramasamy Karvembu [d], Subhabrata Mabhai [f], Hyunsik Im [g], Satyajit Dey [b,*], Atanu Jana [g,*], Ajay Misra [a,*]

[a] Department of Chemistry, Vidyasagar University, Midnapore 721102, West Bengal, India
[b] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur 721636, West Bengal, India
[c] Center for Research in Nanoscience and Nanotechnology, Technology Campus, University of Calcutta, Salt Lake, Kolkata 700106, West Bengal, India
[d] Dept. of Chemistry, National Institute of Technology, Tiruchirappalli 620015, India
[e] Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721404, India
[f] Department of Chemistry, Mahishadal Raj College, Mahishadal, Purba Medinipur 721628, India
[g] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, South Korea

ARTICLE INFO

Article history:
Received 9 August 2021
Revised 1 January 2022
Accepted 22 February 2022
Available online 26 February 2022

Keywords:
Phenolphthalein
Rhodamine-B
CHEF on
PET off
Onsite detection
Cell imaging

ABSTRACT

In this study, a novel rhodamine-phenolphthalein derivative (**RBPF**) was designed, synthesized, and characterized. **RBPF** exhibited the selective and sensitive colorimetric detection of Cu^{2+} and Fe^{3+} and fluorometric detection of Al^{3+} and Cr^{3+}, thus functioning as a multiple-channel probe in MeOH-H_2O (v/v = 9/1, 5 μM HEPES, pH 7.2) in the presence of other cations. A strong enhancement of the absorbance at around 555 nm was observed for the four mentioned cations. In contrast, in the presence of Al^{3+} and Cr^{3+}, emissions were intensified within the red region of the spectra (583 and 586 nm, respectively). The **RBPF** sensor was found to bind to the metal ions at a 1:2 stoichiometric ratio. The proposed mechanism for the observed sensing behavior is the opening of the spirolactam ring of the rhodamine core in the presence of the four mentioned metal ions. The detection limits for Cu^{2+}, Fe^{3+}, Al^{3+}, and Cr^{3+} were calculated to be 1.21 μM, 1.75 μM, 2.27 μM, and 1.29 μM, respectively. To test the practical use of the probe, TLC-based paper strips were fabricated. In addition, cell-imaging analysis of Al^{3+} and Cr^{3+} ions in the A549 cancer cell line produced promising concentration and time-dependent detection results.

1. Introduction

Ions are required for the development, growth, and functioning of living systems [1,2], but the presence of high levels of non-biodegradable ions can have deleterious effects [3]. For example, when the ion balance in living cells is disturbed, the electrolytic equilibrium is disrupted, individual organs can be damaged, and essential enzymatic mechanisms are affected. Trivalent cations, including Al^{3+}, Cr^{3+}, and Fe^{3+}, and divalent Cu^{2+} have a particularly strong impact on the body [4-7]. Al^{3+} is a common pollutant of drinking water and at high levels is toxic to humans in the long term. Aluminum damages the central nervous system (CNS) and is known to cause Alzheimer's disease, Parkinson's disease, neurodementia, encephalopathy, and breast cancer [8,9]. In contrast, Fe^{3+} plays several crucial roles in processes such as cellular metabolism and enzyme catalysis, including electron transfer reactions [10,11]. Fe^{3+} also conjointly transports oxygen within all tissues via haemoprotein [12,13]. However, Al^{3+} and Fe^{3+} interact competitively, and iron-binding proteins can transfer Al^{3+} to the brain and other organs, while the dysregulation of Fe^{3+} contributes to Huntington's disease [14,15]. In addition, although Cr^{3+} deficiency is not biologically detrimental, it increases the risk of diabetes, cardiovascular disease, and malignancy [16-18], while Cr toxicity in

Abbreviations: P, Phenolphthalein; R, Rhodamine B; PF, Phenolphthalein-dialdehyde; RBPF, Phenolphthalein-rhodamine dye derivative; WHO, World Health Organization; CNS, Central Nervous System; TLC, Thin layer chromatography; PET, Photoinduced electron transfer; ESIPT, Excited-state intramolecular proton transfer; HEPES, (4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid); LOD, Limit of detection; AIEE, Aggregation-induced emission enhancement; DFT, Density functional theory; TDDFT, Time-dependent density functional theory; EDTA, Ethelene diamnine tetraaetic acid; TCSPC, Time-correlated single-photon counting; MTT, Methyl thiazolyltetrazolium; FBS, Fetal bovine serum; DMEM, Dulbecco's Modified Eagle's Medium.

* Corresponding authors.
E-mail addresses: satyajitdeyoc@gmail.com, satyajit@tmv.ac.in (S. Dey), atanujanaic@gmail.com (A. Jana), ajay@mail.vidyasagar.ac.in, ajaymsr@yahoo.co.in (A. Misra).

https://doi.org/10.1016/j.molliq.2022.118824
0167-7322/

Journal of Molecular Structure 1253 (2022) 132295

Contents lists available at ScienceDirect

Journal of Molecular Structure

journal homepage: www.elsevier.com/locate/molstr

A cell-compatible phenolphthalein-aminophenol scaffold for Al^{3+}sensing assisted by CHEF phenomenon

Bhriguram Das[a,b], Avijit Ghosh[c], Sabina Yesmin[a,d], Sk Jahir Abbas[e], Malay Dolai[f], Subhabrata Mabhai[g], Atanu Jana[h,*], Satyajit Dey[b,*], Ajay Misra[a,*]

[a] Department of Chemistry, Vidyasagar University, Midnapore, West Bengal 721102, India
[b] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, West Bengal 721636, India
[c] Center for Research in Nanoscience and Nanotechnology, Technology Campus, University of Calcutta, Salt Lake, Kolkata, West Bengal 700106, India
[d] Department of Physics, National Dong Hwa University, Hualien 97410, Taiwan
[e] Department of Biliary-Pancreatic Surgery, Renji Hospital affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai 200127, China
[f] Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721404, India
[g] Department of Chemistry, Mahishadal Raj College, Mahishadal, Purba Medinipur 721628, India
[h] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, Republic of Korea

ARTICLE INFO

Article history:
Received 23 October 2021
Revised 16 December 2021
Accepted 26 December 2021
Available online 28 December 2021

Keywords:
Schiff base
Phenolphthalein
Al3+ sensor
Chelation enhanced fluorescence (CHEF)
Live cell imaging
Paper strips

ABSTRACT

Monitoring of excess Al^{3+} and its selective detection in biological and environmental samples are important tasks for researcher due to its harmful effects. Herein, we present a phenolphthalein-aminophenol derived sensor (**PFAP**) for the selective fluorescent response of Al^{3+} in an "OFF-ON" mode over a pool of analytes including eighteen cations with striking greenish emission. It has a prominent limit of detection (LOD) value (1.5 μM), fast response time (10 s) for Al^{3+} detection. The complexation properties of **PFAP** with Al^{3+} ions were clarified by UV–vis, ^{1}H & ^{13}C NMR, HRMS, and FTIR spectroscopic experiments. The recognition mechanism of **PFAP** for Al^{3+}working with chelation enhanced fluorescence (CHEF) and is verified with two model compounds **PF** and **PFAN** in the light of UV–vis, PL, TRPL, and NMR experiment. To check its applicability, easily prepared test paper and TLC strip of **PFAP** was produced for rapid and selective onsite detection of Al^{3+} ions. Bio-imaging application of **PFAP** in human lung cancer cell lines A549 demonstrated excellent results with negligible cytotoxicity and as an excellent marker to detect traces of Al^{3+} ion in a time-dependent as well as concentration-dependent manner. Actual sample analysis for Al^{3+} with the probe **PFAP** produces fruitful result.

1. Introduction

The sensing and recognition of cationic analytes have attracted much attention due to their environmental and biological important role [1–3]. Aluminum is imperatively a significant ion which assumes to play essential role in biochemical processes [4]. It is regularly found in nature as silicate, hydroxide, sulfate, and cryolite. It has the biggest offer after iron on the planet's economy. However, high quantities of aluminum can generate a variety of biological and environmental issues [5]. Central nervous system, skeletal-muscle system, and hematopoietic framework may go through harmfulness with over exposure to aluminum [6]. Particularly, Alzheimer and Parkinson's dementia are the case of aluminum toxicity [5,7,8]. Aluminum-rich meals, foods stored in aluminum containers, drinking water, and pharmaceutical products are the most common dietary sources of aluminum. Potable water is one of the most major uses for aluminum [9]. According to the World Health Organization (WHO), aluminum compounds used in drinking water treatment should be used in moderation and should not surpass 0.2 ppm after treatment [10,11]. Accordingly, the foundation of new strategies for the fast, simple, and precise monitoring of Al^{3+} is profoundly significant for biological and ecological investigations.

Various methods such as titrimetry, voltammetry, chromatography, and electrochemistry have been developed for metal ions de-

LOD, Limit of detection; PET, Photoinduced elctron transfer; CHEF, Chelation enhanced fluorescence; ESIPT, Excited state intramolcular proton transfer; RET, Resonance energy transfer; ICT, Intermolecular charge transfer; AIE, Aggregation induced emission enhancement; WHO, World health organisation; HEPES, 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid; DFT, Density functional theory; TDDFT, Time-dependent density functional theory; TRPL, Time-resolved photoluminescence; TLC, Thin layer chromatography; BODIPY, 4,4-difluoro-4-bora-3a,4a-diaza-s-indacene.

* Corresponding author, A. Jana
E-mail addresses: atanujanaic@gmail.com (A. Jana), satyajitdeyoc@gmail.com (S. Dey), ajay@mail.vidyasagar.ac.in (A. Misra).

https://doi.org/10.1016/j.molstruc.2021.132295
0022-2860/

NJC

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal | View Issue

Cite this: *New J. Chem.*, 2021, 45, 20806

Combined theoretical and experimental investigation of a DNA interactive poly-hydroxyl enamine tautomer exhibiting "turn on" sensing for Zn^{2+} in pseudo-aqueous medium†‡

Urmila Saha, §[a] Subhabrata Mabhai,¶[b] Bhriguram Das, ¶[c] Gopinatha Suresh Kumar,[a] Paula Brandão[d] and Malay Dolai *[e]

Received 21st July 2021,
Accepted 12th October 2021

DOI: 10.1039/d1nj03510j

rsc.li/njc

Crystallographically established (solid state structure at 150 K temperature) enamine ligand 2-((1,3-dihydroxy-2-(hydroxymethyl)propan-2-ylamino)methyl)-4-bromo-6-methoxyphenol (**H_4L**) was prepared, which showed interconvertible equilibrium (ΔE = 7.37 kcal) of its tautomers and also found to exhibit DNA binding activity at the minor groove of double-stranded (ds) DNA. Spectroscopic and calorimetric methods were employed to explore the interaction of **H_4L** with DNA. Further, the competitive Hoechst 33258 displacement assay indicated the specific binding site of **H_4L** to be at the minor grooves of DNA. Thermodynamic evaluation from isothermal titration calorimetry (ITC) experiments suggested the association of **H_4L** with DNA to be an enthalpy driven process with an equilibrium binding affinity (K) of $(2.50 \pm 0.11) \times 10^4$ M^{-1}. Molecular docking studies were found to be in good agreement with the experimental results of the DNA interaction of the probe in groove binding mode. The poor emission of **H_4L** in the excited state was due to excited state induced proton transfer (ESIPT), but in the presence of Zn^{2+}, the ESIPT was blocked an chelation-enhanced fluorescence (CHEF) was initiated to exhibit 'turn on' fluorescence upon the coordination of Zn^{2+}. The **H_4L** probe was found to detect Zn^{2+} selectively among various metal ions and the LOD was calculated to be ~1.13 μM. The coordination of the Zn(II) bound complex and the relative stability of the tautomers of **H_4L** were investigated in detail *via* spectroscopic and computational studies.

Introduction

As a well-established phenomenon, the Schiff bases prepared from salicylaldehydes and aromatic/aliphatic amines exist in different tautomeric forms, *i.e.*, (i) enamine or keto tautomer[1] (ii) imine or enol[2] and (iii) zwitterionic forms.[3] However, it is very difficult to consider the particular structures of Schiff base adducts where they may exist in the enamine form in the solid state and convert to the imine form in the solution state, although the complication in assessing tautomeric structures can be removed by knowing the exact structures of the compounds. Many research studies have involved determining the structures of the same compounds in recent years using ^{15}N and ^{13}C solid-state nuclear magnetic resonance (NMR) spectroscopy.[4] However, the phase-to-phase inter-conversion of structures is so rapid that it cannot be unequivocally determined in this way. Moreover, single-crystal X-ray structures can give an accurate solution to the puzzling problems in the solid state. Again, there is a possibility of the temperature-dependent interconversion of tautomers in the solid state, known as thermochromism,[5] which adds some extra complications in perfectly assigning structures in this context.

[a] *Organic and Medicinal Chemistry Division, CSIR-Indian Institute of Chemical Biology, 4, Raja S.C. Mullick Road, Kolkata 700 032, W.B., India*
[b] *Department of Chemistry, Mahishadal Raj College, Purba Medinipur 721628, W.B., India*
[c] *Department of Chemistry, Vidyasagar University, Paschim Medinipur 721102, W. B., India*
[d] *Department of Chemistry, CICECO-Aveiro Institute of Materials, University of Aveiro, 3810-193 Aveiro, Portugal*
[e] *Department of Chemistry, Prabhat Kumar College, Purba Medinipur 721404, W.B., India. E-mail: dolaimalay@yahoo.in*

† Dedicated to Professor Ashutosh Ghosh, University of Calcutta on the Occasion of his 62nd birthday.

‡ Electronic supplementary information (ESI) available: The supporting Information includes further synthetic details, experimental details including DFT calculations and information concerning X-ray structure analysis, ^{1}H-NMR spectra, IR spectra and other physical properties studies. CCDC 2092531. For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/d1nj03510j

§ Current address: Department of Chemistry, Presidency University, 86/1 College Street, Kolkata 700073, India.

¶ Authors contributed equally towards the physical measurements.

Analytical Methods

PAPER

View Article Online
View Journal | View Issue

Cite this: *Anal. Methods*, 2021, **13**, 4266

A bio-compatible pyridine–pyrazole hydrazide based compartmental receptor for Al^{3+} sensing and its application in cell imaging†

Bhriguram Das, [ab] Malay Dolai, [c] Avijit Ghosh, [d] Anamika Dhara,[e] Ananya Das Mahapatra,[f] Debprasad Chattopadhyay,[fg] Subhabrata Mabhai,[h] Atanu Jana, *[i] Satyajit Dey *[b] and Ajay Misra *[a]

Received 6th June 2021
Accepted 5th August 2021

DOI: 10.1039/d1ay00963j

rsc.li/methods

For practical applications, the development of bio-compatible organic molecules as p-block ion chemosensors is critical. Herein, we report the single crystal (SC) of new pyridine–pyrazole derived Al^{3+} sensor **H_2PPC** [(*Z*)-*N*'-(2,3-dihydroxybenzylidene)-5-methyl-1-(pyridin-2-yl)-1*H*-pyrazole-3-carbohydrazide] as well as its Cu-complex SC. The probe exhibits an "off–on" fluorescence response towards Al^{3+} ions, and this has been modulated with different solvents. For selective detection of Al^{3+} ions, a special coordination pocket in the structural backbone is advantageous. The chemosensor exhibits a submicromolar detection level (LOD = 4.78 μM) for Al^{3+}. The density functional theory (DFT) and time-dependent DFT (TD-DFT) calculations of **H_2PPC** and **$[Al(HPP)_2]^+$ (1)** reveal that a change of the structural conformation of probe **H_2PPC** upon complexation causes the pyrazole and pyridine units to create a specific cavity to tether Al^{3+}, and consequently **H_2PPC** proves to be a promising molecule for Al^{3+} detection. Furthermore, the probe has been successfully used to evaluate Al^{3+} as a low-cost kit using filter paper strips, and the *in situ* Al^{3+} ion imaging in Vero cells as well as A549 cell lines shows the sensor's nuclear envelope penetrability, indicating that it has great potential for biological and environmental applications.

1. Introduction

Aluminum compounds are used in various items, including household appliances, construction materials, transportation systems, and communication, and advanced medical devices.[1] Aluminum has a high level of exposure due to its widespread use in everyday life. Aluminum is well-known to be highly harmful to human health as well as the plant kingdom.[2,3] Because of the possible connection to the brain, doctors refer to Al^{3+} as the "silent killer" in the human body. Dementia, myopathy, Alzheimer's disease, and Parkinson's disease are all neurodegenerative disorders caused by it.[4–8] Overexposure to aluminum dust has a detrimental effect on dialysis encephalopathy, lung functions, tumors, cough, and asthma in industry staff.[9] Due to aluminum toxicity, studies on aluminum (Al^{3+}) detection are crucial for controlling its concentration levels in the biosphere and have attracted more attention from researchers. In this context, sensitive and dependable fluorescent molecular sensors appear to be the most appropriate tool, as they have advantages in terms of selectivity, sensitivity, response time, and cost, and thus have piqued the interest of chemists.[10–12] The non-transition metal ion Al^{3+} lacks spectroscopic characteristics because it lacks d electrons. As a result, the d–d electronic transition for colorful, complex generation is an ambiguous way to detect Al^{3+} ions with the naked eye. Instead, an alternative route involving appropriate ligand design that results in a successful LMCT (ligand–metal charge transfer) will solve the problem. To fit the coordination preferences of the metal ion, suitable donor atoms should be positioned at strategic positions in the ligand cavity. It should be noted that, in comparison to other transition metal ions, Al^{3+}

[a]*Department of Chemistry, Vidyasagar University, Midnapore, 721102, West Bengal, India. E-mail: ajay@mail.vidyasagar.ac.in; ajaymsr@yahoo.co.in; Fax: +91 3222 275329*

[b]*Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, 721636, India. E-mail: satyajitdeyoc@gmail.com*

[c]*Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur, 721404, West Bengal, India*

[d]*Center for Research in Nanoscience and Nanotechnology, University of Calcutta, Technology Campus, Salt Lake, Kolkata 700106, India*

[e]*Department of Chemistry, Hiralal Mazumdar Memorial College for Women, Dakshineswar, North 24 Parganas, Kolkata 700035, India*

[f]*ICMR-Virus Unit, ID & BG Hospital Campus, 57 Dr Suresh C Banerjee Road, Beliaghata, Kolkata 700010, India*

[g]*ICMR-National Institute of Traditional Medicine, Nehru Nagar, Belagavi 59001, Karnataka, India*

[h]*Department of Chemistry, Mahishadal Raj College, Purba Medinipur, 721628, India*

[i]*Division of Physics and Semiconductor Science, Dongguk University, Seoul, 04620, South Korea. E-mail: atanujanaic@gmail.com*

† Electronic supplementary information (ESI) available. See DOI: 10.1039/d1ay00963j

AgriStick: An IoT-Enabled Agricultural Appliance to Measure Growth of Jackfruit Using 2-Axis JoyStick

Anirbit Sengupta, Anwesha Mukherjee, Abhijit Das, and Debashis De

In the field of agriculture, growth monitoring and measurement are two important factors used specifically to evaluate the influence of the environmental conditions on productivity. The change of circumference of parts of plants like their trunks, branches and fruits is one way to monitor plant growth. In this paper, we developed an Internet of Things (IoT)-based growth measurement and monitoring system using a 2-Axis joystick. In the case study, we measured the growth of Jackfruit which is a tropical fruit and widely cultivated in tropical areas like India, Bangladesh, Thailand, Brazil, and Malaysia**.** The developed appliance is referred to as *AgriStick*. The IoT appliance utilizes a 16-bit ultra-low power consuming microcontroller. We used RS485 protocol to make our appliance work for long distance range. The sensor was utilized for the purpose of monitoring the growth of horticulture crops as well as natural ecosystem plants.

Measuring Agricultural Indicators

Real-time information collection and analysis are essential in recent agricultural systems to properly use fertilizer, pesticide, water, etc. The growth rate monitoring or growth measurement is a significant attribute of the horticulture and regular ecosystem. The crop growth depends on various factors like environmental and physiological conditions and a plant's genetic endowment. The growth monitoring is significant for timely harvesting of crops for better yield, from the economical perspective of the farmers. We generally use the radius-wise growth of stems or tree branches as pointers of the vigor of a plant, while the growth of fruit gives us an essential functional factor in gardening production. Usually, in growth measurement, strain gauges and Linear Variable Differential Transformers (LVDT) are used [1]. Though the LVDT-based systems are more expensive than the strain gauge-based systems, the former provide information with better accuracy and resolution.

The storage of growth-related information is also vital for analysis. In [2], multispectral images were collected for higher output phenotyping of tomato spot wither disease confrontation among 20 peanut genotypes. For growth measurement of tree parts and fruits, there are tools like dendrometers [3], [4]. Though they offer benefits such as temperature compensation and fine resolution, there are few disadvantages such as cost, large size, and additional support required for the sensors, and recalibration of the sensor when moved from one tree to another. The disadvantages led to the development of an alternative sensor which is an optoelectronic sensor-based measurement tool [5]. Practically, this appliance is cost-effective and has proven as an alternative solution for growth measurement. Our research is based on the development of an IoT-based appliance that can perform the monitoring and measurement in an adjusting manner for both remote places and test areas using the Internet.

The authors in [6] have highlighted the use of IoT in smart precision agriculture and farming. The researchers have proposed in [7], an IoT device for monitoring fruit growth. In [8], the authors have discussed the application of Radio Frequency Identification sensing technology in environmental monitoring, soil monitoring, plant growth monitoring, and harvest quality monitoring. The use of IoT in growth monitoring has several advantages, such as the surveillance is continuous even in real-time, and the data fetched through the sensor node can be stored in the cloud for future use. Growth monitoring of crops is a significant area of research interest in the field of smart agriculture. In [9], the authors have developed a system to monitor the growth of apple plantations. In that work, the authors have used a deep learning-based edge network, and performed the remote estimation of apple size during the entire growth period.

The existing growth measurement systems [1], [5] used the mouse or sensor as the sensing unit, Bluetooth as the communication protocol, and stored the collected data inside the SD card. However, there are two major issues: Bluetooth provides short-distance communication, and the SD card is not able to contain a huge volume of data. To deal with these challenges, a system is required that will be able to provide comparatively long-distance communication, and can store high volume of data for further analysis. In this paper, we propose an IoT-based growth measurement system named as *AgriStick*, that

1094-6969/22/$25.00©2022IEEE

Innovations in Systems and Software Engineering
https://doi.org/10.1007/s11334-022-00458-2

S.I. : MULTIFACETED INTELLIGENT COMPUTING SYSTEMS (MICS)

STROVE: spatial data infrastructure enabled cloud–fog–edge computing framework for combating COVID-19 pandemic

Shreya Ghosh[1,2] · **Anwesha Mukherjee**[3]

Received: 30 May 2021 / Accepted: 4 May 2022

Abstract
The outbreak of 2019 novel coronavirus (COVID-19) has triggered unprecedented challenges and put the whole world in a parlous condition. The impacts of COVID-19 is a matter of grave concern in terms of fatality rate, socio-economical condition, health infrastructure. It is obvious that only pharmaceutical solutions (vaccine) cannot eradicate this pandemic completely, and effective strategies regarding lockdown measures, restricted mobility, emergency services to users—in brief data-driven decision system is of utmost importance. This necessitates an efficient data analytics framework, data infrastructure to store, manage pandemic related information, and distributed computing platform to support such data-driven operations. In the past few decades, Internet of Things-based devices and applications have emerged significantly in various sectors including healthcare and time-critical applications. To be specific, health-sensors help to accumulate health-related parameters at different time-instances of a day, the movement sensors keep track of mobility traces of the user, and helps to assist them in varied conditions. The smartphones are equipped with several such sensors and the ability of low-cost connected sensors to cover large areas makes it the most useful component to combat pandemics such as COVID-19. However, analysing and managing the huge amount of data generated by these sensors is a big challenge. In this paper we have proposed a unified framework which has three major components: (i) Spatial Data Infrastructure to manage, store, analyse and share spatio-temporal information with stakeholders efficiently, (ii) Cloud–Fog–Edge-based hierarchical architecture to support preliminary diagnosis, monitoring patients' mobility, health parameters and activities while they are in quarantine or home-based treatment, and (iii) Assisting users in varied emergency situation leveraging efficient data-driven techniques at low-latency and energy consumption. The mobility data analytics along with SDI is required to interpret the movement dynamics of the region and correlate with COVID-19 hotspots. Further, Cloud–Fog–Edge-based system architecture is required to provision healthcare services efficiently and in timely manner. The proposed framework yields encouraging results in taking decisions based on the COVID-19 context and assisting users effectively by enhancing accuracy of detecting suspected infected people by ∼24% and reducing delay by ∼55% compared to cloud-only system.

Keywords Health service provisioning · Health data analysis · Cloud–Fog–Edge framework · COVID-19

1 Introduction

The widespread of infectious coronavirus disease (COVID-19) due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus has affected more than 150 million people (positive case) and resulting over 35,00,000 deaths all over the world (as of last week of May, 2021). This pandemic has brought substantial changes in all aspects of our lifestyle. The healthcare sector of all countries were significantly affected and several strategies such as restricted mobility, isolating regions, lockdown measures have been adapted. All though these measures have reduced the spread of the disease, however, there is a great impact on socio-

✉ Shreya Ghosh
shreya.cst@gmail.com; spg5897@psu.edu

Anwesha Mukherjee
anweshamukherjee2011@gmail.com

[1] Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Kharagpur, India

[2] College of Information Sciences and Technology, The Pennsylvania State University, State College, USA

[3] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal, India

Published online: 02 June 2022

Received: 19 June 2021 | Revised: 19 October 2021 | Accepted: 20 October 2021 | Published on: 15 November 2021

DOI: 10.1002/itl2.331

LETTER

WILEY

OrangeMusic: An orange computing-inspired recommender framework in internet of music things

Samarjit Roy[1] | **Anwesha Mukherjee**[2] | **Debashis De**[1,3]

[1]Centre for Mobile Cloud Computing (CMCC), Dept. of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal (formerly, West Bengal University of Technology), Salt Lake City, Kolkata, India

[2]Dept. of Computer Science, Mahishadal Raj College, Purba Medinipur, West Bengal, India

[3]University of Western Australia, Crawley, Western Australia, Australia

Correspondence
Samarjit Roy, Centre for Mobile Cloud Computing (CMCC), Dept. of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal (formerly, West Bengal University of Technology), BF-142, Sector-I, Salt Lake City, Kolkata-700064, West Bengal, India.
Email: samarjit.tech89@gmail.com

Funding information
University Grants Commission

Abstract

Recent computational analytics in the domain of the Internet of Things provides crowd-sourced reviews for decision assistance for innumerable aspects of our living standards and socio-entertainments. However, one of the most significant tasks for obtainable online music libraries and websites is the demand for personalized and professionalized courses of action for music listeners and composers to elect suitable musical performances. In this paper, we illustrate a hybrid matrix factorization-based content-sensitive music recommender schema on the Internet of Music Things. Emerging orange computing technology offers a harmonic fusion framework for psychological care and happiness-concerned computing. We elucidate the projected music recommender paradigm in the domain of Internet of Music Things, titled as OrangeMusic. The OrangeMusic schema differs from the earlier contributions in the following aspects: (a) Orange computing-based information fusion framework is applied on the Internet of Music Things; (b) Provided musical content revisions can be exposed by listeners' rating metrics and be exploited to amend original listener-provided ratings; (c) Music listeners' preferences and musical items are incorporated into the standard matrix factorization mechanism. The performance metrics flourish that our proposed OrangeMusic presents a proficient rating prediction and intensifies the accuracy of content-sensitive music recommendation expressively.

KEYWORDS

hybrid matrix factorization, internet of music things, music recommender system, Orange computing

1 | INTRODUCTION

Musicians can compose knowledge-based music for listeners and can circulate worldwide through Internet-driven live-streamed performances. Internet of Things (IoT) in Music has provided an evolving schema that enables remotely accessible musicians, multiple instruments, and music-making technologies into a solitary platform. In,[1] the authors have provided the opportunistic crowdsensing-oriented Internet of Music Things (IoMT) system architecture and evaluated the system performances in terms of the time for data transmission, power dissipation, and energy consumption. IoMT has been elucidated in diverge contexts to fix music composition and generation perspectives, such as ubiquitous music retrieval, remote performance monitoring, and auto-tuning of musical instruments. Acceptance of the IoT-inspired musical performances depends on the audiences: how they feel according to their present emotion and recommend to the future listeners.[2,3]

Numerous strategies exist for movies recommendation, product recommendations, etc. In,[4] the authors illustrated an Ensemble-based system with the Particle Swarm Optimization that boosts towards intelligent recommendation frameworks. In,[5] emerging Capsule Network and

Received: 10 July 2021 | Revised: 29 December 2021 | Accepted: 3 February 2022

DOI: 10.1002/spe.3078

RESEARCH ARTICLE

WILEY

RESCUE: Enabling green healthcare services using integrated IoT-edge-fog-cloud computing environments

Jaydeep Das[1,2] | **Shreya Ghosh**[3,4] | **Anwesha Mukherjee**[5] | **Soumya K. Ghosh**[3] | **Rajkumar Buyya**[6]

[1]Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India

[2]School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India

[3]Department of Computer Science and Engineering, Indian Institute of Technology, Kharagpur, West Bengal, India

[4]College of Information Sciences and Technology, The Pennsylvania State University, State College, Pennsylvania, USA

[5]Department of Computer Science, Mahishadal Raj College, Garh Kamalpur, Mahishadal, West Bengal, India

[6]School of Computing and Information Systems, The University of Melbourne, Victoria, Melbourne, Australia

Correspondence
Jaydeep Das, Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal 721302, India.
Email: jaydeep@iitkgp.ac.in

Abstract

Internet of Things (IoT) has a pivotal role in developing intelligent and computational solutions to facilitate varied real-life applications. To execute high-end computations and data analytics, IoT and cloud-based solutions play the most significant role. However, frequent communication with long distant cloud servers is not a delay-aware and energy-efficient solution while providing time-critical applications such as healthcare. This article explores the possibilities and opportunities of integrating cloud technology with fog and edge-based computing to provide healthcare services to users in exigency. Here, we propose an end-to-end framework named *RESCUE* (enabling green healthcare services using integrated iot-edge-fog-cloud computing environments), consisting efficient spatio-temporal data analytics module for efficient information sharing, spatio-temporal data analysis to predict the path for users to reach the destination (healthcare center or relief camps) with minimum delay in the time of exigency (say, natural disaster). This module analyzes the collected information through crowd-sourcing and assists the user by extracting optimal path post-disaster when many regions are nonreachable. Our work is different from the existing literature in varied aspects: it analyses the context and semantics by augmenting real-time volunteered geographical information (VGI) and refines it. Furthermore, the novel path prediction module incorporates such VGI instances and predicts routes in emergencies avoiding all possible risks. Also, the design of development of a latency-aware, power-aware data-driven analytics system helps to resolve any spatio-temporal query more efficiently compared to the existing works for any time-critical application. The experimental and simulation results outperform the baselines in terms of accuracy, delay, and power consumption.

KEYWORDS

cloud computing, edge computing, geospatial query processing, green computing, healthcare service, internet of things, spatio-temporal data

Jaydeep Das and Shreya Ghosh contributed equally to this study.

Wireless Personal Communications
https://doi.org/10.1007/s11277-021-08835-z

Femtolet Based Low Power Hetnet Using Soft Fractional Frequency Reuse

Anwesha Mukherjee[1] · **Priti Deb**[2] · **Debashis De**[2,3]

Accepted: 6 August 2021

Abstract
This paper addresses three prime issues of fifth generation mobile network: frequency allocation, power efficiency and communication while computing. This paper proposes a power-efficient micro-femtolet/macro-femtolet network based on soft fractional frequency reuse. Macrocell/microcell base stations are used in the network, and for providing good signal strength and offloading facilities to indoor and edge region users' femtolets are allocated inside the macrocell/microcell. The power transmission in the proposed heterogeneous network (HetNet) is estimated. The analytical evaluation presents that use of SFFR reduces the power transmission of the network by 10.87% approximately. This is also observed that the signal-to-interference-plus-noise ratio (SINR) of the network is improved using the proposed strategy. For experimental evaluation we have used vector signal generator (VSG) and vector signal analyzer (VSA). The simulation analyses performed using network simulator Qualnet shows that femtolet provides ∼(2–34)% reduction in energy consumption than the cloud based offloading.

Keywords Soft fractional frequency reuse · Femtolet based HetNet · Power reduction · SINR improvement

✉ Debashis De
dr.debashis.de@gmail.com

Anwesha Mukherjee
anweshamukherjee2011@gmail.com

Priti Deb
pritidb@gmail.com

[1] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal 721628, India

[2] Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, B.F.-142, Sector-I, Salt Lake, Kolkata, West Bengal 700064, India

[3] Department of Physics, University of Western Australia, 35 Stirling Hwy, Crawley, WA 6009, Australia

GrowFruit: An IoT based Radial **Grow**th Rate Monitoring Device for **Fruit**

Anirbit Sengupta
Maulana Abul Kalam Azad University of Technology

Anwesha Mukherjee
Mahishadal Raj College

Abhijit Das
RCC Institute of Information Technology

Debashis De
Maulana Abul Kalam Azad University of Technology

***Abstract*—*GrowFruit* is an Internet of Things (IoT)-based low-cost real-time radial growth-rate measurement device for fruit or stem. The working principle is measuring the growth of multiple crops up to 128 different inputs utilizing a single Texas Instrument-based 32-bit ultra-low-power microcontroller. The system utilizes Flex sensors, each of 4.5 inches to measure the change of circumference of the crop. The bending angle of the Flex sensor generates voltage, and via Analog to Digital Converter (ADC), is fed to the microcontroller in the form of a digital signal. With the help of the Quectel M95 GSM modem, the microcontroller sends the signal to the cloud for storage and analysis of the growth rate data. As the system measures the perimeter changes of fruits or stems, more precise growth information is obtained.**

I. Introduction

The recent agricultural aspects require a real-time crop growth rate monitoring system. The crop growth rate depends on various factors such as the plant's genetic endowment and physiological and environmental conditions. The growth rate monitoring is an essential factor in plant studies for horticulture and natural ecosystem-grown crops. The growth measuring systems usually are supported by direct contact with the test sample and the mechanical structure that has to be updated depending on the size and shape of the sample [1]. In the growth measurement systems, Linear Variable Differential Transformers (LVDT) and strain gauges are used [1]. The strain gauge-based systems are economical compared to the LVDT-based systems. However, the LVDT-based systems provide precise, accurate, and high-resolution information regarding growth rate, whereas in strain gauge-based systems, specific electronic circuitry and flexible frames are required. The crop growth-related information storage is also significant for proper monitoring. This paper aims to design a device that will collect growth-related information and store the collected data for better growth monitoring. Our research work has designed an IoT-based device that utilizes a 32-bit ultra-low-power-consuming microcontroller that will process up to 128 inputs. The device utilizes the RS485 protocol for long-distance communication. We have used 4.5-inch Flex sensors to monitor the growth of horticulture crops and natural ecosystem plants. The bending angle of the Flex sensor, which has an analog output, is fed to the microcontroller via ADC for processing the data. Our system stores the processed data inside the EPROM and, after every one hour, sends the data to the cloud using the Quectel M95 GSM modem and the Rest API protocol. We plot the data in the X-Y plane in the form of the day and circumference of the crop, trunk, or branches, measured using the sensor. The proposed system obtains the sleep mode through Real-Time Clock. The proposed low-power consuming system works in a 12V, 1A rating. We may deploy solar panels for natural ecosystem radial growth measurement to power the cell, thus, making it a green or energy-efficient device.

II. Related Work

Improving the productivity and growth rate of fruits is an emerging and significant research trend. In [2], the authors have discussed a low-cost fruit diameter monitoring device. The authors have discussed on multi-color driving algorithm concerning Pulse Width Modulation duty cycles and spectral power distributions [2]. To optimize the color correlation temperature and index for color rendering, multi-colour plant-growing light signals can significantly exploit photosynthetic radiant effectiveness [2]. On the other hand, in [3], the authors have discussed fabrication, calibration,

Science of the Total Environment xxx (xxxx) 154796

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com

Toxicological impacts of nanopolystyrene on zebrafish oocyte with insight into the mechanism of action: An expression-based analysis

Ankit Chatterjee [a, 1], Sukhendu Maity [a, 1], Sambuddha Banerjee [b], Shibsankar Dutta [c], Madhuchhanda Adhikari [a], Rajkumar Guchhait [a, d], Chayan Biswas [a], Sukanta De [c], Kousik Pramanick [a, *]

[a] Integrative Biology Research Unit, Department of Life Sciences, Presidency University, West Bengal, India
[b] Department of Zoology, Visva Bharati University, Bolpur, West Bengal, India
[c] Department of Physics, Presidency University, West Bengal, India
[d] P.G. Department of Zoology, Mahishadal Raj College, Garkamalpur, Purba Medinipur, West Bengal, India

ARTICLE INFO

Editor: Henner Hollert

Keywords:
Nanopolystyrene
Oxidative-stress
Gene expression
Zebrafish
Oocyte
Immunotoxicity
Apoptosis

ABSTRACT

Many studies have investigated the negative impacts of microplastics on teleost fishes with very little or no evidence of their mechanism of action. This scenario entreats us to investigate the toxicities of nanopolystyrene in zebrafish oocyte with emphasis on the mechanism of action. In the present study, the cellular levels of mRNA transcripts of different genetic markers (such as: *sod, gpx, nrf2, inos, ucp2,* and *atp6* (redox-sensitive markers)*; nfkβ, tnfα, il-10, ikβ, gdf9,* and *bmp15* (immune markers); *gadd45, rad51, p53* and *bcl2* (DNA damage and apoptotic)) have been quantified by real-time PCR after 6 h of incubation of isolated oocyte with different doses of nanopolystyrene viz. P0 (control i.e. no polystyrene in culture medium), P1 (100 ng/ml), and P2 (400 ng/ml). Results showed that both the treatment concentrations of nanopolystyrene induce oxidative stress with % DPPH = 30.75, 31.61, and 32.43% for P0, P1, and P2, respectively. Increase in oxidative stress in oocytes with increasing doses of nanopolystyrene was also observed in TBARS assay with MDA content 0.12 and 0.21 μM for P1 and P2, respectively as compared to the control 0.08 μM. This increased oxidative stress can regulate the expression pattern (upregulation/downregulation) of selected genes leading to different toxic effects like oxidative stress, immunotoxicity, and apoptosis in oocytes, which suggests the impairment of reproductive functions by nanopolystyrene.

1. Introduction

Plastic pollution represents a major global concern due to their elevated production and environmental disposal with a low rate of recycling. Regular monitoring of micro/nanoplastics into the environmental samples and their toxicity assessment is important for their environmental risk assessment. Polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), and polyvinyl chloride (PVC) are some most widely used forms of thermoplastics. Plastic waste can impose severe negative impacts on the wildlife in an aquatic system (Vegter et al., 2014). Micro/nanoplastics, formed by the biotic and abiotic degradation of large plastic waste, are ubiquitously distributed in all ecosystems (Besseling et al. 2013; Obbard et al., 2014). The aquatic system may serve as a large sink for the environmental accumulation of nanoplastics, where they can induce severe toxicities to the aquatic organisms.

Recently, many studies have reported the negative impacts of microplastics in fishes such as - oxidative stress (Zhao et al. 2013, Brun et al., 2019), reproductive impairments (Sharifinia et al., 2020; Sarasamma et al., 2020; Yin et al., 2021), disrupted glucose metabolism (Brun et al., 2019), neurotoxicity (Kim et al., 2021), DNA breakage, and the increased mortality rate (Zhou et al. 2013). Microplastics can bioaccumulate into different organs like - liver, kidney, gut, gills, brain, and gonads. Different anti-oxidants provide the first line of defense against oxidative stress (Jin et al., 2010) and therefore play a pivotal role in the regulation of oxidative stress (Dong et al., 2018). Zhou et al. (2013) reported the oxidative damage with increased SOD (superoxide

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).
[1] Joint first author.

https://doi.org/10.1016/j.scitotenv.2022.154796
Received 8 January 2022; Received in revised form 16 March 2022; Accepted 20 March 2022
0048-9697/

Aquatic Toxicology 240 (2021) 105971

Contents lists available at ScienceDirect

Aquatic Toxicology

journal homepage: www.elsevier.com/locate/aqtox

Toxic effects of cyanotoxins in teleost fish: A comprehensive review

Sambuddha Banerjee [a,#], Sukhendu Maity [a,#], Rajkumar Guchhait [b], Ankit Chatterjee [a], Chayan Biswas [a], Madhuchhanda Adhikari [a], Kousik Pramanick [a,*]

[a] Integrative Biology Research Unit, Department of Life Sciences, Presidency University, 86/1, College Street, Kolkata 700073, India
[b] P.G. Department of Zoology, Mahishadal Raj College, Garkamalpur, Purba Medinipur, India

ARTICLE INFO

Keywords:
Cyanobacteria
Cyanotoxins
Algal bloom
Hepatotoxicity
Neurotoxicity
Reproductive toxicity
Eutrophication

ABSTRACT

The phenomenon of eutrophication leads to the global occurrence of algal blooms. Cyanotoxins as produced by many cyanobacterial species can lead to detrimental effects to the biome due to their stability and potential biomagnification along food webs. Therefore, understanding of the potential risks these toxins pose to the most susceptible organisms is an important prerequisite for ecological risks assessment of cyanobacteria blooms. Fishes are an important component of aquatic ecosystems that are prone to direct exposure to cyanotoxins. However, relatively few investigations have focused on measuring the toxic potentials of cyanotoxins in teleost fishes. This review comprehensively describes the major toxicological impacts (such as hepatotoxicity, neurotoxicity, immune toxicity, reproductive toxicity and cytogenotoxicity) of commonly occurring cyanotoxins in teleost fishes. The present work encompasses recent research progresses with special emphasis on the basic molecular mechanisms by which different cyanotoxins impose their toxicities in teleost fishes. The major research areas, which need to be focused on in future scientific investigations, have also been highlighted. Protein kinase inhibition, transcriptional dysregulation, disruption of redox homeostasis and the induction of apoptotic pathways appear to be the key drivers of the toxicological effects of cyanotoxins in fish. Analyses also showed that the impacts of cyanotoxins on specific reproductive processes are relatively less described in teleosts in comparison to mammalian systems. In fact, as compared to other toxicological effects of cyanotoxins, their reproductive toxicity (such as impacts on oocyte development, maturation and their hormonal regulation) is poorly understood in fish, and thus requires further studies. Furthermore, additonal studies characterizing the molecular mechanisms responsible for the cellular uptake of cyanotoxins need to be investigated.

Abbreviations: MC-LR, Microcystin LR; CYN, Cylindrospermopsin; NOD, Nodularin; ANTX-a, Anatoxin-a; ANTX-a(s), Anatoxin-a(s); BMAA, β-*N*-methylamino-L-alanine; STX, Saxitoxin; Oatp, Organic Anion Transporter Protein; PP1, Protein Phosphatase 1; PP2A, Protein Phosphatase 2A; PP2C, Protein Phosphatase 2C; LPS, Lipopolysaccharide; *xbp*-1 s, X-box Binding Protein 1 s; *chop*, C/EBP Homologous Protein; *btp*, β-Trace Protein; *atf4*, Activating Transcription Factor 4; *tnfa*/TNFα, Tumor Necrosis Factor α; *dusp5*, Dual Specificity Phophatase 5; ERK, Extracellular Signal-Regulated Kinase; MAPK, Mitogen-activated Protein Kinase; JNK, c-Jun N-terminal Kinase; ROS, Reactive Oxygen Species; RNS, Reactive Nitrogen Species; *sod*/SOD, Superoxide Dismutase; *cat*/CAT, Catalase; *gst*/GST, Glutathione S-transferase; *gpx*/GPx, Glutathione Peroxidase; GSH, Reduced Glutathione; LPO, Lipid Peroxidation; MDA, Malondialdehyde; G6PDH, Glucose 6-Phosphate Dehydrogenase; DW, Dry weight; LC-MS, Liquid Chromatography-Mass Spectroscopy; DPF, Days Post fertilization; BAF, Bioaccumulation Factor; ACh, Acetyl Choline; nAChR, Nicotinic Acetyl Choline Receptor; AChE, Acetyl Cholinesterase; *elavl3*, ELAV-like Protein 3; *gap43*, Growth Associated Protein 43; *gfap*, Glial Fibrillary Acidic Protein; *syn2a*, Synapsin IIa; *shha*, Sonic Hedgehog Protein A; *nkx2.2a*, NK2 Transcription Factor Related 2a; *mbp*, Myelin Basic Protein; *ngn1*, Neurogenin-1; *bcl2*, B-cell Lymphoma 2; *bax*, BCL2 Associated X; *vtg1*/VTG, Vitellogenin; E2, 17β-Estradiol; T, Testosterone; *cyp19a1a*, Cytochrome P450 Aromatase-a1a; *cyp19a1b*, Cytochrome P450 Aromatase-a1b; *17β-hsd*, 17β-hydroxysteroid Dehydrogenase; *hmgra*, HMG-CoA Reductase a; *gnrh3*, Gonadotropin Releasing Hormone 3; *gnrh2*, Gonadotropin Releasing Hormone 2; *gnrhr1*, Gonadotropin Releasing Hormone Receptor 1; *gnrhr2*, Gonadotropin Releasing Hormone Receptor 2; *fshβ*, Follicle Stimulating Hormone β; *lhβ*, Luteinizing Hormone β; *fshr*, Follicle Stimulating Hormone Receptor; *lhr*, Luteinizing Hormone Receptor; *bmp15*, Bone Morphogenic Protein 15; *erα*, Estrogen Receptor α; *pacap1*, Pituitary Adenylate Cyclase-Activating Polypeptide 1; *gh*, Growth Hormone; *igf*, Insulin-like Growth Factor; DHP, 17α,20β-dihydroxy-4-pregnen-3-one; MPF, Maturation Promoting Factor..

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).
# Equal contribution.

https://doi.org/10.1016/j.aquatox.2021.105971
Received 18 December 2020; Received in revised form 3 September 2021; Accepted 13 September 2021
Available online 17 September 2021

Received: 26 July 2021 | Revised: 6 November 2021 | Accepted: 25 November 2021

DOI: 10.1111/pce.14248

REVIEW

Plant, Cell & Environment | PC&E | WILEY

Occurrence and distribution of micro/nanoplastics in soils and their phytotoxic effects: A review

Sukhendu Maity[1] | Rajkumar Guchhait[1,2] | Moumita Biswas Sarkar[3] | Kousik Pramanick[1]

[1]Integrative Biology Research Unit (IBRU) Lab, Department of Life Sciences, Presidency University, Kolkata, India

[2]Department of Zoology, Mahishadal Raj College, Purba Medinipur, India

[3]Division of Plant Biology (DPB), Bose Institute, Kolkata, India

Correspondence

Kousik Pramanick, Integrative Biology Research Unit (IBRU) Lab, Department of Life Sciences, Presidency University, Kolkata, West Bengal, India.
Email: kousik.dbs@presiuniv.ac.in

Funding information

Council for Scientific and Industrial Research, Grant/Award Number: 08/155(0075)/2019-EMR-I; Science and Engineering Research Board, Grant/Award Number: EEQ/2018/000275

Abstract

Some recent studies have reviewed the occurrence and phytotoxicity of micro/nanoplastics, but their distribution in the soil environment, mechanisms of uptake by roots and the mode of action are unclear. Thus, this review comprehensively represents the relative abundance of micro/nanoplastics in different soil types and their toxicities in plants with insights into their partitioning to different soil matrices, uptake mechanisms, and the mode of action. Partitioning of micro/nanoplastics to different soil matrices (like—soil particles, naturally occurring soil organic matters, pore waters and soil fauna) could modify their bioavailability to plants. The small micro/nanoplastic particles can be taken up by roots through the apoplastic and symplastic pathways. In this regard, cellular endocytosis and aquaporin might play a significant role. The shape of the polymers can also regulate their uptake, and the polymers with spherical shapes are more easily absorbed by roots than the polymers with other shapes. Bioaccumulation of micro/nanoplastic induces oxidative stress, which, in turn, causes alterations of gene expressions and different metabolic pathways responsible for plant growth, biomass production and synthesis of secondary metabolites.

KEYWORDS

bioavailability, oxidative stress, partitioning, plant uptake, toxicity

1 | INTRODUCTION

Since the 1950s, the worldwide production of different plastic polymers has been increasing very rapidly. According to Plastic Europe (2020), ~370 million tonnes and ~58 million tonnes of plastics have been produced in 2019 as total global and European production, respectively. Packaging, construction, building, and automotive industries are some of the important sectors heavily liable for the consumption of a large fraction (viz. 39.6%, 20.4% and 9.6%, respectively) of total European production. Polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS) and polyvinylchloride (PVC) are the most common forms of thermoplastic to be used widely.

Based on the size of plastic particles, they can be categorised as macroplastic (>25 mm), mesoplastic (5–25 mm), large microplastic (1–5 mm), small microplastic (1 μm–1 mm), and nanoplastic (<1 μm) (Kim et al., 2021). But it is generally accepted that the plastic particles with diameter <5 mm are microplastics and those with diameter <100 nm are nanoplastics (He et al., 2018; Song et al., 2017). Plastics in the environment can exist in various forms including fibres, films, beads and foams. Micro/nanoplastics may have two types of origin in the natural environment. Firstly, they can be directly released from manufactured products (Guo et al., 2020); and secondly, different environmental processes such as: photo-oxidation (UV mediated), thermo-oxidation (temperature mediated), mechanical forces, biodegradation, and hydrolysis can break up the large plastic fragments

Environmental Science and Pollution Research (2021) 28:60291–60307
https://doi.org/10.1007/s11356-021-16448-z

REVIEW ARTICLE

Interaction of plastic particles with heavy metals and the resulting toxicological impacts: a review

Sukhendu Maity[1] · Chayan Biswas[1] · Sambuddha Banerjee[1] · Rajkumar Guchhait[2] · Madhuchhanda Adhikari[1] · Ankit Chatterjee[1] · Kousik Pramanick[1]

Received: 13 January 2021 / Accepted: 5 September 2021 / Published online: 15 September 2021

Abstract

Interactions of plastic particles with different organic/inorganic pollutants including heavy metals impact their ecotoxicological potential, and proper understanding in this regard is important for their ecological risk assessment. However, many studies have reported the interactions between micro-/nanoplastics (MNPs) and heavy metals (HMs), but the most prevalent interactive forces and factors monitoring their interactions are still not clear. So, the present review represents the mechanisms of interactions with special emphasis on major interactive forces and biophysicochemical and environmental factors influencing trace element's adsorption onto the surface of MNPs. Electrostatic interaction and pore-filling mechanism can best explain the HMs adsorption to MNPs. A number of biophysicochemical factors (such as biofilm, size, crystallinity, and surface charge) and environmental factors (such as pH, salt, and temperature) act together for mediating interactions and ecotoxicities of MNPs and HMs in the real environment. From a toxicological point of view, the synergistic mode of action may be more active in animals, whereas the antagonistic activity may be prevalent in plants. Besides polymer density, biofilm formation and agglomeration property of MNPs can control the vertical distribution of MNPs along the water column. Finally, the ecotoxicological potential of MNPs in the natural environment can be considered as a function of spatiotemporal variation in abiotic (including MNPs and heavy metals) and biotic components. This review will be helpful in the detail understanding of ecotoxicological risk assessment of MNPs in relation to their interaction with heavy metals.

Keywords Micro-/nanoplastic · Interactions · Heavy metals · Ecotoxicity · Biophysicochemical factors · Spatiotemporal variation

Introduction

Since last few decades, the concern of plastic pollution has been growing up very rapidly (Browne et al. 2007; Eerkes-Medrano et al. 2015; Galloway et al. 2017; Campanale et al. 2020) due to their scaled-up global production, inadequate waste management, and toxic behaviors. The ubiquitous distribution of MNPs in every environmental compartment and their trophic level transfer can impose threats to the ecosystem and public health (Eerkes-Medrano et al. 2015; Thompson 2015; Vethaak and Leslie 2016; Horton et al. 2017; Chae and An 2017; Hodson et al. 2017; Chae and An 2018; Zhang and Liu 2018). Many studies have already reported different toxicological effects of MNPs including developmental toxicity, reproductive toxicity, neurotoxicity, immunotoxicity, cytotoxicity, and phytotoxicity (Supplementary table 1). MNPs induce toxic effects by disrupting redox homeostasis (oxidative stress) and modulating gene expression (Alomar et al. 2017; Espinosa et al. 2017; Yu et al. 2018). The increased surface area of MNPs and surface chemistry enable them to interact with organic/inorganic pollutants (Turner and Holmes 2015; Wang et al. 2019; Tang et al. 2020; Mao et al. 2020; Singh et al. 2020). Thus, MNPs can act as vectors for a large number of organic/inorganic pollutants including HMs due to their sorption

Chayan Biswas, Sambuddha Banerjee and Rajkumar Guchhait contributed equally to this work.

Responsible Editor: Philippe Garrigues

✉ Kousik Pramanick
kousik.dbs@presiuniv.ac.in

[1] Integrative Biology Research Unit (IBRU), Department of Life Sciences, Presidency University, 86/1 College Street, Kolkata, West Bengal 700073, India

[2] Mahishadal Raj College, Garkamalpur, Purba Medinipur, West Bengal 721628, India

International Journal for Modern Trends in Science and Technology, 8(06): 263-266, 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0806046
Available online at: http://www.ijmtst.com/vol8issue06.html

Overview on Anorexia Nervosa: An eating disorder

Anirban Pattanayak[1], Eshita Manna[2], Paromita Mukherjee[3], Payel Kumar Roy[4] and Swati Nakhale*[5]

[1]State Aided College Teacher, Dept. of Physiology, Mahishadal Raj College, Vidyasagar University, West Bengal, India.
[2]Laboratory in charge, Haldia Institute of Health Sciences, West Bengal, India.
[3,] Assistant Professor, Dept. of Food and Nutrition, Swami Vivekananda University, Barrackpore. West Bengal, India.
[4] HOD of Dietetics, Dept. of Techno India DAMA Healthcare Medical Centre, West Bengal, India.
[5] Principal, IIFST, Aurangabad, Maharashtra, India
Corresponding Author Email Id: swatinakhale28@gmail.com

To Cite this Article
Anirban Pattanayak, Eshita Manna, Paromita Mukherjee, Payel Kumar Roy and Swati Nakhale. Overview on Anorexia Nervosa: An eating disorder. International Journal for Modern Trends in Science and Technology 2022, 8(06), pp. 263-266. https://doi.org/10.46501/IJMTST0806046

Article Info
Received: 15 May 2022; Accepted: 09 June 2022; Published: 13 June 2022.

ABSTRACT

Anorexia nervosa is a serious mental disorder with a characteristic appearance. It can affect people of all ages, genders, sexual orientations, races, and ethnicities, but it is especially dangerous for adolescent girls and young adult women. Anorexia is caused by a combination of psychological, societal, and biological variables, and there is no single cause. Anorexia nervosa affects about 0.5–1.0 percent of women over the world. Previous research suggested that anorexia nervosa is a condition that exclusively affects women in Western countries; however, recent research has showed that it is more common in boys than previously assumed.The higher rate of anorexia nervosa in western countries compared to non-western countries was explained by cultural differences, as western culture places a high priority on thinness in young women. Being skinny, on the other hand, is socially unacceptable in most non-western cultures. Although anorexia nervosa is primarily a problem in Western countries, current data suggests that it is spreading to non-Western countries in both genders. This phenomenon was explained by a number of factors, including Western media attention, social and parental pressure, genetic and biochemical variables, and other psychological problems including such sexual abuse and poor self are also contributors.

KEYWORDS: eating disorder, Western media attention, social and parental pressure, genetic and biochemical variables, Depression, anxiety

1. INTRODUCTION

Eating disorder is a psychological condition characterised by food avoidance, excessive consumption, or purging. It's also been stated that eating disorders are a form of dependency. Eating becomes a source of reliance, disrupting everyday life's equilibrium**(Arcelus*et al.*, 2011)**. Others define eating disorders as a disease that leads to the adoption of unhealthy eating behaviours. Teenage girls and young women are more likely to suffer from these diseases. Psychologists define an eating disorder as a psychiatric condition that interferes with normal eating behaviour**(Smith, 2012)**.

Characteristics of Eating Disorder

Extremes characterise this illness. It appears when a person's eating behaviour is severely disrupted, such as intense distress or concern over body weight or shape. Unlike hysteria, an eating disorder involves manipulating one's food intake and being obsessive about one's own body's shape and weight**(Attia,**

The Pharma Innovation Journal 2022; 11(5): 2491-2494

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 2491-2494

www.thepharmajournal.com
Received: 20-03-2022
Accepted: 29-04-2022

Anirban Pattanayak
State Aided College Teacher, Department of Physiology, Mahishadal Raj College, West Bengal, India

Souvik Tewari
Assistant Professor, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, West Bengal, India

Mainak Sur
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Titlee Majumder
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Corresponding Author:
Titlee Majumder
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Malnutrition and immunity: A review

Anirban Pattanayak, Souvik Tewari, Mainak Sur and Titlee Majumder

Abstract
Malnutrition, which includes both lack and overnutrition, is a major cause of disease and mortality around the world. Malnutrition is caused by dietary absorption problems, but it is also marked by recurring infections and persistent inflammation, signaling an underlying immunological problem. Defects arise in the immunoepigenome of impoverished parents before birth, and these may lead to intergenerational malnutrition cycles. Immune dysfunction is both a cause and a consequence of starvation, according to this review, which includes major recent data from experimental animals, *in vitro* models, and human cohorts. We emphasize gaps in existing understanding of immune- physiological dysfunction in malnutrition, with the goal of therapeutically addressing immunological pathways as a novel strategy to reduce morbidity and death in children.

Keywords: Immunoepigenome, low of protein diet, malnutrition cycles, immune dysfunction, dietary absorption

Introduction

Malnutrition as an Immunodeficiency Syndrome

Malnutrition, which includes both under- and over-nutrition, causes a huge health burden worldwide (Rahman and Adjeroh, 2015; Black *et al*., 2013) [35, 6]. Nutritional aspects have always found to be very instrumental with the physiological attributes not only that various nutritional changes input various physiological changes projecting the deficiency and sufficiency of the key factors responsible for the particular nutrient markers.

Despite being usually described as poor nutritional digestion, malnutrition is not solely caused by a lack of food intake. Obesity can develop without a poor diet and continue even if a healthy diet is adopted (Clemente *et al*., 2012; DeBoer *et al.,* 2012; Godfrey *et al.,* 2011; Gregor and Hotamisligil, 2011; van der Klaauw and Farooqi, 2015) [8, 11, 17, 19, 48], while intensive feeding therapies only marginally reduce stunting prevalence (Bhutta, 2008). Despite the fact that under- and overnutrition manifest as separate physical defects, several studies suggest that they share etiological pathways: early-life undernutrition increases the risk of obesity later in life (DeBoer *et al.,* 2012; Roseboom, 2006) [11, 38], altered metabolism (Bartz *et al*., 2014; Kong *et al*., 2014; O'Keefe *et al.,* 2015) [3, 24, 29], chronic inflammation (Kong *et al.,* 2014; Prendergast *et al.,* 2014; Kosek *et al.,* 2013) [24, 32, 25], and gut dysfunction (enteropathy) (Kong *et al.,* 2014; O'Keefe *et al.,* 2015; Subramanian *et al.,* 2014) [24, 29, 46], in overweight people, excessive calorie and macronutrient intake is commonly linked to micronutrient deficiencies. Malnutrition is increasingly being recognized as a complex condition with overlapping and poorly understood comorbidities (Humphrey, 2009; Prendergast *et al.,* 2014; Ahmed *et al.,* 2014) [21, 33, 2]. In order to create novel therapeutic diet (Therapeutic diet is a diet which is given to the patient who is suffering from any type of disease condition (Tewari, 2019) [47] to support international aims to increase nutrition, health, and well-being, pathogenesis across the malnutrition spectrum must be characterized.

Malnutrition affects immunity

A primary immunodeficiency is an immune system condition caused by a genetic or developmental defect. Secondary or acquired immunodeficiency is the loss of immunological function caused by a range of external factors. Although infection with the human immunodeficiency virus (HIV) is the most well-known cause of secondary immunodeficiency, acute malnutrition is the most prevalent cause of immunodeficiency worldwide, affecting up to 50% of the population in some underprivileged communities (Geraix *et al.,* 2008) [15]. Both innate and adaptive immunity are affected by immune system abnormalities.

www.asle-brasil.com/journal
RILE -Revista Interdisciplinar de Literatura e Ecocritica
ISSN: 9788-5232

Human/Non-human Interface and the Affective Uncanny in Amitav Ghosh's *Gun Island*

Asis De[i]

Abstract
Postcolonial fiction depicting transnational human mobility across landscapes and cultural spaces often represents the variable "structure of feeling" in a human being with continuous 'de-' and 're-territorialization' (Grossberg 313) from the familiar space to the unfamiliar. Experiences of lived realities and relationships alter with time and space, simultaneously affecting human understanding of logic and thereby leaving a scope to interpret newer experiences on multiple levels such as the mysterious, uncanny, or the exotic. It is not just the fictional character/s in literary narratives but also the reader/s who feel affected by the relationality between the rational and the mysterious as emotional affect "arises in the midst of in-between-ness" (Seigworth and Gregg 1). The epistemic lens of affect theory has been used in this essay to explore the human/non-human relationships in Amitav Ghosh's novel *Gun Island* (2019). I would show how, in Ghosh's narrative, the human/non-human interface has been perceived by inventories of belonging and migration, and often represented with an interplay of the corporeal and the uncanny, mainly aiming at emotional affect sandwiched between anxiety and hope— both conditions of postcoloniality and ecological engagement. The representation of the human/non-human relationships in literary narratives depends heavily on imaginative correspondence, where the affective exceptional may find its easy place. Examining several episodes in the novel, I would discuss how the corporeality of a snake, spider, shipworm, or even a wildfire affects the incorporeal cognitive dimensions like trauma or anxiety in Dinanath— the central character, and reshapes his "structure of feeling."

Keywords
human/non-human interface, affect, uncanny, corporeal, sensorial

Introduction

One of the exclusive twenty-first-century cultural phenomena is the ever-increasing use of digital and computational technology and devices, where space for the imaginative and the emotional requires, quite naturally, a new reconfiguration. The visible emergence of the interdisciplinary research network of affect studies in the last two decades can be seen as a part of this process of cultural reconfiguration. While the application of digital and computational technology demonstrates the *relatedness* of corporeal organic matters with logical and mathematical precision, the critical lens of Affect theory "*accumulates* across both relatedness and interruptions in relatedness" (Seigworth and Gregg 2). In the 'Introduction' to *The Affect*

Cover Page

DOI: http://ijmer.in.doi./2022/11.05.118

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2022); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:11, ISSUE:5(6), May: 2022
Online Copy of Article Publication Available (2022 Issues): www.ijmer.in
Digital Certificate of Publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 2nd May 2022
Publication Date:10th June 2022
Publisher: Sucharitha Publication, India

SUBJECTIVITY, TRANSGRESSION AND RESISTANCE: RETHINKING THE IDEA OF FEMALE DOMESTIC SPACE OF INDEPENDENT BENGAL

Shyamal Mondal
Mahishdal Raj College
West Bengal, India

Abstract:
Subjectivity, Transgression and resistance are the perpetual conditions in human existence. The construction of individual identity as a defense mechanism to get a space in patriarchal hegemony is vividly portrayed by Mahasweta Devi in her renowned seminal work Mother of 1084 (Hazard Churasir Maa). In this Independent system, Virginia Wolf's A Room of One's Own has become ' No Room of One's Own' where any attempt to break it, challenge it, question it, or speak the truth against the status quo is violently suppressed, dominated and subdued. Importantly Foucault's idea of Transgression establishes a scenario for the analysis of the oppressive and transgressive women under a patriarchal hegemony in the literary text, Mother of 1084. Mahasweta Devi's Mother of 1084 sets the situation with transgression and its representation in theatrical performance and in Indian English literature.

Keywords: Subjectivity, Transgression, Indigenous Identity, and Hegemony.

Introduction

"The history of men's opposition to women's emancipation is more interesting perhaps than the story of that emancipation itself.". (P- 46)

The modernist twentieth century prolific writer Virginia Wolf does not hesitate to talk about woman's emancipation in her seminal extended essay 'A Room of One's Own'.' Actually the idea of uprising of the subjugated woman is crystal clearly portrayed in the writings from all over the world- in the writings of once colonized nations like Africa, the Carribeans, south east part of Asia and of colonizing nation's like England (Virginia Wolf, Emily Bronte) France (Simon De Beauvoir) and America (Judith Butler). They have consistently showed through the lens of unimpeachable realism the status of woman as a questioning subjects. In this established power structure of gender binary system, Virginia Wolf's A Room Of One's Own has become a 'No Room Of One's Own' where any attempt to break it, challenge it, question it or speak against the status quo is violently suppressed, and dominated. The historical, social and existential questions of woman is represented not only in the western Culture and literature but in Indian/Bengali Literature as well. The works of Bankimchandra, Tagore, Sarat Chandra have established the convention of portraying woman in literature as a Self sacrificing Devi or 'Other' and the witch or dinner. Asapurna Devi focuses on one the common Indian phenomenon in the 19th century- widowhood. The Hindu window now occupies a crucial place in the canonical texts of modern Indian Literature. Similarly, Mahasweta Devi picturizes the Indian politics of domesticity and the social attitudes towards women with their extraordinary literary effort. In my paper I would like to reconceptualize the idea of Female Domestic space in Independent Bengal through Mahasweta Devi's watershed literary work Mother of 1084.

The issues of power, identity and the female domestic space and the history of gender injustice are efficiently expressed in Mahasweta Devi's Mother of 1084. In September 1973 for the October issue of the Periodical ' Prasad' Devi wrote the first version of Hajar Churasir Maa (Mother of 1084). The narrative predominantly points out the psychological and emotional trauma of a mother who gets a horriable news in the morning that her beloved son Brati is lying dead in the police morgue, reduced to a mere number: corpse no -1084. This situation moves her to a journey of discovery in the course of which she tries to understand her Naxalite son's revolutionary commitment and her own alienation as a woman, wife and mother in the so called bourgeoisie 'bhadralok' society.

Women's subjectivity, Transgression and resistance are the perpetual condition in human existence. It is quite evident in the construction of individual identity as a defense mechanism to get a space in the patriarchal middle class society may be seen a beginning of a social revolution. In the story, Sujata Chatterjee, mother of Brati, is a traditional apolitical upper middle class educated lady. She starts the revolution by educating herself and pursuing B.A. degree in a conservative family. Interestingly the members of the family thinks that education benefits her marriage proposal and finally married to Dibyanath Chatterjee, a chartered accountant belonging to a 'bhadralok' bourgeois Calcutta family. In the 34 years of marriage life, Sujata becomes mother of four children, two sons (Jyoti and Brati) and two daughters (Nipa and Tuli). So women in a domestic household of Independent Bengal is fit only for marriage and reproduction. The only aim of mother of a mother is to look after the household and bring up children efficiently. But after Brati's death, Sujata goes on to discover her life again with a vision of new Ideology. She emerges throwing all the pretensions to hypocritical social respectability and challenging the hegemonic notions of 'bhadralok' domestic family and she claims a space for her own. According to

International Journal of Engineering, Management and Humanities (IJEMH)
Volume 3, Issue 3, pp: 61-67 www.ijemh.com

A Discourse on Patachitra Art with narratives and songs in religious and cultural Scenario of West Bengal.

Shyamal Mondal

Date of Submission: 10-06-2022 Date of Acceptance: 25-06-2022

Abstract: India, with its colonial history and contemporary postcolonial culture offers an elaborate arena for the interpretation of the Patachitra art form of different states- Odisha, Bihar, Jharkhand and most importantly west Bengal. Although through the rise of Edward Said's "Orientalism", it was India which first exercised literary influence on the west, similarly Indian Rural Cultures like patachitra, miniature painting, pottery and other crafts have spread on a global scale. Especially the patachitra of west Bengal with its ethnographic reflections is like to leave a permanent and positive mark on the world.In some historical narratives, miscellaneous studies are conceptualized to reveal the significance of the Patachitra art of Bengal, particularly the Patachitra of East and West Medinipur.

Keywords: Postcolonial culture, ethnographic, orientalism and Patachitra

" Culture is a means of communication, language carries culture and culture carries , particularly through orature and literature, the entire body of values by which we come to perceive ourselves and places in the world."(Thiongo P-16)

The kenyan writer Ngugi wa Thiongo in his canonical essay ' *Decolonising the Mind: the politics of Language in African Literature (1986)* precisely explains the co-existence of language, culture and communication. Culture and language are intimately connected to each other. Patachitra art form is supposed to be the byproduct of the indistinguishable relationship of language and culture.Patachitratradition in Indian socio-cultural scenario is the most significant platform where various modes of communication have merged including visual messages, oral traditions and music. It portrays nature, society and culture with narratives of social transformation, migrations and socio-political and religious reflections through the folk songs. And their identity as Patausbelongs to one particular culture and ethnicity. In this discourse of identity formation, it is often associated with the idea of self conception and self perception. So the term cultural identity obviously refers to an individual sense of self derived from formal or informal membership in a group which transmit and inculcate knowledge, beliefs, values, attitudes and ways of life.

In this perspective, it is noteworthy to mention the ideas expressed in " ***Modernity An Introduction To Modern Societies"*** edited by the Jamaica-born British Marxist sociologist, cultural theorist Stuart Hall who explores some questions about the cultural identity and a crisis of identities. Cultural identity is passing through some transformations. It is shifting from the individual consciousness to collective identity and social identity. The concept of collective identity was first introduced by Freud in his essay *Group Psychology and the Analysis of the Ego*(1921). Freud argues that the individual is always a part of a group. It is also important to note that when a given group is formed , no matter whether it is an ethnic group , a nation or just a crowd the individuals behave uniformly to tolerate the peculiarities of the members of the group and feel themselves to be equal. The difference between social and cultural identity could be made much easier, if the first is related to society while the second is used to refer to culture. So the artists of Patachitra art form consists of a collective identity of a specific culture in West Bengal. The 'Pataus' together form a cultural identity that is highly significant to prove existence in the world of globalization and commercialization.

Therefore, language as culture is the collective memory bank of a people's experiences in history, values and aesthetics that is quite interestingly visible in the creative works of Paatachitra art form. The choice of language and the use of language is important to identify the definition in relation to the entire universe. Thiongo


Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2022); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:11, ISSUE:5(6), May: 2022
Online Copy of Article Publication Available (2022 Issues): www.ijmer.in
Digital Certificate of Publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
DOI: http://ijmer.in.doi./2022/11.05.122
Article Received: 2nd May 2022
Publication Date:10th June 2022
Publisher: Sucharitha Publication, India

THE DISTINCT CULTURE OF MATUYA: A HISTORICAL PERSPECTIVE AND ANALYSIS

Dr Sujit Mondal
Assistant Professor
Department of History, Mahishadal Raj College
Mahishadal, Purba Medinipur, West Bengal, India

Abstract

One of most imperative revolutions among the Namasudra was the instigation of the new religious sect Matuaism in the middle of the 19th century. Harichand Thakur; a Hindu votary and founder of the Matuya sects of Hinduism, felt that the bakward Hindus were victimized not only socially, economically and educationally but also exploited religiously in Bengal. According to him, the social customs and order were the main barriers before the upliftment of the down-trodden and their freedom of mind. Matuya movement was adopted by Namashudra (chandal). His doctrine is based on three basic principles-'truth', 'love', and 'sanctity' and it treats all people as equal. Harichand Thakur left 12 instructions for matuyas;known as Dvadash Ajva. Cultural aspects of Matuaism are related with ideas, customs and social behavior of the Matuya society. The cultural atmosphere of Matuya developed in association with existing social activities, lifestyle, social customs, rules and regulation. The culture of Matuya is independent from the traditional culture of India.

Keywords: Distinct, Dvadash Ajva, Abatars, Incarnation, Gurugiri, Hari Sabha, Kirtan, Gonsai 'Matam, Kabigan, Haribol, Swayam-Dikshiti, Darshan.

INTRODUCTION

One of most imperative revolutions among the Namasudra was the instigation of the new religious sect Matuaism in the middle of the 19th century. Harichand Thakur; a Hindu votary and founder of the Matuya sects of Hinduism (the son of Jasabanta Thakur and Annapurna Devi) was born in a Namasudra family of Safala Danga village in the district of Gopalgunj (Greater faridpur; now in Bangladesh),on the auspicious day of Madhukrishna Traodashi Tithi in 1812 A.D. (the day is logical and reasonable to Bengalee; 1218 Bengali year).He for the first time ,felt that the bakward Hindus were victimized not only socially, economically and educationally but also exploited religiously in Bengal. In these circumstances, he took an initative step for protest against social injustice at first, he did not protest against social injustice directly but introduced a new religious sect for religious liberty for the down-trodden Hindu in Bengal. He realised the imperativeness of religious reformation for the down-trodden people who were deprived of various rights for centuries due to the existence of traditional social customs and order based on social inequality in Hinduism. According to him, the social customs and order were the main barriers before the upliftment of the down-trodden and their freedom of mind.

Different types of works performed and developed with the help of 'Matuya Religion' for Namashudra and other downtrodden people of society. It performed social and cultural reformation, establishment of a newly distinct religion, development in agriculture, economy, familial lives, human moralities, reservation in educations, services and in elections etc and development of social status, respect, position and honour. These become very essential for different types social positions and because of classification of society and professions. In every caste, there are distinction and have restriction about food habits, customs and cultures as well as social marriage system, social rituals.[i]

According to the Yajuveda, the worked and dignity of four castes or classes explained. The Brahmins set up at the highest position of the society on the basis of their work and dignity. The distinction started with in cultures of social arrangement according to the basis of colour or class and it led to create their own culture of every class. After that, these started to appear as distinct categories. As the Brahmins were the highest position in society, lots of rule's regulations and customs depended on them because Brahmins only the main creators of highly cultures, customs and advisers as well as maintainer. As a result of inter-caste marriage, there were formed newly mixtures classes with in social arrangement. In India, there could found another one class who were original inhabitants or natives, known as Santal, Adibashi, Koal Munda, Chandalas. Their social customs, rules and regulations of living cultures, food, habits and social arrangements were totally distinction and we could not find out similarities with them.[ii]

Namasudra, also known as Namassej or Namassut, is an avarna community originating from Southern and Central Bengal. The community was earlier known as Chandala or Chandal, a term usually considered as a slur. As per the Hindu's religious books, the Manusanghita and the Brihaddharma Purana, the chandala is the descendants of illegal sexual union of the Shudra male and the Brahmin female. The term is also used in modern times for a specific caste of agriculturists, fishermen and boatmen, more usually referred to as Namasudra.[iii]

Knowledge and Information Systems (2023) 65:281–339
https://doi.org/10.1007/s10115-022-01752-y

REGULAR PAPER

Multi-objective covering salesman problem: a decomposition approach using grey wolf optimization

Indadul Khan[1] · **Krishnendu Basuli**[2] · **Manas Kumar Maiti**[3]

Received: 7 February 2022 / Revised: 15 August 2022 / Accepted: 20 August 2022 /
Published online: 30 September 2022

Abstract

In this study, the basic grey wolf optimization (GWO) algorithm is modified along with K-bit exchange, K-opt operation, and integrated with the structure of multi-objective evolutionary algorithm with decomposition approach (MOEA/D) to solve multi-objective covering salesman problem(MOCSP). The algorithm is named a "multi-objective evolutionary algorithm with decomposition using Grey Wolf optimization (MOEA/D-GWO)." The K-opt operation with $K = 3$ and $K = 4$ is used to generate the initial solution set. The GWO algorithm is modified with a set of newly introduced perturbation rules. A two-stage updating mechanism has been introduced to improve the quality of a potential solution. The first sage of the process is done by the modified GWO algorithm, and in the second stage, a perturbation technique using K-bits exchange operation is applied. The MOEA/D-GWO algorithm is a two-phase algorithm where in the first phase, the clustering/grouping of cities is done, and in the next phase one city from each cluster/group is selected to search pareto-optimal Hamiltonian cycles in such a way that each cycle maintains the pre-define covering distance. Here, for the first time a heuristic approach is proposed for MOCSP. Different sizes of standard benchmark MOCSP test instances are used to test the performance of the MOEA/D-GWO algorithm. The instances are generated from TSPLIB. Different traditional multi-objective optimization algorithms, like NSGA-II, SPEA2, MOEA/D, MR-ABCWCD, SMPSO, SR4-MOEA/D for MOOP, have been modified according to MOCSP and implemented to compare the efficiency of the proposed approach. Nine standard well-known performance metrics/indicators have been used to analyse the performance of the MOEA/D-GWO algorithm for MOCSP. Differ-

✉ Indadul Khan
indadulkhan@gmail.com

Krishnendu Basuli
krishnendu.basuli@gmail.com

Manas Kumar Maiti
manaskr1969@gmail.com

1 Department of Computer Science, Chandrakon Vidyasagar Mahavidyalaya, Paschim-Medinipur 721201, West Bengal, India

2 Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal 700126, India

3 Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur 721628, West Bengal, India

CREDIT POLICY FOR AN INVENTORY MODEL OF A DETERIORATING ITEM HAVING VARIABLE DEMAND CONSIDERING DEFAULT RISK

Rituparna Mondal[a], Prasenjit Pramanik [b,*], Ranjan Kumar Jana [a], Manas Kumar Maiti [c]

[a] Applied Mathematics and Humanities Department (AMHD), Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat 395007, India.

[b] Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, Paschim-Medinipur, West Bengal 721102, India.

[c] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India.

Abstract. In this study, a supplier-retailer-customer supply chain has been proposed for a deteriorating item with expiration time and dynamic deterioration rate. Here, the supplier adopt full credit policy for the retailer to enhance the retailer's order volume. This facility influences the retailer to provide some partial credit opportunity to the customers to boost the demand. For this credit policy, the retailer always faces a risk due to defaulters, which is termed as default credit risk. The default credit risk is considered in more realistic manner, which depends on the customers' partial credit period and credit amount. The market demand is influenced by customers' credit amount, customers' credit period and retail price of the item. Optimal decision is searched by maximizing the average profit of the system. For the search process, an artificial bee colony algorithm is implemented, tested and used. Illustration of the model is done with some hypothetical examples.

Key words : Expiration time; Dynamic deterioration; Credit policy; Credit amount; Default credit risk.

1. Introduction

In any supply chain, among different parameters, market demand is the key factor as revenue of the system fully comes from the sell revenue of the item. This phenomenon influences both the supplier and retailer to adopt different promotional activities to improve their sales. Trade credit is one of the important strategies to improve the demand of each player involved in the system. To increase the retailer's order size, the supplier offers a credit period to the retailer. This opportunity promotes the retailer to adopt some credit policy for his/her customers. Pioneering work in this direction was made by Goyal[1] incorporating credit policy. Afterwards, there are several research works done incorporating full credit policy[2, 3, 4, 5, 6, 7] and partial credit policy[8, 9, 10, 11, 12, 13].

Though credit policy is a good promotional tool for the enhancement of the market demand of any item, any credit policy involves credit risk. In fact, in any business transaction under trade credit policy, there are some business bonding between the supplier and the retailer, but there is no such bonding between the retailer and the customers. In reality customers are floating in nature and so some of the customers normally do not follow business ethics and move to another shop without paying the credit amount. For that, researchers developed their models[8, 12] considering partial credit policy in retailer-customers level to decrease the default credit risk. However, partial credit policy is an excellent attempt to decrease the credit risk, but still it is very critical to draw the optimal decision for the decision maker(DM) as the number of defaulters is not known. To overcome this difficulty, Pramanik *et al.*[14] considered a percentage of total customers as defaulters. But in reality, it is impossible to predict the amount of defaulters at the beginning. So it is more appropriate to consider the default credit risk as a function of customers' credit period and credit amount as the number of defaulters increases/decreases with customers credit amount and credit period proportionally. According to the authors best knowledge, there is only one article[15], considered the default risk as a function of customers' credit period. But number of defaulters may vary with the customers' credit amount also. So default risk must be a function of credit amount and the

∗ Corresponding Author.
Authors' email addresses: parnaritumondal@gmail.com(R Mondal), pramanik.prasenjit72@gmail.com(P Pramanik), rkjana2003@yahoo.com(R K Jana), manasmaiti@yahoo.co.in(M K Maiti).

Indian J Phys (March 2023) 97(3):897–906
https://doi.org/10.1007/s12648-022-02411-2

ORIGINAL PAPER

Two-mode difference-squeezing in CARS and CAHRS processes

S Kumar[1,2] and D K Giri[3]*

[1]Department of Physics, Mahishadal Raj College, Mahishadal, WB, India

[2]University Department of Physics, Vinoba Bhave University, Hazaribag, India

[3]University Department of Physics, Binod Bihari Mahto Koyalanchal University, Dhanbad, India

Received: 28 July 2021 / Accepted: 07 June 2022 / Published online: 21 August 2022

Abstract: In this manuscript, we studied two-mode difference-squeezing in coherent anti-Stokes Raman scattering (CARS) and coherent anti-Stokes hyper Raman scattering (CAHRS) processes. We established that for uncorrelated modes, the difference (higher-order) squeezing of the fundamental and Stokes fields can be turned into the normal squeezing of the anti-Stokes field. We showed that the second-order (amplitude-squared) squeezing and the fourth-order (amplitude fourth-power) squeezing of the fundamental (pump) mode are directly converted into the normal squeezing of the anti-Stokes mode in CARS and CAHRS processes, respectively. We investigated that the difference-squeezing responds nonlinearly to the number of pump photons and found it greater in the CAHRS process than in the CARS process. We established the concept of detection of difference-squeezing and normal squeezing in these processes. It is inferred that difference-squeezing exists only in certain domains of pump photons. We demonstrated that the multi-photon absorption approach is ideal for the generation of optimal squeezed light, which results in a larger reduction of noise in any optical system.

Keywords: Squeezed states; Second-order squeezing; Amplitude-squared; Fourth-order (amplitude fourth-power) squeezing; Difference-squeezing; CARS; CAHRS; Multi-photon process; Photon number operator

1. Introduction

Squeezing of the electromagnetic field [1] is a special feature of non-classical states of light. It has sparked considerable interest in the possibility of reducing the quantum noise of an optical signal below the vacuum limit [2, 3], with potential applications in optical telecommunication [4, 5], quantum cryptography [6, 7], and the development of techniques for performing higher-order correlation measurements [8–13]. In their past research, Prakash and Mishra have looked into higher-order squeezing as a way to improve the performance of a number of optical devices and networks [14–16]. Mishra et al. [17] and Yadav et al. [18] have studied the enhancement of higher-order squeezing with different parameters using beam splitters. Garcia Fernandez et al. [19] as well as Mishra et al. [20] have investigated higher-order nonclassical states in single-mode and their utility in detecting nonclassical light. Apart from the present work, we [21, 22] have worked out in earlier times the possibilities of co-existence of the higher-order squeezing with lower-order squeezing in pumps, Stokes and anti-Stokes modes, up to the interaction of second-order coupling of the field in CARS and CAHRS processes. Later, Kumar et al. [23] reported the existence of nonclassical nature and enumerated total noise in CARS and CAHRS processes up to first-order Hamiltonian interaction. In addition to the possibilities for the enhanced sensitivity of the measurements, there are several higher-order versions like higher-order amplitude squeezing, sum-squeezing, difference-squeezing, higher-order antibunching, and entanglement that fulfil various aspects of quantum optics [24, 25]. Out of these things, sum-and difference-squeezing is a multi-mode non-classical state of light that was first proposed by Hillery [26]. In the past few decades, many people have been able to get sum-and-difference-squeezing states both theoretically and experimentally in a number of nonlinear optical processes [27–31]. To generalize, three modes [32] as well as an arbitrary number of modes for sum and

*Corresponding author, E-mail: dilipkumargiri@gmail.com

Innovations in Systems and Software Engineering
https://doi.org/10.1007/s11334-022-00499-7

S.I. : LOW RESOURCE MACHINE LEARNING ALGORITHMS (LR-MLA)

IoHMT: a probabilistic event-sensitive music analytics framework for low resource internet of humanitarian musical things

Samarjit Roy[1,2] · **Anwesha Mukherjee**[3] · **Debashis De**[1,4]

Received: 7 February 2022 / Accepted: 21 October 2022

Abstract
The procreative statistical framework of musical note structures produces a crucial role in multimedia music classification and reconstruction strategies. Another significant thing for harmonious music composition is the rhythmic structures that transform musical performances into harmonic forms. Intelligent music computing paradigms try to establish human–machine interaction phenomena for systematic music generations, compositions, and reconstructions. In the emergent internet era, musical composition and reconstruction schema are largely dependent on the IoT-based paradigm where human beings can arrange musical compositions through musical things, such as, remotely arranged singing and musical instruments, smart rhythmic behaviours, and intelligent auto-tuning systems. Although it can possess substantial success, computers yet struggle with comprehending several facets of computational musicology, that are challenging in formal characterization. Moreover, most of the success is achieved for chord-based standardized western music compositions, whereas melodic Indian music is composed through single-note structures. Low resource music computing is in dire need of tools and resources to overcome the resource barrier such that probabilistic and intelligent IoT-based music formations can deliver more widespread benefits. This paper illustrates (a) computational music speculation and associated characteristics to standardize what human beings can assimilate, recall, and reconstruct musical items for sustaining intangible cultural heritage; (b) a stochastic model along with probabilistic context-free music grammar to afford a syntactic outline of musical note arrangements; (c) state transition analysis; (d) Petri net-based complex music composition framework along with the simulation-based reachability and system efficiency for evaluating the effectiveness of event-driven music schema; (e) a systematized case study on low resource Internet of Music Things for humanistic care computing, that we have named as the Internet of Humanitarian Musical Things (IoHMT).

Keywords Computational musicology · Music automata · Music composition and reconstruction · Petri Nets · Markov model · Reachability · Low resource environment · Internet of music things

1 Introduction

Musical performances such as one of the intangible heritages in entertainment that, regardless of its pervasive existence in the human ethos, remain mostly insusceptible to comprehensive understanding. The statistical and structural pattern recognition strategies are already active in the context of musical heritage conservancy and manipulation. Although, the specific issue is that the music information confined in the digital music representation is not laid back to extract musical background through the conventional paradigms [1]. With the advancements in computational paradigms, some novel music composition and reconstruction frameworks have been illustrated. Researchers have often visualized that music projects a handy affinity to mathematical analysis and

✉ Samarjit Roy
samarjit.tech89@gmail.com

1 Centre for Mobile Cloud Computing (CMCC), Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly, West Bengal University of Technology), BF-142, Sector-I, Salt Lake City, Kolkata, West Bengal 700064, India

2 School of Computer Science, Engineering, and Applications (SCSEA), Department of Computer Science and Engineering, D Y Patil International University, Sector 29, Nigdi Pradhikaran, Akurdi, Pune, Maharashtra 411044, India

3 Department of Computer Science, Mahishadal Raj College, Purba Medinipur, West Bengal 721628, India

4 University of Western Australia, 35 Stirling Hwy, Crawley, WA 6009, Australia

Published online: 15 November 2022

MCG: Mobility-Aware Computation Offloading in Edge Using Weighted Majority Game

Anwesha Mukherjee, *Member, IEEE*, Shreya Ghosh, *Student Member, IEEE*, Debashis De, *Senior Member, IEEE*, and Soumya K. Ghosh, *Senior Member, IEEE*

***Abstract*—Edge computing plays a pivotal role in computation offloading at low latency. However, selecting the appropriate node to offload a computation is a challenge, especially when the user node is mobile. The problem can be stated as follows: (i) a mobile device has to offload a computation, and the user is moving, (ii) a set of edge/fog devices is available nearby the mobile device, then to select the suitable device to offload the computation. To address the challenge, this paper proposes an end-to-end mobility-aware computation offloading framework, MCG, which consists of: (i) a novel mobility prediction module that finds the user mobility pattern, (ii) selection of a set of edge/fog devices based on the predicted mobility and user's current location, (iii) selection of the high majority device from the set of edge/fog devices based on the resource availability and present load of the devices, and (iv) offloading the computation to the selected high majority device. The experimental results demonstrate that MCG outperforms existing mobility prediction modules in terms of accuracy, precision, and recall measures. The theoretical analysis and experimental results illustrate that MCG reduces the latency and power consumption of mobile device during offloading compared to existing offloading strategies.**

***Index Terms*—Computation offloading, Game theory, Latency-aware, Low power, Mobility analytics.**

I. Introduction

THE explosive increase in the usage of smartphones for accessing resource exhaustive applications has raised different challenges, e.g. limited battery, increase in latency, high power consumption, etc. To deal with them, mobile cloud computing (MCC) comes [1], [2]. To overcome the problem of resource limitation of the mobile devices, the offloading of data and computation has been introduced, where mobile devices store their data and execute their computations inside the cloud, cloudlet, etc. [1], [3]. In computation offloading, a node requests another node to execute its computation. After execution, the serving node sends the result to the requesting node. However, offloading computation from a mobile device to the remote cloud increases delay, and to overcome this problem edge and fog devices can be used [4], [5], [6]. Now, a situation may arise where multiple edge/fog devices are available in the vicinity of the mobile device. In such a scenario, the selection of the suitable edge/fog device for "green" offloading of the computation at low latency is a challenge because user mobility can affect network connectivity. Here, the term "green" refers to low power consumption.

Motivating scenario: Let a mobile device (say, D) has to offload a computation, and a set edge/fog devices is available nearby (say, $F_{pre} = \{F_1, F_2, F_3, F_4, F_5\}$) (refer to Fig. 1). Although, F_1 is the nearest one with respect to the present location of the mobile user (say, u), as he moves he goes out of the coverage of F_1. In such a case, offloading the computation to F_1 may not be fruitful. As a solution to this problem, the prediction of the destination and the probable path to be followed by u is highly desirable. Consequently, the edge/fog devices in the predicted path can be detected. Let in the present scenario, u is currently at location A and his destination is location B. The probable path to be followed by u to reach B is marked in blue colour in Fig. 1. The set of edge/fog devices in the predicted path is $F_{nex} = \{F_3, F_4, F_5, F_6, F_7, F_8\}$ (refer to Fig. 1). In this scenario, offloading to a device, which is presently nearby as well as present in the predicted path may be better compared to selecting the presently nearest device to offload the computation. Now, if more than one device belong to the set $(F_{nex} \cap F_{pre})$, (here, $\{F_3, F_4, F_5\}$), then finding the suitable device among them to offload the computation is a challenge. The use of game theory can provide a solution to this problem. Now, another situation may also arise, where D gets disconnected from the serving edge/fog device due to mobility. In such a case, prediction of the next location and delivery of the result to D through the probable connecting edge/fog node, can be fruitful. For instance, D offloads computation to F_3, and gets disconnected before getting the result. When the result is ready to deliver, D is not present in the coverage of F_3. In such a case, F_3 sends the result to the cloud that forwards the result to the nearby connecting edge/fog device (say, F_5) of u after predicting his next location, and F_5 sends the result to D when it gets connected. Based on the discussed scenario, we can state that the objective of this work is *to select the suitable edge/fog device for offloading a particular*

Manuscript received 7 April 2022; revised 25 July 2022; accepted 7 August 2022. Recommended for acceptance by Dr. Chi Harold Liu. *(Corresponding author: Shreya Ghosh.)*

Anwesha Mukherjee is with the Department of Computer Science, Mahishadal Raj College, Mahishadal, Purba Medinipur, West Bengal 721628, India (e-mail: anweshamukherjee2011@gmail.com).

Shreya Ghosh is with the College of Information Sciences and Technology, The Pennsylvania State University, University Park 16802-1204 USA (e-mail: shreya.cst@gmail.com).

Debashis De is with the Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology (formerly known as West Bengal University of Technology), Salt Lake, Kolkata 700064, India (e-mail: dr.debashis.de@ieee.org).

Soumya K. Ghosh is with the Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal 721302, India (e-mail: skg@cse.iitkgp.ac.in).

Digital Object Identifier 10.1109/TNSE.2022.3198114

Received: 11 April 2022 | Revised: 2 August 2022 | Accepted: 8 August 2022

DOI: 10.1002/spe.3144

RESEARCH ARTICLE

WILEY

STOPPAGE: Spatio-temporal data driven cloud-fog-edge computing framework for pandemic monitoring and management

Shreya Ghosh[1] | **Anwesha Mukherjee**[2] | **Soumya K. Ghosh**[3] | **Rajkumar Buyya**[4]

[1]College of Information Sciences and Technology, The Pennsylvania State University, State College, Pennsylvania, USA

[2]Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal, India

[3]Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India

[4]School of Computing and Information Systems, The University of Melbourne, Parkville, Victoria, Australia

Correspondence
Shreya Ghosh, College of Information Sciences and Technology, The Pennsylvania State University, State College, PA 16802, USA.
Email: spg5897@psu.edu

Funding information
Department of Science and Technology, Government of India

Abstract

Several global health incidents and evidences show the increasing likelihood of pandemics (large-scale outbreaks of infectious disease), which has adversely affected all aspects of human lives. It is essential to develop an analytics framework by extracting and incorporating the knowledge of heterogeneous data-sources to deliver insights for enhancing preparedness to combat the pandemic. Specifically, *human mobility, travel history*, and other *transport statistics* have significantly impact on the spread of any infectious disease. This article proposes a spatio-temporal knowledge mining framework, named ***STOPPAGE***, to model the impact of human mobility and other contextual information over the large geographic areas in different temporal scales. The framework has two key modules: (i) *spatio-temporal data and computing infrastructure* using fog/edge based architecture; and (ii) *spatio-temporal data analytics* module to efficiently extract knowledge from heterogeneous data sources. We created a *pandemic-knowledge graph* to discover correlations among mobility information and disease spread, a deep learning architecture to predict the next hotspot zones. Further, we provide necessary support in home-health monitoring utilizing Femtolet and fog/edge based solutions. The experimental evaluations on real-life datasets related to COVID-19 in India illustrate the efficacy of the proposed methods. STOPPAGE outperforms the existing works and baseline methods in terms of accuracy by ≈(18–21)% in predicting hotspots and reduces the power consumption of the smartphone significantly. The scalability study yields that the STOPPAGE framework is flexible enough to analyze a huge amount of spatio-temporal datasets and reduces the delay in predicting health status compared to the existing studies.

KEYWORDS

COVID-19, deep learning, healthcare, Internet of Spatial Things (IoST), knowledge graph, pandemic, spatio-temporal data

Abbreviations: IoST, Internet of Spatial Things; IoT, Internet of Things; PKG, pandemic-knowledge graph; QoS, quality of service.

Received: 13 June 2022 | Accepted: 20 July 2022

DOI: 10.1002/biof.1882

REVIEW ARTICLE

Biofactors WILEY

Melatonin mediated activation of MAP kinase pathway may reduce DNA damage stress in plants: A review

Sukhendu Maity[1] | **Rajkumar Guchhait**[2] | **Kousik Pramanick**[1]

[1]Integrative Biology Research Unit (IBRU), Department of Life Sciences, Presidency University, Kolkata, West Bengal, India

[2]P.G. Department of Zoology, Mahishadal Raj College, Purba Medinipur, West Bengal, India

Correspondence
Kousik Pramanick, Integrative Biology Research Unit (IBRU), Department of Life Sciences, Presidency University, Kolkata, West Bengal, India.
Email: kousik.dbs@presiuniv.ac.in

Funding information
DST-FIST, Govt. of India, Grant/Award Number: SR/FST/LSI-560/2013(C); DBT-BUILDER, Grant/Award Number: BT/INF/22/SP45088/2022; FRPDF scheme, Presidency University, Kolkata, India; CSIR–JRF; DST-SERB, Govt. of India, Grant/Award Number: EEQ/2018/000275

Abstract

Melatonin is an important biomolecule found in diverse groups of organisms. Under different abiotic stresses, the synthesis of melatonin is markedly increased suggesting pivotal roles of melatonin in plants enduring stresses. Being an endogenous signaling molecule with antioxidant activity, melatonin alters many physiological responses and is found to be involved in regulating DNA damage responses. However, the molecular mechanisms of melatonin in response to DNA damage have not yet been studied. The present review aims to provide insights into the molecular mechanisms of melatonin in response to DNA damage in plants. We propose that the MAP kinase pathway is involved in regulating melatonin dependent response of plants under DNA damage stress. Where melatonin might activate MAPK via H_2O_2 or Ca^{2+} dependent pathways. The activated MAPK in turn might phosphorylate and activate SOG1 and repressor type MYBs to mitigate DNA damage under abiotic stress.

KEYWORDS

abiotic stress, antioxidant, cyclin-CDK, DNA damage, MAP kinase, melatonin, MYBs, SOG1

1 | INTRODUCTION

A number of biomolecules are produced by plants in response to external stimuli, regulating different physiological responses. Melatonin (MET) or N-acetyl-5-methoxy tryptamine is such a biomolecule that is widely distributed in both plants and animals.[1] The presence of melatonin in diverse groups of organisms indicates the conserved nature of its biosynthetic pathway in different organisms. In both plants and animals, MET is biosynthesized from the amino acid tryptophan (trp) in a tryptophan-tryptamine-serotonin dependent pathway.[1–3] Serotonin, the precursor of MET, is acetylated to N-acetylserotonin which is then methylated to produce MET by serotonin N-acetyl transferase (SNAT) and acetyl serotonin methyl transferase (ASMT) or Caffeic acid O-methyl transferase (COMT), respectively. Serotonin may also form 5-methoxy tryptamine by ASMT/COMT. Finally, SNAT catalyzes the formation of MET from 5-methoxy tryptamine. These SNAT and ASMT are the key enzymes over-expression of which in plants are known to be associated with increased stress tolerance.[4–7]

Different plant species have been reported to produce melatonin (MET) with quantitative variations from

Abbreviations: Act-MYBs, activator MYBs; ASMT, acetyl serotonin methyl transferase; ATM, ataxia telangiectasia mutated; ATR, ataxia telangiectasia and Rad3 related; CHK1, checkpoint-1 kinase; CHK2, checkpoint-2 kinase; CKI, CDK inhibitor (CKI); COMT, caffeic acid O-methyl transferase; DSB, double stranded DNA breaks; HR, homologous recombination; MAPK, mitogen activated protein kinase; MDA, malondialdehyde; MET, melatonin; Rep-MYBs, repressor MYBs; SMR, SIAMESE-related; SNAT, serotonin N-Acetyl transferase; SOG1, suppressor of gamma response 1.

Modal data-based simple statistical analysis as an effective petrogenetic indicator: a study from Kadavur gabbro-anorthosite complex, Tamil Nadu, southern India

Debaleena Sarkar, Jyotisankar Ray*, Papiya Banerjee and Suranjana Kayal

Department of Geology, University of Calcutta, 35, B.C. Road, Kolkata 700 019, India

Field and petrographic studies on the Neoproterozoic Kadavur intrusive complex (10°35′N, 78°11′E) (located in the Southern Granulite Terrane of the Indian shield) reveal three distinct types: (i) earliest phase of deformed schistose gabbro-anorthosite; (ii) most dominant layered gabbro-anorthosite, and (iii) locally developed pegmatoidal gabbro-anorthosite. A simple modal data-based statistical analysis of layered gabbro-anorthosite type yields highly significant or significant correlation coefficients for different mineralogical parameters and strongly supports differentiation from a common magma. Typical dispositions of the mineralogical parameters (as depicted by isopleths patterns) suggest maintenance of a magmatic lineage in varying hydration ambience that developed several petrographic variants within the layered type.

Keywords: Gabbro-anorthosite, isopleths map, mineralogical parameters, modal data, statistical analysis.

MODAL analysis studies on gabbro-anorthosites have been useful to classify and characterize such rocks. For example, Ashwal[1] worked out the genesis of the Mount Marcy anorthosite massif (Adirondacks, New York, USA) with a particular focus on anorthositic rocks associated with the high-grade terrain[2,3]. Even for the Apollo-11 samples, modal analyses helped ascertain the heterogeneity in the lunar highland series[4]. However, in recent times, such modal analysis-based approaches for gabbro-anorthosites are lacking. In reality, modal data of igneous rocks represent the actual mineralogical composition and help in accurate nomenclature. Nowadays, however, the emphasis has shifted to other domains, presumably because of the availability of major, trace and isotopic data[5,6]. Even in this scenario, in the recent past, modal data-based studies have helped resolve the long-standing controversy related to the accretion of gabbroic lower crust at the ridge axis[7]. In this context of the intrusive gabbro-anorthosite complex near Kadavur (10°35′N, 78°11′E), southern India (Figure 1), the present study performs statistical analyses of several mineralogical parameters to present a cogent petrogenetic history. The Kadavur complex was initially reported from the Southern Granulite Terrane (SGT) of the Indian shield (Figure 1 *a*)[8,9]. However, during 1980s, the region (hosting the Kadavur complex) was known as the Eastern Ghats Belt[10]. Early studies on the Kadavur complex suggest that: (i) the intrusion represents a funnel-shaped concordant body and (ii) the complex bears geological similarities with the Adirondack mountains[11]. However, later studies have argued against the similarities between the Kadavur complex and intrusive rocks in the Adirondack region[12]; on the contrary, it was compared with early Archean, layered gabbro-anorthosite complex. It has been suggested that the Kadavur complex manifests multiple phases of magmatism with corresponding mappable attributes[13,14]. Recent workers suggest a tholeiitic parentage and an inferred age of ~810 Ma for the anorthositic intrusions[15,16]. However, it is unclear whether the complex is a product of differentiation from common parent magma or corresponds to discrete and separate magmatic pulses. Hence, this study attempts to resolve this issue with the help of statistical analyses of modal data and relevant correlation characteristics amongst mineralogical parameters.

The present work involves field studies, petrographic analyses and detailed statistical studies on modal variables that help throw light on the petrogenesis of the Kadavur

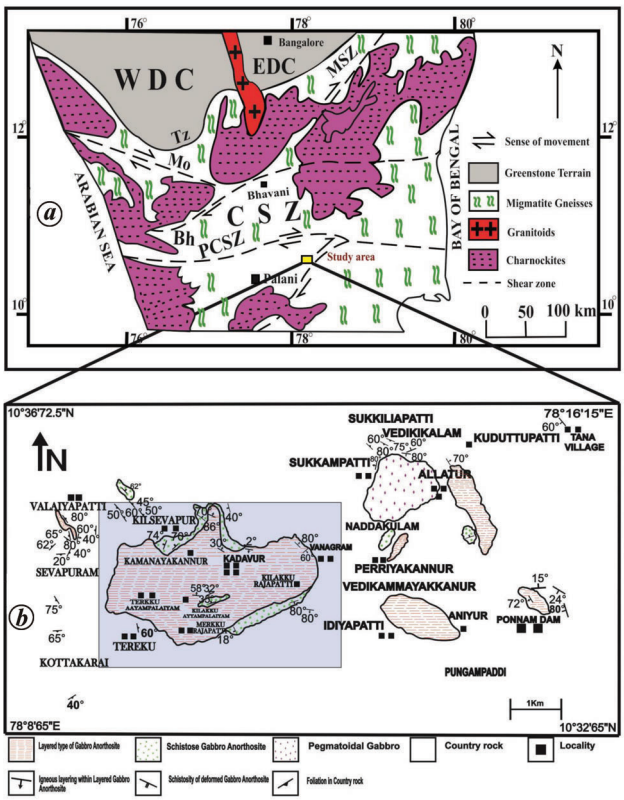


Figure 1. ***a***, Location of the study area (Kadavur complex) within the regional tectonic frame of the Southern Granulite Terrane[9]. The complex falls within the branch-out portions of the Palaghat–Cauvery shear zone[8]. ***b***, Geological map of the Kadavur complex (by the present authors). Shaded portion represents the area where isopleths maps for different mineralogical parameters were constructed.

*For correspondence. (e-mail: jsray65@hotmail.com)

J. Earth Syst. Sci. (2022)131 196
https://doi.org/10.1007/s12040-022-01932-y

Petrogenetic implications of mineral chemistry and mode-based statistical studies of Sholayar alkaline syenite complex, Southern Granulite Terrane, India

Moumita Chowdhury[1], Jyotisankar Ray[1,*], Rohit Pandey[2], Debaleena Sarkar[1] and Paulomee Guha[1]

[1]*Department of Geology, University of Calcutta, 35, Ballygunge Circular Road, Kolkata 700 019, India.*
[2]*Department of Geology, Banaras Hindu University, Ajagara, Varanasi, Uttar Pradesh 221 005, India.*
**Corresponding author. e-mail: jsray65@hotmail.com*

MS received 6 September 2021; revised 10 March 2022; accepted 23 March 2022

A recent petrological study on the lesser-known Sholayar alkaline syenite complex (10°17′59.9″N: 076°47′26.3″E) accommodated in the high-grade rocks of the Southern Granulite Terrane reveals the presence of three distinct petrographic types namely leuco syenite, melanofelsic syenite and mela syenite. The syenites, in general, have the following constituent minerals, namely alkali feldspar ($Or_{76.8}Ab_{23.2}$–$Or_{93.4}Ab_{6.6}$), plagioclase ($An_{4.1}$–$An_{17.3}$), calcic amphibole (edenitic hornblende/ferroparg-asitic hornblende), quad pyroxene (diopside–hedenbergite), biotite and opaque minerals (magnetite and ilmenite). Mode-based statistical studies indicate that a highly significant correlation exists among certain mineralogical parameters including quartz%, total feldspar%, colour index, alteration index and hydration index. Isopleth plots of these parameters strongly suggest maintenance of a magmatic regime throughout, with increasing water content towards the end stage of crystallization. Several geothermo-barometric methods point to shallow to moderate level emplacement (∼9–23 km) of the alkaline/sub-alkaline syenite magma which was facilitated by a 'hydration event'. The steep change in water gradients (in localized pockets) of the syenite intrusives has been corroborated by textural evidences.

Keywords. Mineral chemistry; geothermobarometry; equilibration depth; mode-based statistics; Sholayar Complex; mineralogical parameters.

1. Introduction

The mineral chemistry of syenites and associated rocks has received attention (though limited in number) by petrologists for long. For the Klokken syenite(-gabbro) complex, south Greenland based on mineral-chemical evaluation, it has been documented (Parsons 1981) that the less fractionated members of syenite probably crystallized with PH_2O less than P_{total} at temperature greater than 870°C where as more fractionated syenite had PH_2O similar to P_{total} with a different range of crystallization-temperature. For this complex, the fO_2 condition of ambient melt could also be successfully evaluated by Parsons (1981). Mineral chemistry-based similar approach for the Mboutou

Supplementary material pertaining to this article is available on the *Journal of Earth System Science* website (http://www.ias.ac.in/Journals/Journal_of_Earth_System_Science).

Published online: 12 September 2022

International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898
Received: 05-08-2022, Accepted: 21-08-2022, Published: 07-09-2022
Volume 7, Issue 3, 2022, Page No. 158-161

A short review on medicinal value of Indian blackberry (*Syzygium cumini* L.)

Shampa Chowdhury[1], Souvik Tewari[2], Paromita Mukherjee[3], Anirban Pattanayak[4*]

[1] Assistant Professor, Department of Nutrition, Haldia Institute of Health Sciences, West Bengal, India

[2] Assistant Professor, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, West Bengal, India

[3] Assistant Professor and Research Scholar, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, West Bengal, India

[4] Department of Physiology, Mahishadal Raj College, Vidyasagar University, West Bengal, India

Abstract

Indian blackberry, also known as Java plum, black plum, jambolan, or jamun, is a tropical evergreen tree in the *Myrtaceae* genus of flowering plants. It is mostly used for conventional treatment of diarrhoea, ulcers, inflammation, and diabetes mellitus. It is a good source of anthocyanin, which is useful against analgesic characteristics, and it has medicinal benefits. Additionally, it possesses antineoplastic, radioprotective, and chemopreventive qualities. The information about the therapeutic benefits of Indian blackberries for human health is briefly described in the current article.

Keywords: Indian blackberry, medicinal value, human health, chemo preventive qualities, ulcers, inflammation

Introduction

Syzygium cumini, a member of the *Myrtaceae* family, is also known as Eugenia cumini and Syzygium jamunum. Other names for Indian blackberry include Jambul, Black Plum, Java Plum, Jamblang, and Jamun (Tewari *et al*., 2021) [16, 17]. The tree only bears fruit once a year, and the taste of the berries is sweetish-sour. The ripe fruits are used to produce wine, squash, jellies, and health beverages. All components of the tree, but most significantly the seeds, are used to manage diabetes mellitus in connection with its nutritional usage. Jamun has antioxidant, anti-inflammatory, anti-HIV, an-tileishmanial and antifugal, nitric oxide scavenging, free radical scavenging, anorexigenic, gastroprotective, anti-ulcerogenic, and redio-protective effects (Baliga *et al*., 2011) [3].

Nutritional composition of Indian blackberries

Table 1: Nutritional composition of Indian Blackberry

Java Plum, raw - Nutritional value per 100 g	
Energy	60 kcal
Carbohydrates	15.56 g
Fat	0.23 g
Protein	0.72 g
Water	83.13 g
Vitamin A	3 IU
Thiamine (vit. B1)	0.006 mg (1%)
Riboflavin (vit. B2)	0.012 mg (1%)
Niacin (vit. B3)	0.260 mg (2%)
Pantothenic acid (B5)	0.160 mg (3%)
Vitamin B6	0.038 mg (3%)
Vitamin C	14.3 mg (17%)
Calcium	19 mg (2%)
Iron	0.19 mg (1%)
Magnesium	15 mg (4%)
Phosphorus	17 mg (2%)
Potassium	79 mg (2%)
Sodium	14 mg (1%)

Source: USDA Nutrient Database