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Supporting Documents for Cover & Content Page on 3.3.3

Additional_Documents_1

File No	Author Name	Title of Paper	Page
2010.00	A11111 D		No.
2019_09	Abhijit Banerjee	A Gamma-Levy Hybrid MetaHeuristic for HyperParameter	14
		Tuning of Deep Q Network	
2018_29	Abhijit Banerjee	Evaluation of Reverse Ellitism Firefly Algorithm on the	22
		CEC2013 Real Parameter Single Objective Optimization	
		Benchmark Functions	
2019_40	Abhijit Banerjee	Evolving Network Topology in Policy Gradient Reinforcement	38
		Learning Algorithms'	
2016_10	Abhijit Banerjee	Repulsion-Propulsion Firefly Algorithm with Fast Convergence	39
		to Solve Highly Multi-Modal Problems	
2020_05	Ankita Som	Effect of Drag Force Linearization and Damper Placement	40
		Optimization on Semi-Active Sliding Mode Control of	
		offshore Structures	
2020_07	Arijit Kumar	Characterization of Stabilized Subgrade on Pavement	49
	Banerjee	Performance by means of Finite Element Method	
2020_12	Soumyadip Das	Study of Traffic Behaviour at an Uncontrolled Intersection in	50
	, ,	Durgapur, India	
2019_11	Soumyadip Das	Analysis of Pedestrian Movements on Sidewalks: A Case Study	53
	, ,	in Kolkata, India	
2019_12	Md. Hamjala Alam	A Review on Integrated Water Resources Management for	58
	-	Solving Water-related Issues	
2018_03	Soumyadip Das	A Comprehensive Study on Characterization of Concrete	61
		Pavements	
2018_23	Soumyadip Das	An Intensive Study of Pavement Performance Models	65
2019_18	Krishna Roy	A study to devise strategies to curb absenteeism rates to ensure	69
	Í	sustainable development of private professional colleges of	
		West Bengal"	



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Hyper-parameter tuned deep Q network for area estimation of oil spills: a meta-heuristic approach

<u>Abhiit Banerjee</u> ⊠, <u>Dipendranath Ghosh</u> & <u>Suvrojit Das</u>

Evolutionary Intelligence (2020)

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Abstract

Oil Spills near shoreline are a major environmental hazard. Rapid estimation of spill perimeter provides a quick estimate of its area extent thus facilitating its quick removal. In this study; a meta-heuristic algorithm; "Gamma-Levy Hybrid Meta-heuristic with Conditional Evolution (GLHM-CE)" is proposed. The proposed algorithm is then used to evolve a distributed control strategy for a swarm of unmanned aerial vehicles for rapid confinement and estimation of spill perimeter. Every agent is controlled by a Deep Q Network whose Hyper-Parameters are tuned by GLHM-CE. Evaluation of GLHM-CE over 28 Blackbox Problems of CEC-2013, Special Session on Real-Parameter Optimization and its comparison with evolutionary algorithms like SHADE, Co-DE and JADE reveals that GLHM-CE convergence. The effectiveness in hyper-parameter tuning of a Deep Q Network by GLHM-CE was evaluated over the quintessential CartPole problem from OpenAI Gym framework.

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Papers	About	
Page 2 of 2		
Search within book		
		Q

Feature Selection Using Graph-Based Clustering for Rice Disease Prediction

Ankur Das, Ratnaprava Dutta, Sunanda Das, Shampa Sengupta

Pages 589-598

Shifted Peterson Network: A New Network for Network-on-Chip

M. M. Hafizur Rahman, M. N. M. Ali, Osinusi A. Olamide, D. K. Behera

Pages 599-609

Gathering Identification Using Image Metrics for Intelligent Situation Awareness System in Real Time Scenarios

Nandita Gautam, Debdoot Das, Sunirmal Khatua, Banani Saha

Pages 611-619

Secure: An Effective Smartphone Safety Solution

Sampreet Kalita, Dhruba Kumar Bhattacharyya

Pages 621-633

A Gamma-Levy Hybrid MetaHeuristic for HyperParameter Tuning of Deep Q Network

Abhijit Banerjee, Dipendranath Ghosh, Suvrojit Das

Pages 635-646

Dewarping of Single-Folded Camera Captured Bangla Document Images

Arpan Garai, Samit Biswas

Pages 647-656

Deep Learning Techniques—R-CNN to Mask R-CNN: A Survey

Puja Bharati, Ankita Pramanik

Pages 657-668

Comparison of Four Nature Inspired Clustering Algorithms: PSO, GSA, BH and IWD

Shankho Subhra Pal, Rupkatha Hira, Somnath Pal Pages 669-674

Detection of Diseases in Potato Leaves Using Transfer Learning Soumik Ranjan Dasgupta, Somnath Rakshit, Dhiman Mondal, Dipak Kumar Kole

Pages 675-684

Self Driving Car

Ankit Kumar, Mayukh Mukherjee, Preetam Mukhopadhyay Pages 685-691

A Local-to-Global Approach for Document Image Binarization Deepika Gupta, Soumen Bag Pages 693-702

Feature Extraction and Matching of River Dam Images in Odisha Using a Novel Feature Detector

Anchal Kumawat, Sucheta Panda

Pages 703-713

Multimodal Segmentation of Brain Tumours in Volumetric MRI Scans of the Brain Using Time-Distributed U-Net

Jeet Dutta, Debajyoti Chakraborty, Debanjan Mondal Pages 715-725

A Cooperative Co-evolutionary Genetic Algorithm for Multi-Robot Path Planning Having Multiple Targets

Ritam Sarkar, Debaditya Barman, Nirmalya Chowdhury Pages 727-740

A Shape Retrieval Technique Using Isothetic Cover of Digital Objects Abdul Aziz Al Aman, Apurba Sarkar, Arindam Biswas Pages 741-749

Complete Statistical Analysis to Weather Forecasting Anisha Datta, Shukrity Si, Sanket Biswas Pages 751-763

An Improved Non-local Means Denoising Technique for Brain MRI Saumyadipta Sarkar, Prasun Chandra Tripathi, Soumen Bag Pages 765-773

A Combined Approach for k-Seed Selection Using Modified Independent Cascade Model

Debasis Mohapatra, Ashutosh Panda, Debasish Gouda, Sumit Sourav Sahu

Pages 775-782

Fast Adaptive Decision-Based Mean Filter for Removing Salt-and-Pepper Noise in Images

Amiya Halder, Supravo Sengupta, Pritam Bhattacharya, Apurba Sarkar

Pages 783-793

An Appearance Model and Feature Selection in Kernelized Correlation Filter Based Visual Object Tracking

Vijay K. Sharma, Bibhudendra Acharya, K. K. Mahapatra

4 of 8

Pages 795-806

Role of Soft Computing Techniques in Software Effort Estimation: An Analytical Study

P. Suresh Kumar, H. S. Behera

Pages 807-831

A Nonlinear Telegraph Equation for Edge-Preserving Image Restoration

Subit K. Jain, Jyoti Yadav, Manisha Rao, Monika Sharma, Rajendra K. Ray

Pages 833-841

A Q-Learning Approach for Sales Prediction in Heterogeneous Information Networks

Sadhana Kodali, Madhavi Dabbiru, B. Thirumala Rao Pages 843-851

WNN-EDAS: A Wavelet Neural Network Based Multi-criteria Decision-Making Approach for Cloud Service Selection

O. Gireesha, Nivethitha Somu, M. R. Gauthama Raman, Mandi Sushmanth Reddy, Kannan Kirthivasan, V. Shankar Sriram

Pages 853-865

An Improved Feedforward Neural Network Using Salp Swarm Optimization Technique for the Design of Intrusion Detection System for Computer Network

N. Neha, M. R. Gauthama Raman, Nivethitha Somu, R. Senthilnathan, V. Shankar Sriram

Pages 867-875

An Efficient Intrusion Detection Approach Using Enhanced Random Forest and Moth-Flame Optimization Technique

P. S. Chaithanya, M. R. Gauthama Raman, S. Nivethitha, K. S. Seshan, V. Shankar Sriram

Pages 877-884

Unidentified Input Observer: Comparative Study Through Block Pulse Function and Hybrid Function

Anindita Ganguly, Tathagata Roy Chowdhury, Suman Kumar Ghosh, Aishik Panigrahi, Nilotpal Chakraborty, Anirudhha Ghosh et al.

Pages 885-896

Data Hiding with Digital Authentication in Spatial Domain Image Steganography

Ayan Chatterjee, Soumen Kumar Pati

Pages 897-907

Implementation of WOA-Based 2DOF-FOPID Controller for AGC of Interconnected Power System

Debashis Sitikantha, Binod Kumar Sahu, Pradeep Kumar Mohanty

Pages 909-920

Decision-Making Process of Farmers: A Conceptual Framework
Partha Mukhopadhyay, Madhabendra Sinha, Partha Pratim
Sengupta

Pages 921-934

An Efficient Approach to Optimize the Learning Rate of Radial Basis Function Neural Network for Prediction of Metastatic Carcinoma

Prachi Vijayeeta, M. N. Das, B. S. P. Mishra

Pages 935-946

Voice-Based Gender Identification Using Co-occurrence-Based Features

Arijit Ghosal, Chanda Pathak, Pinki Singh, Suchibrota Dutta Pages 947-956

Fuzzy Posture Matching for Pain Recovery Using Yoga Ahona Ghosh, Sriparna Saha, Amit Konar Pages 957-967

Application of SCA-Based Two Degrees of Freedom PID Controller for AGC Study

Nimai Charan Patel, Binod Kumar Sahu, Manoj Kumar Debnath

Pages 969-980

Classifications of High-Resolution SAR and Optical Images Using Supervised Algorithms

Battula Balnarsaiah, T. S. Prasad, Laxminarayana Parayitam, Balakrishna Penta, Chandrasekhar Patibandla

Pages 981-990

An Approach for Video Summarization Using Graph-Based Clustering Algorithm

Ghazaala Yasmin, Aditya Chaterjee, Asit Kumar Das Pages 991-998

Parameter Tuning in MSER for Text Localization in Multi-lingual Camera-Captured Scene Text Images

Souvik Panda, Swayak Ash, Neelotpal Chakraborty, Ayatullah Faruk Mollah, Subhadip Basu, Ram Sarkar

Pages 999-1009

Applications and Advancements of Firefly Algorithm in Classification: An Analytical Perspective

Janmenjoy Nayak, Kanithi Vakula, Paidi Dinesh, Bighnaraj Naik

Pages 1011-1028

A Multi-step-Ahead Fuzzy Time Series Forecasting by Using Hybrid Chemical Reaction Optimization with Pi-Sigma Higher-Order Neural Network

Radha Mohan Pattanayak, H. S. Behera, Sibarama Panigrahi Pages 1029-1041

Back Matter PDF

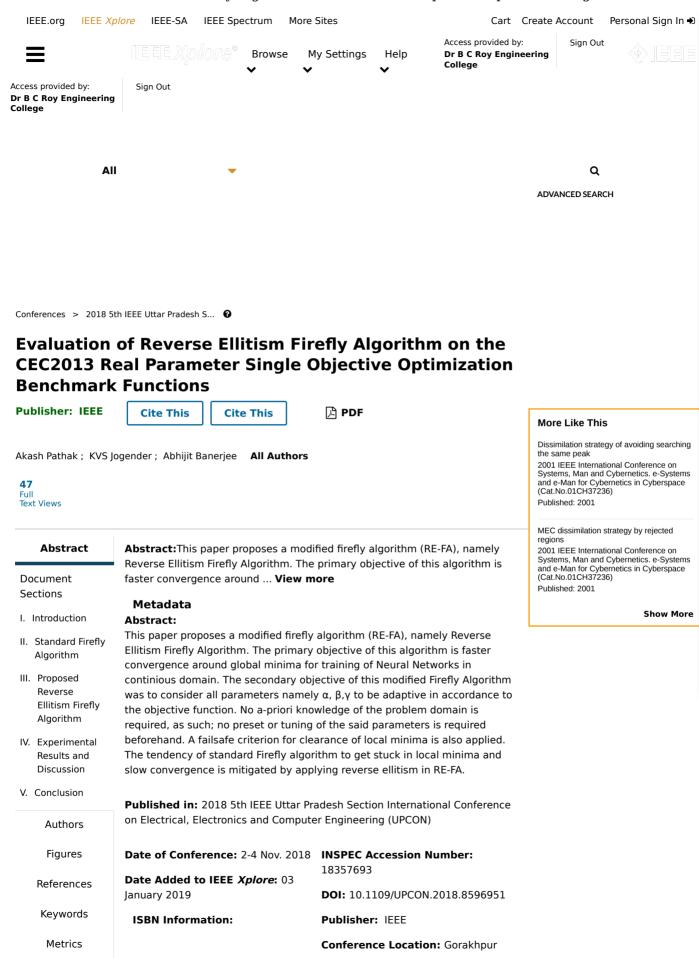
Pages 1043-1046

Page 2 of 2

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Contents

I. Introduction

Firefly Algorithm is widely used for multimodal global optimization. It has been used recently for adaptive digital filtering [1], dc-dc conversion [2], optimal power generation in microgrid system [3], global path planning [4] and other NP hard problems, thus reinstating its relevancy in recent years. As a metaheuristic algorithm, Firefly Algorithm (SFA) has its own pros and cons. The agents in this multi-agent strategy is devoid of memory, as such they cannot remember any good locations in $\mathbf n$ dmensions that it has visited. Any metaheuristic strategy should have a proper balance of exploration/exploitation. The more exploration, the less probability of attaining the global minima. Whereas more exploitation results in premature convergence. A strategy to balance this exploration to exploitation ratio is thus imperative.

Authors	~
Figures	~
References	~
Keywords	~
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2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON)

2-4 November 2018

TABLE OF CONTENTS

S. No.	Paper ID	Title and Authors	Page No.
1	2	Enhancement of Power System Performances by Optimally Placed FACTS Controllers by using Different Optimization Techniques in Distribution Systems: A Taxonomical Review	1
		Bindeshwar Singh, Prabhakar Tiwari and S. N. Singh	
2	16	Automatic Generation Control for Hybrid Hydro- Thermal System using Soft Computing Deepak Kumar Gupta, R. Naresh and Amit kumar Vidyakant Jha	7
3	23	A Deep Learning Method for the Detection of Diabetic Retinopathy	13
		Navoneel Chakrabarty	
4	24	Effect of Phase Filtering on Interferometry based Displacement Analysis of Cultural Heritage Sites Akshar Tripathi and Shashi Kumar.	18
5	25	FPGA Implementation of 32 Bit Complex Floating Point Multiplier Using Vedic Real Multipliers with Minimum Path Delay	23
		K.Deergha Rao ,P.V. Muralikrishna, Ch. Gangadhar	
6	26	Control of Autonomous Solar PV-Wind Hybrid System	29
		Harshal Shelar and Urmi Shah	
7	32	Substrate Integrated Waveguide Leaky Wave Antenna with Continuous Beam Steering	35
		Prayesh Belwal, Rahul Agrawal and S C Gupta	
8	34	Model Predictive Control Approaches for Induction Motor in Virtual Environment	38
		Shivaram Kamat and Amit Kamat	
9	36	Diamond Shaped Microstrip Patch Antenna with Defected Ground Structure for WiMAX Applications	44
		Ajay Balwantrao Thatere, Prasanna Zade and Prajakta Dudarao Sontakke	
10	39	QOS Improvement in MANET Routing by Route Optimization through Convergence of Mobile Agent	49
		Vandna Rani Verma, D.P. Sharma, AMIT and C.S. Lamba	
11	40	Three Party Key Sharing Protocol Using Polynomial Rings	55
		Atul Chaturvedi, Varun Shukla and Manoj Kumar Misra,	
12	41	EM Analysis of Wideband Disc-Loaded Gyro-TWT	60
		Rajiv Kumar Singh	
13	42	Evaluation of Reverse Ellitism Firefly Algorithm on the CEC2013 Real Parameter Single Objective Optimization Benchmark Functions	66
		Akash Pathak , KVS Joginder and Abhijit Banerjee	
14	43	Novel Feeder Pillar Box	72
		Ishant Jain and Sudhakar Reddy.	
15	45	Neural Network Based Classification of Virtual Machines in IaaS	80
		Eva Patel, Aalekh Mohan and Dharmender Singh Kushwaha	
16	47	Image Watermarking Scheme using Homomorphic Transform in Wavelet Domain	88
		Priyank Khare and Vinay Kumar Srivastava	

17	49	Systematic Design of Dual-band MIMO Antenna using Characteristic Mode Analysis	94
		Harsh Verdhan Singh, Shrivishal Tripathi and Ramesh Vaddi	
18	50	Stability analysis of continuous time-delayed system with input saturation	100
	.00000	Nisha, Vipin Chandra Pal , Richa Negi and Avadh Patel.	
19	53	Protection of TCSC Transmission Line by Wavelet Based Advance Mho Relay	106
	00242	Ashok Manori and Manoj Tripathi	.7552722
20	56	Thermodynamic Properties of LiGaS2 and LiGaSe2 Using First-Principle Calculations S. Chandra and V. Kumar	110
21	57	Selective Sleep- Awake Scheduling in WSN-Cloud Integration	113
		Rashi Srivastava and Muzammil Hasan	
22	59	Numerical Investigation of the Effect of Blade Profile of a Darrieus Hydrokinetic Turbine Gaurav Saini and R.P. Saini	119
23	64	Revamping an Accelerometer Calibration System-A 'Better-than-New' Approach	125
-56		Jitendra Chauhan, Vijayalakshmi V, Sridhar B, Muralidharan V and Sreelal Sreedhar.	1200
24	66	A CP-free STBC-MIMO OFDM communication system for underwater multipath channel.	129
		Shiho Oshiro and Tomohisa Wada	100000
25	67	Performance Analysis of Polar Codes for 5G Short Message Transmissions K. Deergha Rao	134
26	69	Experimental Analysis of Electro-Thermal Contact Resistance of Al and Cu Surfaces	139
		Nitin Pandey, Ishant Jain, E. Sudhakar Reddy and Nitin P. Gulhane.	
27	71	A Novel 10T SRAM cell for Low Power Applications	146
		Manay Bansal, Ankur Kumar, Priyanka Singh and R.K. Nagaria.	
28	72	Review and Analysis of Electric Spring for Power Quality improvement	150
		Ankit Kumar Srivastava, Himanshu Shukla and A.N. Tiwari.	
29	73	Target Detection and Tracking in Infrared Videos Using Frequency Domain Analysis and Machine Learning for Surveillance	154
		Kamlesh Verma, D. Ghosh, Divyanshu Pundir and Avnish Kumar	
30	74	Modeling and Simulation of Compact Feeder Pillar System	160
		Sumit R. Zanje, Ishant Jain and E. Sudhakar Reddy.	
31	78	Impact Assessment of Distributed Solar PV Integration in Low-Voltage Unbalanced Distribution Network: A Case Study	166
	102/2	Balveer Singh and Naran M. Pindoriya.	
32	79	Analyses of Grid Connected Hybrid PV/Wind Renewable Power Generation System	172
		Ankit Srivastava, Archana Singh, Preeti Singh and Santosh Kumar Suman.	
33	80	Video Stabilization Through Target Detection.	177
		Kamlesh Verma, D. Ghosh and Avnish Kumar	The base of
34	81	The Load Balancing of Optimizing LEACH clustering Algorithm with Mobile Sink and Rendezvous Nodes	183
		Sunil Kumar, Akshay Verma, Prateek Raj Gautam, Akash Dayal and Arvind Kumar	
35	82	Android-based Text Reader for Partial Vision Impairment	189
		Rituparna Dhar and Saswati Mukherjee,	
36	83	Detection of Event Related Potential for a Cognitive Task	194
37	85	Nazia Noor, Omar Farooq and Saba Shahnawaz IMC - Modified PID Load Frequency Controller for Two Area Interconnected System with WPP	200
		Precti Sonkar and O. P. Rahi.	

38	87	Forecasting of Solar Radiation in India Using Various ANN Models	206
		Rachit Srivastava, A. N. Tiwari and V. K. Giri,	
39	88	Performance Estimation of Permanent Magnet Synchronous Generator Based Wind Energy Conversion System	212
		Puncet Kumar Srivastava, A. N. Tiwari and S. N. Singh.	
40	92	Hankel Norm Approximation of A Highly Unstable System	219
		Shashi Pandey, Shashi Kant Chaudhary, S. P. Singh, Rahul Singh Yadav and K.G. Upadhyay.	
41	93	Backstepping Approach based Controller Design for Magnetic Levitation System	224
		Brajesh Kumar Singh and Awadhesh Kumar.	
42	97	Design optimization of electrical busbars of power distribution system using Taguchi method	230
		Sumit R. Zanje and Ishant Jain.	
43	98	Comparison Parameters and Evaluation Technique to Help Selection of Right IaaS Cloud	237
		Mr. Dayuanaand Ghule and Arpita Gopal.	
44	102	Effect of Ionizing Radiation and Temperature on SiGe HBT	243
		Yogesh Kumar Verma, Varun Mishra, Prateek Kishor Verma, Santosh Kumar Gupta and Rajeev Kumar Chauhan.	
45	104	Measuring the Fault Predictability of Software using Deep Learning Techniques with Software Metrics	249
		Guru Prasad Bhandari and Ratneswer Gupta	
46	105	Comparative Performance Analysis of OMP and SABMP for Massive MIMO OFDM Channel Estimation	255
		K. Deergha Rao and B.K .Kartheek	
47	106	BFrWF: Block-based FrWF for coding of high-resolution images with memory-complexity constrained-devices.	260
		Mohd Tausif, Ekram Khan and Mohd Hasan	
48	108	Active Reflexology Actuation and Pressure Mapping Footwear Somya Gupta and Aman Malhotra	265
49	109	No Reference Quality Assessment of Blurred Images.	268
		Md Amir Baig, Athar A. Moinuddin and Ekram Khan.	
50	116	Reliable and Economy Modes of Operation for Electric Vehicle-to-Home (V2H) System	272
		Mahdi Shafaati Shemami, Syed Muhammad Amrr ,Mohammad Saad Alam,and M. S. Jamil Asghar	
51	118	FPGA Based Power Flow Control of Grid Side Converter of DFIG Wind Energy System Maloth Naresh and Ramesh Kumar Tripathi.	278
52	119	TAPPED-INDUCTOR QUASI-Z-SOURCE BASED PWM DC-DC CONVERTER	283
		Keshav Patidar.	
53	123	Computational Transformation from Web to e-book archiving Avnecsh Singhal, Prakhar Srivastava, and Suma Dawn.	289
54	126	Crosstalk in Dynamic WDM System Employing EDFA.	295
		Anamika Singh and Vishnu Priye	
55	128	Optical Properties of Hydrogenated Graphene using First-Principle Calculations,	299
		R. Santosh and V. Kumar	
56	129	Hybrid Multilevel Inverter with Reduced Switches Topology	302
0.7525-0.0		Madan Kumar Das, Akanksha Sinha and Kartick Chandra Jana	-7370
57	131	Optimization Framework for Flavour and Nutrition Balanced Recipe: A Data Driven Approach	308
		Isura Nirmal, Amith Caldera, Roshan Dela Bandara	
58	132	A Modified Seven Level Cascaded H Bridge Inverter	317
		Anil Kumar Yarlagadda, Vargil kumar Eate, Y.S.Kishore Babu and Abanishwar Chakraborti,	

59	143	Networks.	323
		Indrasen Singh and Niraj Pratap Singh	
60	145	Frame Context Dependency of Intra-Prediction Modes of H.265/HEVC: An Analytical Study	329
		Mohammad Asif, Mohd Ayyub Khan and Ekram Khan.	
61	147	A review on Key Issues and Challenges in Integration of Distributed Generation System	335
		Nikita Gupta and Seethalekshmi k.	
62	148	Performance Analysis of PMSG Wind Turbine at Variable Wind Speed.	342
		Nityanand and Ashok Kumar Pandey.	
63	150	Design of Optimally Tuned Two Degree of Freedom Fractional Order PID Controller for Magnetic Levitation Plant	348
		D.S. Achary, S. K. Mishra, P. K. Ranjan, S. Misra, and S. Pallavi	
64	154	Performance Analysis of Single and Dual Gate Vertical Channel Organic Thin Film Transistor	354
		Rashmi Rathi, Rais Ahmad, Shubham Negi and Varij Panwar	
65	155	A Survey Paper on Multicarrier Modulation Techniques.	359
		Mrinalini and Kamlesh Kumar Singh	
66	157	A Memory based meta-heuristic optimizer for optimal VAr management in power transmission system	365
		Nihar Karmakar and Biplab Bhattacharyya.	
67	160	Droop Design Methodology for Proportional Power Balancing in VSC MTDC Systems	370
		Omkar Yadav, Richa Negi and Nand Kishor.	
68	161	Study on the Frequency Tracking ability of Empirical Mode Decomposition.	375
		Stuti Shukla Datta.	
69	162	Design of Dual Core Photonic Crystal Fiber (DC-PCF) Based Temperature Sensor with Rectangular Lattice Structure	381
		Aparna Singh, Vishal Chaudhary, Vijay Shanker Chaudhary and Dharmendra Kumar	
70	164	Performance analysis of Rotated Square Sierpinski Gasket (RSSG) fractal antenna for wireless communication.	385
		Devesh, Mobd Gulman Siddiqui, Abhishek Kumar Saroj and J. A. Ansari.	
71	165	Linearity Enhancement of CMOS OTA for High Performance Applications.	389
		Narendra Prasad, Nilesh Anand Srivastava, Ritesh Kumar Jaiswal and Ram Awadh Mishra	
72	167	Partial Discharge Analysis in Time and Frequency Domain of Solid Dielectric in Power Transformer	395
		Shivam M. Bhatt, Dinesh Kumar and Krishna Patel	
73	168	A comparative analysis on the performance of different handcrafted descriptors over thermal and low resolution visible image dataset	400
		Sumit kumar and Satish Kumar Singh,	
74	169	Recognition of Bangla Handwritten Characters using Feature Combinations	406
		Halima Begum, Arshad Rafid and Muhammed Mazharul Islam.	
75	171	Fabrication of electro-spin coated Zn0.97 Fe0.03 O nano-rough thin film and application in LPG sensing.	411
		Brij Bansh Nath Anchal, Preetam Singh and Ram Pyare.	
76	172	Comparative Study of Model Reference Adaptive Control and H-infinity control to Non- Isolated Boost Converter	414
		Nibedita Swain and Nivedita Pati,	
77	174	Speech Signal De-noising using Wavelet Transform and Different Standard Software's: Performance Evaluation and Comparisons Study	418
		Lavi and Amit Kumar Ahuja	

/8	177	Problems in Distribution System	424
11.00		Trapti Yadav and, Deepti Yadav.	1004000
79	180	k-NN and LDA based Motor Imagery EEG Classification using Phase Features	429
	124	Maanvi Bhatnagar, Gauri Shanker Gupta Rakesh Kumar Sinha	
80	187	Compression of Medical Images using their Symmetry	435
81	190	Mecnakshi Srivastava and Sunceta Agarwal, Impact of Communication Delay on Load Frequency Control of Interconnected Power System	440
		Vijay P. Singh, S.K Pandey, Sanjay Agrawal and Navdeep Singh.	
82	191	The Challenges in Development of Internet of Things Based Smart Power Distribution	446
		Desh Deepak Sharma	
83	193		453
		Yogendra Kumar Upadhyaya, Mobd. Hasan and Sudhanshu Maheshwari.	
84	195	Periodically Variable Antenna Pattern for Maximizing Path Diversity Gain in MIMO Receivers	456
		Masato Suito	
85	197	A New Hierarchical Clustering Algorithm with Intersection Points	462
		Zahra Nazari and Dongshik Kang.	
86	198	Detection of ECG Fiducial Points using Moving Average Filters for Diagnosis of Cardiac Disease	467
		Shikha Choudhary and Sunita Choudhary.	
87	199	Large Signal Analysis of a Tapered Disc-Loaded Gyro-TWT	472
		Rajiv Kumar Singh	
88	201	Improving PV Array Output During Partial Shading using Voltage Balancing Approach Binoy Kumar Karmakar and Asbok Kumar Pradhan.	478
89	202	Future of Graphene based Interconnect Technology - A Reality or a Distant Dream,	484
		Vijay Rao Kumbhare, Punya Prasanna Paltani and Manoj Kumar Majumder	
90	203	Performance Evaluation of Joint Filtering and Histogram Equalization Techniques for Retinal Fundus Image Enhancement	491
		Shailesh Kumar, Shubham Choudhary, Rajeev Gupta and Basant Kumar,	
91	204	Turn-to-Turn Fault Detection in Indirect Symmetrical PST Based on Negative Sequence Current Components	496
		Shailendra Kumar Bhasker and Manoj Tripathy.	
92	205	Behaviour Analysis of PMSM Drive using ANFIS Based PID Speed Controller Deepti Yadav and Arunima Verma	502
93	207	A novel Fast Alterable Duty (FAD) MPPT procedure for Solar PV Hybrid Vehicles	507
		Mohammed Aslam Husain, Arif Iqbal, Yudhishthir Pandey, S. P. Singh and Aba Tari.	
94	208	Parallel Manipulator control using different LQG tuning	511
		Chandan Choubey and Jyoti Ohri.	
95	211	Study of Sigmoid Spectral Composite Kernel based noise classifier with entropy in handling non linear separation of classes	517
		Ishuita SenGupta, Anil Kumarand Rakesh Kumar Dwivedi	
96	215	Study of Extended SM scheme over Generalized α – μ fading channel.	523
		Aayesha Khatoon and Mohd. Sharique.	
97	216	A Cost-effective Mobile Sensing System intended for Continuous Monitoring of Vehicular Emissions for Air Quality Monitoring Applications.	528
		Pronadcep Bora, Monish Kumar Choudhury, J. Arul Valan and Jay Chandra Dhar.	

98	217	MOSFET	534
		Anjali Gupta, Narendra Yadava and R. K. Chauhan	
99	218	Characterization and Global Parameter Extraction of bulk MOSFETs using BSIM-BULK Model.	539
		Shivendra S. Parihar, Chandan Jhay, Ramendra Singhy, Ramchandra Gurjar and Abhisek Dixit.	
100	219	Development of EMT Model for Circulating Current Control	545
		Ankit Yadav , S. N. Singh and S. P. Das.	
101	225	Optimal Placement of TCSC and STATCOM for Voltage Stability Enhancement in Transmission Network	551
		Mahiraj Singh Rawat and Ruchi Tamta.	
102	226	Analysis of Sinusoidal PWM and Space Vector PWM based diode clamped multilevel inverter	557
		Akhilesh Sharma, Deepak Singh, Pukhrambam Devachandra Singh and S. Gao.	
103	227	A Survey: Speech Recognition Approaches and Techniques	563
		Atma Prakash Singh ,Ravindra Nath and Santosh Kumar.	
104	229	Analysis of different types of core materials in Photonic crystal Fiber	568
1.174-174-11		Ravindra kumar Sharma, Sunil Sharma and Kirti Vyas	11700000
105	230	Investigation of Planar and Double-Gate Junctionless Transistors with Non-Uniform Doping	574
	1997.50.0	Dipak Kumar Singh, Puli Kishore Kumar and M.W Akram	
106	232	Impact of Asymmetricity in Gate Oxide on the RF Performance of FDSOI MOSFET	579
100		Narendra Yadava and R.K. Chauhan	3,3
107	234	Recognition of Handwritten Numerals of various Indian Regional Languages using Deep Learning	582
		Saumya Chaurasia and Suneeta Agarwal.	
108	238	Dual-Band Dual-Beam Microstrip Patch Antenna for Intelligent Transportation Systems Application.	588
		Shivesh Tripathi, N. P. Pathak and M. Parida.	
109	242	A Flexible Copper Incorporated Carbon Nano Fibers Grown Activated Carbon Cloth as Anodes for Sodium Ion Batteries.	593
		Indu Pandey and Jai Deo Tiwari.	
110	243	SBPSO-LB: SB-PSO based Secure Load Balancing Approach for Cloud Data Center with RSA	598
		Sweta Dey	
111	244	Model Reduction of Linear Dynamical MIMO Systems by Using Balanced Realization and Moment Matching Algorithm.	604
		Arvind Kumar Prajapati and Rajendra Prasad.	
112	245	Gate Stacked FD-SOI MOS Structure for Better Controllability at High Frequencies	610
		Jyotsana Singh, Narendra yadava and R.K. Chauhan	
113	246	Role of High-k in 32nm FDSOI MOS Transistor for High Frequency Applications	615
	247	Ankita Pandey, Narendra Yadava and R. K. Chauhan	620
114	247	A Comparative Analysis for Optimal Placement of DG and Capacitor for Loss Minimization in Benchmark Network	620
		Arpit Srivastava, Niraj Kumar Choudhary and Nitin Singh.	11000
115	255	Netra: Smart Hand Gloves Comprises Obstacle Detection, Object Identification & Ocr Text To Speech Converter for Blinds Frequencies.	626
		N.K. Srivastava and Satyam Singh.	
116	257	Off-line Signature Verification through Machine Learning Avani Rateria and Sunceta Agarwal	630

117	259	Improved Widrow-Hoff Based Adaptive Control of Multi-Objective PV-DSTATCOM System	637
		Gaurav Modi, Shailendra Kumar and Bhim Singh.	
118	263	Decision Making for E-learners based on Learning Style, Personality, and Knowledge Level	643
		Mukta Goyal, Divakar Yadav and Mehak Sood.	
119	264	Optimization of Capacity Allocation Problem in 4G LTE Mobile Networks	648
		Rajalakshmi Krishnamurthi and Mukta Goyal.	
120	265	Prediction of Consumer Behaviour using Random Forest Algorithm	653
		Harsh Valecha, Aparna Varma, Ishita Khare, Aakash Sachdeva and Mukta Goyal.	
121	266	An Approach to Enhance the Life of Transformer and the Battery of Gridable Vehicles Menaka Karki and Jai Govind Singh	659
122	267	Optimal Scheduling of Customers' Demand based upon Power Availability and its Price in Smart Grid	667
		Mukkamalla Srikanth Reddy and Jai Govind Singh	
123	271	A Dedicated CCC based Data Channel Selection Scheme with Proactive Hand-off in Cognitive Radio Network	674
		Vivek Rajpoot and Vijay Shanker Tripathi	
124	272	Online Food Court Payment System using Blockchain Technology	680
		Arun Yadav, Divakar Yadav, Sonam Gupta, Dharmendra Kumar and Pankaj Kumar	
125	273	Tuning of Passband in Compact Substrate Integrated Waveguide Bandpass Filter by Controlling Higher Order Modes.	687
		Soumit Samadder Chaudhury, Seema Awasthi and Rajat Kumar Singh.	
126	274	VME system based technique for IGBT Switching and Current	691
		Dinesh Kumar Sharma, Akhilesh Kumar Singh and Subrata Pradhan.	
127	276	Comparative Analysis Between Sliding Mode Control and Feedback Linearization For Robotic Manipulator	697
		Gaya Prasad, Awadhesh kumar and Akhilesh Singh.	
128	277	Congestion control in software defined network	702
		Tanmay Jain, Dharmender Singh Kushwaha and Sharbani Mallick	
129	278	Hexagonal Boron Nitride: A Material Odyssey for the High Performance of OTFTs Shagun Pal and Brijesh Kumar	707
130	279	Design and Simulation of Smart Prepaid-Postpaid Energy Meter with Alarm and Theft Control	712
		Kumar Ask, Navneet Kumar Singh, Asheesh Kumar Singh, Dinesh Kumar Singh and Kundan Anand.	
131	280	Analysis of Effectiveness of PMU based Wide Area Monitoring System in Indian Power Grid	718
		Marwan Ahmed Abdullah Sufyan, Mohd Zuhaib and Marzieh Sefid, Mohd Rihan.	
132	281	Deep Learning based Command Pointing direction estimation using a single RGB Camera Shruti Jaiswal, Pratyush Mishra and G.C. Nandi	724
133	283	Micro-controller Based Water Pumping System using Solar Energy	730
11000000		Prakhar Kumar Singh, Omveer Singh, and Shivam Pandey	1/1/2002
134	285	An Analysis on Arduino based Single Axis Solar Tracker	735
		Prachi Rani, Omveer Singh, and Shivam Pandey	11.000
135	288	Congestion Comparative Analysis of Optimized Algorithms for Ontology Clustering	740
		Avantika Tiwari and Ajay Kumar	্ৰ কৰা
136	289	Four Element Dual-band Sub-6 GHz 5G MIMO Antenna Using SRR-loaded Slot-Loops.	747
		Debdeep Sarkar and Kumar Vaibhay Srivastava.	110000
137	290	Frequency Reconfigurable Compact Multi-Band Printed Monopole Antenna Using Capacitively Loaded Loops.	752

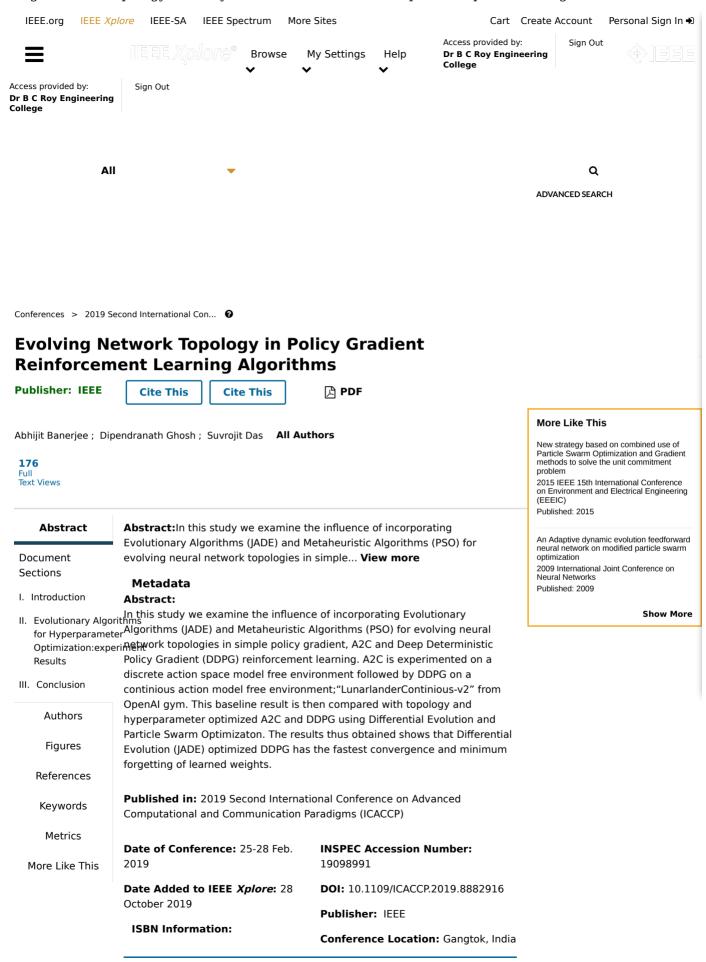
		Mehak Bansal, Debdeep Sarkar and Kumar Vaibhav Srivastava.	
138	291	Fuzzy Based Smart Farming using Wireless Sensor Network	758
		Ravi Yadav and A.K Duniel.	
139	292	Investigation of Field Plate Misalignment on Electrical Characteristics of AlGaN/ GaN HEMT.	764
		Khushwant Sehra, Vandana Kumari, Mridula Gupta and Manoj Saxena.	
140	293	Design and Analysis of SPV array fed Water Pumping System using BLDC motor with different Converter Topologies Smriti Mishra, S. K. Sinha and A. S. Pandey	770
141	296	A Robust Trust Model for Wireless Sensor Networks	777
141	270	Amit Kumar Gautam and Rakesh Kumar.	
142	297	No-Reference Image Quality Assessment of Blur and AWGN Contaminated Images Utilizing Colour Features	782
		Mohammad Usman Khan, Md Amir Baig and Athar Ali Moinuddin.	
143	299	Standalone Hybrid Power Generation using Photovoltaics, Battery and Bio-gas	788
		Kundan Anand, Navneet Kumar Singh, Asheesh Kumar Singh, Dinesh Kumar Singh and Kumar Ask.	
144	300	A Stacked Patch MIMO Antenna With Circular Polarization for non-invasive Blood Glucose Sensing Application	794
		Saurabh Raj, Gaurav Upudhyay, Nand Kishore, , Shivesh Tripathi, and Vijay Shanker Tripathi.	
145	302	Forecasting Methodology Used in Restructured Electricity Market: A Review	798
		Aishvarya Narain and S.K.Srivastava	
146	303	Multi Band Antenna with Multi Band Notch 2.5/3.7/6.4/8.1/12.4/14.4GHz Characteristics	804
		Praveen Kumar Rao and Rajan Misra.	
147	305	Impact of donor-layer doping & thickness, Gatelength and temperature on potential and electron concentration in AlGaN/GaN Double-Heterostructure and Single-Heterostructure HEMT	809
		Nisha Chugh, Monika Bhattacharya, Manoj Kumar and R.S. Gupta,	
148	308	Comparative Analysis of Control Schemes in Grid Connected PV	814
		Ritesh Goyal, Singh Rupal H., Nand Kishor and Soumya R. Mohanty	
149	310	Sensor Cloud: Integrating Wireless Sensor Networks with Cloud Computing	820
		Rajendra Kumar Dwivedi and Rakesh Kumar.	
150	311	A Scheme for Detection of High Transmission Power Based Wormhole Attack in WSN	826
		Rajendra Kumar Dwivedi, Prachi Sharma and Rakesh Kumar,	
151	312	PiScanner: Economical User-driven Context based OCR Translator	832
		Vipin Kumar Pandey, B.Chaminda Charan, Vikas Meena and Suddhasil De.	
152	313	Performance Analysis of Energy Detection Based Cognitive Radio over GBK Fading Channel	838
		Manisha Bhatt and Sanjay Kumar Soni.	
153	315	Performance Analysis of Dual Branch MRC Diversity over Non-identical Mixture of Gamma Distribution.	841
		Puspraj Singh Chauhan and Sanjay Kumar Soni	
154	318	Comparative Analysis of Photonic Bandgap and Transmittance in 1D Photonic Crystals	845
		Upendra Kumar Mishra, Vishal Singh Chandel, , Isht Vibhu, and Prabal Pratap Singh	
155	319	Bandpass Frequency Selective Surface with Wide Shielding Effectiveness	850
		Chitra Singh and Kumud Ranjan Jha.	
156	326	Chalcogenide Glasses: Thin Film Deposition Techniques and Applications in the Field of Electronics Sensor Tripothi Britach Kumus and D.F. Deposition	853
		Sonam Tripathi, Brijesh Kumar and D.K Dwivedi	

157	327	Internet of Everything: A survey based on Architecture, Issues and Challenges	857
		Anu Raj and Shivu Prakash.	
158	328	Performance Analysis of Different Bootstrap Inverter Configurations using Dual Gate OTFT	863
		Neha Mishra , Poornima Mittal and Brijesh Kumar	
159	329	Pentagonal Monopole Patch Antenna for UWB, X-Band and Ku-Band with Parasitic Resonator	868
		Milind Saurabh Singh and Rajan Mishra	
160	330	Rectangular Monopole Patch Antenna for C-band and X-band Applications.	872
		Milind Saurabh Singh and Rajan Mishra.	
161	332	A Leaky-Wave Antenna With Improved Directivity and Scanning Range.	876
		Ajay Kumar Tiwari, Seema Awasthi and Rajat Kumar Singh	
162	336	STAP Based Detector for Multi-Dynamic Radar in Homogeneous Clutter Scenario.	881
		Jawed Qumar, S Christopher and Ratnajit Bhattacharjee.	
163	337	Basis for Tracking Area Reconfiguration for 5G Networks Aman Sanwal, M J Nigam and P M Pradhan	886
164	339	Improved Exon Prediction Technique by De-noising Period-3 spectrum with SVD Algorithm	891
		Amit Kumar Singh and Vinay Kumar Srivastava.	
165	340	Novel Combined Coordination of Distance and Overcurrent Relay for a Radial Distribution System	896
		Dinesh Kumar Singh, Asheesh Kumar Singh, Soumya Ranjan Mohanty and Navneet Kumar Singh.	
166	341	A Content Analysis Based Recommender System using Categorization of Online Text Resources on Five-Dimensional Human Cognitive System	902
		Rohit, Tanu Agarwal, Suyash Mani Sharma, Sandeep Gupta and Anil Kumar Singh.	
167	342	Surface Plasmon Amplification in Transition Metal Nitrides based Gain Assisted Core-Shell Nanoparticles	908
		Pankaj Pathania and Manmohan Singh Shishodia	
168	343	Conducting artificial enzymatic nanocubes based electronic sensor for simultaneous detection of hemoglobin and glycated hemoglobin in diabetic patients	912
160	345	Indu Pandey and Jai Deo Tiwari A Robust SRAM cell for high performance Register File	016
169	343		916
470	246	Ravish Kumar, Manisha Pattanaik and Gaurav Kaushal	022
170	346	Optimal Trajectory Tracking of Robotic Manipulator using Ant Colony Optimization	922
	7.47	Ruchi Singh and Lal Bahadur Prasad	
171	347	Development of Feature Extraction and Classification for Bearing Fault Analysis of Induction Motor	928
202.EX	2.40	R. K. Patel and V. K. Giri	1222
172	349	Workspace and Singularity Analysis of Five Bar Planar Parallel Manipulator.	936
7.00		Ram Bilas Prasad and Mohd Arif.	712
173	350	Decentralized SoC based Droop with Sliding Mode Current Controller for DC Microgrid Santosh Kumari and Sukumar Mishra	942
174	354	PV-Hydro-Battery Based Standalone Microgrid for Rural Electrification Seema, and Bhim Singh	947
175	357	An Empirical Model to Enhance the Flexibility of gm/Id Tuning in BSIM-BULK Model.	953
11101000		Ravi Goel, Chetan Gupta, and Yogesh S. Chauhan	101000
176	358	Wireless sensor network for characterizing the effectiveness of a fan ventilated telescope enclosure.	957
		T. S. Kumar, Shobhit Yadava and A. K. Singh.	
177	361	A New Information Hiding Approach using Haar- Wavelet Transformation	962
		4245044740455 454, TATO FILE CONTRACTOR TO THE STATE OF STATE OF THE S	

		Tanmoy Halder, Kh. Amirul Islam, Anup Pasari and Sunil Karforma	
178	362	Semi-Automated System Based Defect Detection in Software Requirements Specification document	967
		Nancy Vaish and Ashish Sharma,	
179	364	Evaluation and Research Directions in Nature-Inspired Algorithms	972
		Rohit Kumar Sachan, Suraj Gupta and Dharmender Singh Kushwaha.	
180	365	Analysis, Modelling and Design of Resonant Dual Active Bridge Isolated Bi-Directional dc/dc Converter for Minimizing Cold Start Effect of Fuel Cell Vehicle	977
		B. Mallikarjuna Reddy and Paulson Samuel	
181	367	Optimized SHE-PWM Technique for Low Distortion Single Phase MLI for PV Standalone System,	984
		Prabhu Omer, Jagdish Kumar and Balwinder Singh Surjan	
182	370	Smart Home Load Manager Algorithm under Demand Response	990
		Vaibhav Jain, Naveen Jain and S. N. Singh	
183	376	A Review on Web Services Interoperability Issues Jaspreet Chawla , Anil.k. Ahlawat and Gunjan Goswami	999
184	377	Economical Load Dispatch Using Modified Harmony Memory Search Optimization Technique	1004
		Tanmoy Mulo, Prasid Syam and Amalendu Bikash Choudhury.	
185	378	Receding Horizon Control Strategy for Energy Storage Devices Incorporating Capacity Loss	1010
		Desh Deepak Sharma	
186	380	A PSO based Fractional Order PI (FOPI) controller design for a Shunt Active Power Filter for Harmonic Elimination	1016
		Abhishek Srivastava, Dushmanta Kumur Dus and Akshay Kumar.	
187	382	Performance analysis of n-channel MoS2 FET with variation of oxide thickness and channel length	1022
o person	10010/0474	Prachi Singh and Bramba P. Pandey	
188	383	Chaos control of an extended four dimensional fundamental power system using sliding mode control	1026
		Manish Kumar and Piyush Pratap Singh.	
189	384	A New Multilevel Inverter Topology with Reduced Switch Count and Device Stress	1032
		Prabhu Omer, Jagdish Kumar and Balwinder Singh Surjan.	
190	385	Energy-efficient Aggregation-aware IEEE 802.15.4 MAC Protocol for Railway, Telemedicine & Industrial Applications.	1038
		Manoj Tolani, Sunny and Rajat Kumar Singh	
191	389	Control of Grid Fed PV Generation using IIR Peak Filter in Distribution System	1043
		Bhim Singh and Pavitra Shukla.	
192	394	RFPA Nonlinearity Compensation with MIMO Diversity for Indoor Channels.	1049
		Anurag Vijay Agrawal and Meenakshi Rawat	
193	395	Design of Out Pipe Crawler for Oil Refinery based on Analysis and Classification of Locomotion and Adhesion Techniques	1054
		Devesh Mishra, K. K. Agrawal, R.S. Yadav and Rekha Srivstava.	
194	396	Regulation of DC Bus Voltage for DC MicroGrid Using PSIM	1061
		Gaurav Singh, Vikas Verma, Shabana Uroo ¹ and Ahteshamul Haque.	
195	397	Grid Connected Renewable Energy Based EV Charger With Bidirectional AC/DC Converter	1067
		Pandla Chinna Dastagiri Goud, Chandra Sekhar Nalamati and Rajesh Gupta	
196	398	Fuzzy Based Prediction Model Using Rainfall Parameter for North eat India Maize production	1073
		A.K. Daniel, Prachi Sharma and Rashi Sriyastava.	

197	405	IOT Based Status Tracking and Controlling of Motor in Agricultural farms Sri J. Balakrishna, Mr. Himamsu Marellapudi and Dr. N. Alivelu Manga,	1079
198	409	Design and Analysis of Grid-Interactive DFIG Based WECS for Regulated Power Flow	1084
		Sambasivaiah Puchalapalli, Bhim Singh, S.K. Tiwari and P.K. Goel.	
199	411	Optical Investigations of Thermally Evaporated Ge10Se60Te30 and Ge8Se60Te30In2 Chalcogenide Thin Film for Optical Memory Devices.	1090
		Pravin Kumar Singh, Surabhi Mishra, Brijesh Kumar, and D. K. Dwivedi	
200	413	Chalcogenide glasses for sensor application: A Review Surabhi Mishra, Priyanka Jaiswal, Pooja Lohia and D. K. Dwivedi	1094
201	415	Distributed Incremental Adaptive Filter Controlled Residential Photovoltaic-Battery Microgrid for Rural Electrification	1099
		Bhim Singh and Shailendra Kumar.	
202	416	Folding and Register Minimization Transformation On DSP Filter Aksha Joy and C. S. Vinitha	1105
203	419	Spherical and Cylindrical Plasmonic Nanoparticles for Enhanced Light Trapping in Photovoltaic Cells	1111
		Alok Singh, Pradeep Kumar and Manmohan Singh Shishodia	
204	420	A Compact Band Notched Monopole Antenna with Defected Ground Plane for UWB Applications.	1116
		Sunil Kumar Gupta and Rajan Mishra	
205	422	Solar PV-BES Based Microgrid System with Multifunctional VSC	1120
		Vivek Narayanan and Seema and Bhim Singh.	
206	423	Voltage and Frequency Regulation with Load Leveling of a PMSG Based Pico-Hydro System Using SLMS Control Algorithm	1126
		Vineet P. Chandran , Shadab Murshid, and Bhim Singh.	
207	424	A novel distributed T-equivalent circuit model of a microstrip interdigital capacitor.	1132
		Salman Raju Talluri.	
208	425	Isolated Zeta Converter Fed SRM Drive with High Power Conversion Efficiency Aniket Anand and Bhim Singh.	1135
209	426	Power Quality Improvement In Sensorless Direct Torque Controlled Induction Motor Drive	1141
209	420	Piyush Kant and Bhim Singh.	1141
210	427	SyRG-PV-BES Based Standalone Microgrid Using Appoximate Multipliers Based Adaptive Control	1147
		Rohini Sharma, Seema and Bhim Singh.	
211	429	Review Paper on Solar Tapping -a Sustainable Resource	1153
211	-	Prayeen Kumar Mishra, Prabhakar Tiwari and Vivek Singh.	1133
212	430	Feature based leaf identification	1159
216	130	Nagendra Pratap Singh, Takumi Nagahama, Pratima Yaday and Diyakar Yaday.	1133
213	431	Modified Notch Filter Based Control for Wind Energy Generation System Integrated to Single-Phase Weak Grid	1166
		Tripurari Nath Gupta, Shadab Murshid and Bhim Singh.	
214	432	Melanoma Skin Cancer Detection Using Various Classifiers	1172
Marie I	100	Preeti Shahi, Shekhar Yadav, Navdeep Singh and Nagendra Pratap Singh.	3000
215	433	Panorama Generation From a Video	1177
-	02/2/2011	Suma Dawn, Apoorva Khera , Niyati Agarwal and Anuja Arora.	
216	434	Comparative Analysis of Buried-Gate GaN OPFET Models for UV Photodetector Applications.	1181
		Jaya V. Gaitonde, Sudhir Pal Singh Rawat and R. B. Lohani.	

217	435	A Novel Structure for Piezoelectric Based MEMS Energy Harvester.	1189
		Anil Chamuah, Kurmendra and Rajesh	
218	436	Integrated Energy Management Framework for Environmentally Sustainable Energy Access	1193
		Naran Pindoriya, Aristides Kiprakis, Choksi Kushan Ajay, S N Singh , Dinesh Garg, Deepak Padmanabhan and John Thompson.	
219	437	Ultra-Flat Dispersion with High Nonlinearity Hexagonal Photonic Crystal Fiber.	1201
		Arpit Singh Yadav, Aparna Singh, Vijay Shanker Chaudhary and Dharmendra Kumar	
220	438	Impact of Doping Concentration on the performance of TMG Re-S/D FDSOI MOSFET.	1204
		Anjali Priya, Nilesh Anand Srivastava and Ram Awadh Mishra	
221	439	Performance Investigation of Cylindrical Double Gate Junctionless FET.	1210
		Balraj Singh and Satyabrata Jit.	
222	440	Organic Solar Cell: Operating Principle, Performance Parameters, Structures and Its Advantages Suboori Najam and Brijesh Kumar	1215
223	441	A Multi-layered Outlier Detection Model for Resource Constraint Hierarchical MANET	1221
		Adarsh Kumar, Alok Aggarwal and Divakar Yadav	
224	442	Organic Humidity Sensors with Different Materials and Its Application in Environment Monitoring	1228
		Chandani Dubey and Brijesh Kumar	
225	443	Thin Film Deposition and Characterization for Various Applications Neha Pandey, Sonam Tripathi, Brijesh Kumar and D. K. Dwivedi,	1234
226	444	Significance of Pass Transistor Logic in Organic Electronic Circuits.	1240
		Arun Pratap Singh Rathod, Poornima Mittal ,Brijesh Kumar and Anamika Bhatia.	
227	445	Detection of Ovarian Cancer using Organic Light Emitting Diodes	1245
		Shubham Negi,Poornima Mittal ,Brijesh Kumar and Anamika Bhatia	
228	446	Statistical Analysis of EMG and GSR Therapy on Visual Mode and SF-36 Scores for Chronic TTH	1248
		Rohit Rastogil, D.K. Chaturvedi, Himanshu Verma, Himanshu Saini, Kunal Singh Mehlyan and Yatharth Varshney.	
229	447	Outcome-Based Education (OBE) Academic Planning-An Insight into All Round Development of an Engineer Abbya Tiwari, Aishwarya Singh, Shivangi Shukla "Shivani Mishra, Eshaan Goyal and Brijesh Kumar.	1254
230	448	Impact of Different Organic Semiconductor Materials on Performance of Dual Gate OTFT.	1259
150000		Vivek Kumar Singh, Richa Srivastava, Shagun Pal , Anil Kumar Baliga, and Brijesh Kumar	0775
231	450	Design, Modelling and Implementation of an Attraction type Levitation Prototype with tilt Control	1264
		Janardan Kundu.	



1 of 2 17/02/21, 12:01 pm

Contents

I. Introduction

A deep model of the artificial neural network with multiple hidden layers often dubbed as Deep Neural Networks is prinarilly trained by gradient based algorithms. The most popular and successful such gradient based algorithm is the Backpropagation Algorithm which uses the Stochastic Gradient Descent approach for wiight optimization. Computation power surge in modern days has seen the advent of multicore CPUs and GPUs which were crucial in computing the matrix multiplication in weight update of neuaral networks with millions of weights. This was crucial in classification or regression type problems (supervised) or even in recursive problem solving as stated by various publications [1]-[3].

Authors	~
Figures	~
References	~
Keywords	~
Metrics	~

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2 of 2 17/02/21, 12:01 pm

Neural Machine Translation System of Indic Languages - An Attention Based Approach
Parth Shah (Uka Tarsadia University & Chhotubhai Gogaibhai Institute of Technology, India), Vishvajit Bekrola (Uka Tarsadia University, India)

Geophysical Remote Sensing and Geographic Information System

Role of Humidity Content on Atmospheric Turbulence and Essay on Earthquake Precursor Studies
Prancy Ghosh (Netaji Subhash Engineering College, India), Arrist De (Netaj-Subhash Engineering College, India)

AgriSense: Automatic Imigatum Utibity Syntem Using Wireless Sensur Network and Web of Things
Gridhar Urkude (National Institute of Technology, Raipur, India), Manju Pandey (NET Raipur & MANIT Bhopal, India)

Generation of Vegetation Fraction (VF) from Resourceset-2 AWVS Images
Suresh Rumar M (NATIONAL REMOTE SERSING CENTRE, 15RO, India), V Keerthi (NATIONAL REMOTE SENSING CENTRE, 15RO, India), RN Anjar
(NATIONAL, REMOTE SENSING CENTRE, India), Ch Venketeswara Rai (NRSC, India)

Quantification of Particulate Matter Using Haze Optimized Transform (HOT) of Opeansat-2 OCM Data

Santha PK (National Remote Sensing Centre, Indian Space Research Organisation, India), Jayabharathi Sethuraman (NATIONAL REMOTE SENSING CENTRE, India), Ch Venkateswara Rai (NRSC, India)

Use of Remote Sensing Data for Exploring Potential Evapotranspiration over Gangtok

Prava Adhikan (Sikkim Manipal Institute of Technology, India), Swastika Chakrationty (Sikkim Manipal Institute of Technology, India), Senat Das i
Manipal Institute of Technology, India)

Human Computer Interaction, Mechatronics and Robotic

Implementation of a Two Wheel Self-Balanced Robot Using MATLAB Simscape Multibody
Shubham Mohapatra (Delhi Technological University, India), Rachit Srivastava (Delhi Technological University, India), Rispesh Khera (Delhi Technologi

Graph, Geometric Algorithms and Applications

Perturbid Layered Graphs

Bhadrachalam Chitturi (Amrita School of Engineering, Amritapuri, USA)

Analysis of Algorithm & on Full Binary Trees

Induelsho T 5 (Amrita Vishwa Vidya Peetham, Amritapuri, Koltan, India), Bhadrechalam Chitturi (Amrita Vishwa Vidyapeetham, Amritapuri, India

Material Science and Nano Technology

Sensitivity Einancement of Rezonastive Pressure Sensor Using Carbon Nanotube as a Plezonasistor
Ajayakumar C Kataperi (Basaveshwar Engineering College, Bagalkot, India)

Design of Double Gate Nano-FET
Kuleen Kumar (National Institute of Technology Mizoram Alzawi, India), Lalthanpui Khiangte (National Institute of Technology Mizoram, India), Ri

Sankar Dhar (National Institute of Technology Mizoram, India)

Improvement in Efficiency Diroop of Green Light Emitting Dirde Using Lattice Matched Barrier

Shameem Ahmail (Aligarh Muslim University, India), Mohd Adit Raushen (Aligarh Muslim University, India), Mohammati Jawaid Siddiqui (Aligarh P University, India), Parvez Alvi (Banasthali University, India), Sandhys Kattayat (Higher Colleges of Technology, United Arab Emirates)

1 of 1 17/02/21, 12:03 pm

N1 0110
Neural Stegoclassifier
Lacezar Licev, Jakub Hendrych, and Radim Kuncicky
Polymorphic Malware Detection
Nur Syuhada Selamat, Fakariah Hani Mohd Ali, and Noor Ashitah Abu Othman
Linguistic Based Steganography using Lexical Substitution and Syntactical Transformation
Ari Moesriami Barmawi
Holistic-Based Feature Extraction and Error Correcting Code Biometric Template
Protection Technique
Suzwani Binti Ismail, Fakariah Hani Mohd Ali, and Syed Ahmad Sheikh Aljunid
A Network based IMSI Catcher Detection
Simen Steig, Hai Thanh Nguyen, Andre Arnes, and Thanh van Do
Fault Analysis of Data Upload Process in Ostrava, Czech Republic using Measured
Network Parameters
Ondrej Grunt, Jan Plucar, and Lukas Kapicak
Better Protection of SS7 Networks with Machine Learning
Kristoffer Jensen, Thanh van Do, Hai Thanh Nguyen, and Andre Arnes
Identity Management of Devices in Internet of Things Environment
Low-Power, Long-Range, High-Data Transmission Using Wi-Fi and LoRa
Light-weight API-call Safety Checking for Automotive Control Software using
Constraint Patterns
Dongwoo Kim and Yunja Choi
SmartDriver: Extenstion of Scienium WebDriver to Create More Efficient
Automated Tests
Miroslav Bures and Martin Filipsky
Functionality versus Complexity Analysis of Project Management Software in
Kingdom of Bahrain
Sarmad Mohammad
Model-Based Testing and Exploratory Testing: Is Synergy Possible?
An Automated ECG Beat Classification System using Convolutional
Neural Networks
Muhammad Zubair, Jinsul Kim, and Changwoo Yoon
Author Index

1 of 1 17/02/21, 12:06 pm



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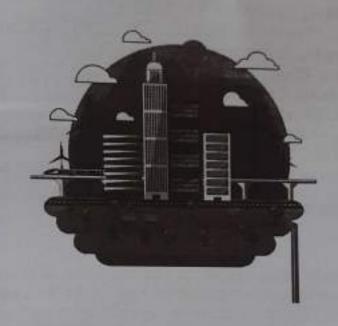


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CONTENTS

Theme Is Smart Infrastructure Plan

Production of the second secon	
Energy efficient planning for infrastructure development	05-16
Tor Enhancing Sustainability and Resilience	
Sale and Congestion Free Smart Transport System	00 =+
Urban Renewal and Assets Managements	23-51
Disaster Risk Reduction and Management	71.00
Regulatory and Governance Challenges	83-91
Theme II: Sustainable Wanagement of	
Water & Environment Systems	
Approaches to Sustainable Water Resources Managementg	3-110
Measures for Climate Change Adaptation and Resilience and Storm Water and Flood Management Challenges and Case Studies11	1-127
Innovations in Water and Wastewater Treatment12	9-152
Air Quality Improvement15	3-160
Management of Industrial and Hazardous Waste16	1-170
Innovative Solid Waste Utilization and Recycling Method	01-01-160-17 7 .7
Theme III: Innovative Materials and Structural bull	
Innovative Construction Materials and Technologies17	9-232
Structure and Soil Dynamics	3-263
Ground Improvement Techniques26	5-281
Recent Trends in Pavement Design	3-304
Uncertainty Analysis in Civil Engineering	5 212
Structural Health Monitoring	200
Aerodynamic Effects on Structure	3-329
Aerodynamic Effects on Structure and	
Retrofitting of Structures and Advanced Analysis	345
Retrofitting of Structure and Advanced Analysis	-355

Theme III Innovative Materials and Structural Design STRUCTURE AND SOIL DYNAMICS

AIC2020-30-326

EFFECTS OF DRAG FORCE LINEARIZATION AND DAMPER PLACEMENT OPTIMIZATION ON SEMI-ACTIVE SLIDING MODE CONTROL OF OFFSHORE STRUCTURES

A. Som' and D. Dasb

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A semi-active control system using MR dampers is developed for seismic vibration mitigation of offshore jacket platforms. The semi-active control algorithm considered is the sliding mode algorithm because it is robust against uncertainties and imprecision. The effect of linearization of drag force on the behavior of the jacket platforms and the performance of controller need to be understood. The number and placement of MR dampers have a significant influence on the effectiveness of the controllers. Being located in hostile sea environments, the deployment of the MR dampers is restricted due to practical difficulties of installation and maintenance and cost implications. Thus, study needs to be carried out to ascertain the optimum number and placement of these dampers and their effects on the structural response and controller performance. The motivation and objective of the present study is to investigate the effects of drag force linearization and damper placement optimization on semi-active sliding mode control of offshore jackets platforms. MR dampers are installed at different positions and the command voltages supplied to these dampers are regulated through the clipped-optimal algorithm. A comparative study of the responses of the 5th storey is also been done showing the effect of self-excited force on the given jacket structure. The results indicate that the semi-active control system is stable and robust, and is also effective in reducing the seismic vibrations induced in the structure. It can be concluded that the predicted controller effectiveness based on numerical study is conservative when drag forces are linearized since a decrease in percentage reduction is observed for almost all the responses. Also, drag force linearization gives conservative estimates of the structural responses; the overestimation being more for displacement and velocity than for acceleration. Comparing the results obtained for all the different combinations of MR dampers position and numbers and taking into consideration the cost and difficulties of placement of dampers in the bottom stories near the sea bed, the placement of MR dampers in the top two stories of the jacket structure can be considered to be an optimum solution.

AIC2020-317-484

ESTIMATION AND COMPARITIVE ANALYISIS OF SETTLEMENTS OF BORED PILE FOUNDATION

Yashwant Dadi', Senior Engineer, Infinite Civil Solution Pvt Ltd, Email ID : dadiyashwantics@gmail.com Rajat Purwar', Geo Tech Engineer Dilip Buildcon Ltd, Email id: rajat.eddie.1@gmail.com

The paper describes the estimating settlement of bored cast in situ test pile on the site of Bhopal Metro Rail Project, Bhopal. The bored pile foundation supports pier with box girder as superstructure. For settlement calculation 5 methods were employed, such as Vesic's Method, Bowles Method, Method in IS 8009: Part 2, Schmertmann Methods and modelled numerically in Geo 5 Pile software package. This software computes the load-displacement curve on the pile head under vertical loading. The results obtained by applying these methods were compared with experimental results on construction site. On site, experiment results were acquired from Static load test on one test pile and four anchor reaction piles.



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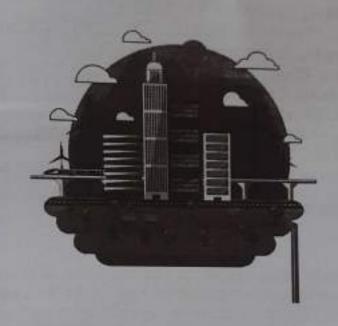


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CONTENTS

Theme Is Smart Infrastructure Plan

Production of the second secon	
Energy efficient planning for infrastructure development	05-16
Tor Enhancing Sustainability and Resilience	
Sale and Congestion Free Smart Transport System	00 =+
Urban Renewal and Assets Managements	23-51
Disaster Risk Reduction and Management	71.00
Regulatory and Governance Challenges	83-91
Theme II: Sustainable Wanagement of	
Water & Environment Systems	
Approaches to Sustainable Water Resources Managementg	3-110
Measures for Climate Change Adaptation and Resilience and Storm Water and Flood Management Challenges and Case Studies11	1-127
Innovations in Water and Wastewater Treatment12	9-152
Air Quality Improvement15	3-160
Management of Industrial and Hazardous Waste16	1-170
Innovative Solid Waste Utilization and Recycling Method	01-01-160-17 7 .7
Theme III: Innovative Materials and Structural bull	
Innovative Construction Materials and Technologies17	9-232
Structure and Soil Dynamics	3-263
Ground Improvement Techniques26	5-281
Recent Trends in Pavement Design	3-304
Uncertainty Analysis in Civil Engineering	5 212
Structural Health Monitoring	200
Aerodynamic Effects on Structure	3-329
Aerodynamic Effects on Structure and	
Retrofitting of Structures and Advanced Analysis	345
Retrofitting of Structure and Advanced Analysis	-355

Theme III Innovative Materials and Structural Design STRUCTURE AND SOIL DYNAMICS

seismic hazard studies. The recorded seismogram data has collected from the Delhi, Punjab and Haryana seismic hazard studies. The seismic hazard studies of moment magnitudes of the Delhi, Punjab and Haryana region of India. Overall, four earthquakes of moment magnitudes M, 3.1, M, 3.5, M, 4.0 and M, 4.9 data region of this data has obtained from the soil type site which has recorded within the soil of the soil type site which has recorded within the soil of the so region of India. Overall, has obtained from the soil type site which has recorded within the hypo-central has collected. This data has obtained from the soil type site which has recorded within the hypo-central has collected. This data the source of earthquake event. Total 30 horizontal components of all the four distance of 100 km from the selected data has used to estimate the kappa which gives kappa factor(κ_n), the selected data has used to estimate the kappa which gives kappa factor(κ_n), earthquake events has deen transfer of exp($-\pi\kappa f$) of Fourier Amplitude Spectrum. The Fourier with the help of exponentially decay trend of $\exp(-\pi\kappa f)$ of Fourier Amplitude Spectrum. The Fourier with the help of exponential of the control of the control of Fourier Amplitude Spectrum has obtained from the recorded acceleration data of accelerogram. This frequency Amplitude Spectrum has taken from the linear fit of log – log and and log-linear plot to dependent Foundation frequency (f_{min}) and corner frequency (f) of all the earthquake events. From this know the maximum that the frequency dependent kappa parameter kappa factor has derived. The kappa parameter has eatimated in the frequency depends a parameter has eatimated in the form of $\kappa = \kappa_0(sec) + slope(km/sec)$. distance (km). Finally, the comparison of all the kappa factors obtained from all four earthquake events has carried out in this study.

AIC2020-316-937

CHARACTERIZATION OF STABILIZED SUBGRADE ON PAVEMENT PERFORMANCE BY MEANS OF FINITE ELEMENT METHOD

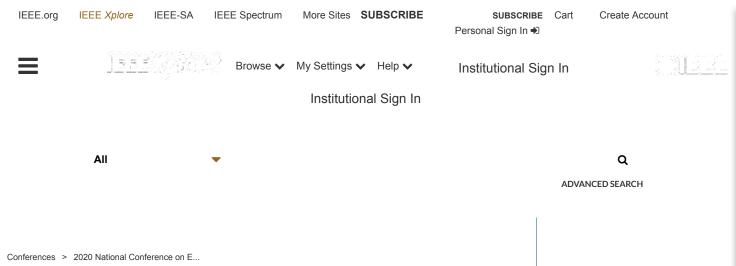
Arijit Kumar Banerji', Pijush Topdar' and Aloke K Datta'

Part Time Research Scholar, National Institute of Technology Durgapur, and Assistant Professor, Dr. B. C. Roy Engineering College, Durgapur, India, arijit.banerji@bcrec.ac.in

Associate Professor, National Institute of Technology, Durgapur, India, topdar72@yahoo.co.uk 'Associate Professor, National Institute of Technology, Durgapur, India, dattarec@yahoo.com

Stabilisation of subgrade soil are often used to improve its mechanical properties significantly and the performance is usually measured in terms of the California bearing ratio (CBR), which is an index of strength of subgrade soil. In the present study, an experimental investigation was carried out to evaluate the performance of the subgrade soil with the appropriate treatment/stabilization by addition of chemical stabilizer (Terrasil). Through the laboratory-determined parameters of CBR and Triaxial test, an attempt was made to evaluate the response of flexible conventional pavement system to single axle traffic loading using a finite element (FE) software suite. A tire-pavement-interaction three dimensional FE model, using ANSYS was developed by taking into account the influence of rectangular tire imprint, modulus of binder course, modulus of unbound granular materials (base and sub-base) and subgrade. The mechanical behavior of bituminous layer, granular base and sub-base layer are characterized by the linear elastic model and stabilized subgrade layer is simulated by the Drucker Prager non-linear model in finite element analysis. The traffic intensity and thickness of pavement layer was used according to codal provisions of Indian road congress (IRC: 37-2012). The present analysis deals with the influence of static loading on stress, strain and deflections; and comparison was made by using the CBR results with the control and stabilized subgrade layer. Furthermore, deflection factors have been calculated as a function of ratio of modulus of pavement and subgrade, and ratio of pavement thickness and tire width. Analysis result indicate that, strength enhancement using Terrasil significantly influences the mechanical responses of pavement to vehicular loading. Moreover, the increase in subgrade strength with the addition of Terrasil leads to economy in the structural thicknesses of the pavement with different traffic intensities.

Sl. no	Name	Title of Lecture	
38	Subhajit Bhattacharya, Kazi Sabiruddin, Santanu Das	Optimization of Gas Metal Arc Welding of High Carbon Steel Using the AHP	Page no 17
39	Saikat Nandy, Provas Kumar Roy	Electrostatic Discharge Algorithm for Economic Load Dispatch Problems Including Renewable Energy	17
40	Debraj Chakraborty, Moumita Mukherjee	Study on Effect of Photo-illumination on Si/SiC Asymetrical Superlatice Avalanche Transit Time Device: A High Power Terahertz Room Temperature Source	17
41	Amit Mistri, Provas Kumar Roy, Barun Mandal	Chaotic Biogeography-Based Optimization (CBBO) Algorithm Applied to Economic Load Dispatch Problem	18
42	Koustav Dasgupta, Pratosh Kumar Jha, Provas Kumar Roy	Solution of Combined Economic Emission Load Dispatch Problem Using Chaotic BSA-PSO Hybrid Algorithm	18
43	Karunamoy Maji, Asit Bera	Developing a Suitability Index Algorithm for Recruitment	19
44	Kamalika Tiwari	Instrumental Analysis of Groundwater and Water Quality Index in Fuljhore, Durgapur Using GIS	19
45	Soumyadip Das, Kunal Nandan, Md. Meer Ali	Study of Traffic Behaviour at an Uncontrolled Intersection in Durgapur, India	19
46	Sandip Guha Thakurta	A Modified MPPT Algorithm for Single Phase Grid Connected PV System	20
47	Pulakesh Roy, Dibyendu Roy, Rajib Banerjee	A Proficient Video Compression Using Block Based Fragmented Cosine Transform (BFCT) in Wireless Multimedia Sensor Network (WMSN)	20
48	Tapas Mondal, Trisha Chandra, Prasenjit Kuila, Sandip Maity	A Flower-Fractal Based Circularly Polarized Wide Beam-Width Folded Antenna	21



Study of Traffic Behavior at an Uncontrolled Intersection in Durgapur, India

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III. Data Collection

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References

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This paper focuses on the effects of mixed traffic circumstances of uncontrolled or unsignalized intersection under heavy flow when traffic is heterogeneous in character. On the basis of field data collected on Fuljhore road, Durgapur, it is clear that capacity reduces if the proportion of slower vehicles increases in the traffic stream. On the basis of field data collected, the present study also made it evident that the speed data deviate from the normal distribution curve and skewness of speed data is significantly high under the high density of traffic flow. The present study, therefore, examined the distribution of these data and concluded that their logarithmic transformation reasonably satisfies the normality assumption while modeling in terms of goodness-of-fit. Modeling traffic flow through urban uncontrolled intersections in developing countries like India is a complex process because of the high-level heterogeneity of traffic and absence of major and minor road concepts in traffic regulation schemes. Moreover, Indian codes have not been provided any relation which can be used to directly determine the delay



at uncontrolled intersections under Indian traffic conditions. Uncontrolled intersections are vital points on urban roads, the performance of which will influence the flow of traffic on the road network.

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Contents

I. Introduction

A well-functioning road-transport system is vital to the well-being and prosperity of a nation. In developing countries like India, where the population is quite high, the importance of a good road network is enormous. One of the key aspects of the road transportation is the traffic management in the intersection. Intersections, in particular, are associated with a higher level of crash risk than other types of facilities on the road network, largely due to the threatening angles of impact and high collision speeds which they put up. An intersection is, by definition, the area in which two or more roads or streets join or cross. While the main goal of intersection design is to facilitate the safe and efficient movement of vehicles and road-users through the intersection, in highly motorized countries, intersection design is often driven primarily by capacity and performance considerations that prioritize vehicular traffic. Other objectives such as safety, the conservation of transport energy, the minimization of harmful emissions and the needs of pedestrians and other vulnerable road users are often given a lower priority, is one of the most important cities in the state of West Bengal. The traffic control in most of the roads of Durgapur are not present and as a result, the aggressive and intolerant behavior of road users is a major problem, particularly in the morning and evening peak hours. Fuljhore is one of the densely populated areas of Durgapur, where the traffic volume is very high as it is situated at an important point. Major schools & private colleges of Durgapur, as well as the Bidhan Nagar hospital, are situated near Fuljhore and as a result of people often use this road for traveling. As a consequence, the uncontrolled T- intersection at Fuljhore is very risky for the vehicles, particularly for the right-turning vehicles.

Authors	~
Figures	~
References	~
Keywords	~
Metrics	~

Lecture Notes in Intelligent Transportation and Infrastructure *Series Editor:* Janusz Kacprzyk

Kasthurirangan Gopalakrishnan Olegas Prentkovskis Irina Jackiva Raimundas Junevičius *Editors*

TRANSBALTICA XI: Transportation Science and Technology

Proceedings of the International Conference TRANSBALTICA, May 2–3, 2019, Vilnius, Lithuania



Kasthurirangan Gopalakrishnan ·
Olegas Prentkovskis · Irina Jackiva ·
Raimundas Junevičius
Editors

TRANSBALTICA XI: Transportation Science and Technology

Proceedings of the International Conference TRANSBALTICA, May 2–3, 2019, Vilnius, Lithuania



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x Contents

Assessment of Crash Risks at Highway Access Points with Restricted Sight Visibility	76
Basic Methods to Support City Bus Fleet Conversion Towards a 100% Electric Bus Fleet Krzysztof Krawiec	89
Analysis of Pedestrian Movements on Sidewalks: A Case Study in Kolkata, India Deotima Mukherjee, Soumyadip Das, Pritam Saha, and Sudip K. Roy	99
Simulation Processes of Construction of Optimal Routes for the Delivery of Goods by Road Transport on Urban Road Network	110
in Mountainous Cities Viktor Danchuk, Talal Ameen, Olena Bakulich, and Vitaliy Svatko	112
Analysis of Quality of Car Rental Services Following Example of "Citybee"	122
Assessment of the Interoperability of Railway and Maritime Transport in Lithuania Aldona Jarašūnienė, Vladislav Lagunovič, and Kristina Čižiūnienė	132
Modernizing of the Rail Transport Curriculum and Study Process Enno Lend and Wladimir Segercrantz	139
Comparison of Studies of Dangerous Cargo Flow Distribution Between Rail and Road Transport Gediminas Vaičiūnas, Olha Porkuian, and Jelena Nozhenko	151
Applying the Business Model Canvas to Increase Enterprise Competitiveness: A Case Study of Transport Company Virgilija Vasilienė-Vasiliauskienė, Aidas Vasilis Vasiliauskas, Monika Donculaitė, and Ieva Meidutė-Kavaliauskienė	158
Comparison of Railway Routes Enabling Freight Transportation from the Eastern Border of Poland to the West Wojciech Kamiński and Aleksander Sładkowski	171
The Impact of the Bioethanol Fuel on the Exhaust Gas Emission of a Two-Stroke Engine	185
Research of Mathematical Model of Movement of Six-Axle Locomotives with Controllable Wheelsets Installation Serhii Kliuiev, Dmytro Bobyr, Gediminas Vaičiūnas, and Stasys Steišūnas	193



Analysis of Pedestrian Movements on Sidewalks: A Case Study in Kolkata, India

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Abstract. This paper focuses on investigating the effect of sidewalk frictions on pedestrian movements. The study accordingly analysed the characteristics of pedestrians on five sidewalk zones selected on the basis of their land-uses. Traffic data was videotaped and bi-directional movement was captured. Empirical investigations demonstrate that hourly flow at the public transport terminal is significantly high throughout the day, while in recreational area usually it starts increasing since afternoon. Presence of buffer has an effect on speed of female pedestrians; however, such effect was insignificant in case of males. Speed of pedestrians reduces considerably if they carry baggage. Notably, it was more in commercial areas compared to public transport terminals. This is attributable to the fact that majority of daily commuters carry lighter baggage which has little or no effect on their speeds. Capacity drops down with the decrease in effective width which however does not have considerable impact on free-flow speeds. Also, the study found that sidewalk frictions affect speeds of pedestrians' irrespective of their age and gender and capacity as well.

Keywords: Pedestrians · Sidewalk facility · Land use · Traffic flow parameters · Mixed traffic

1 Introduction

Walking is a vital mode of transportation. Every person, irrespective of their social stature, is a pedestrian at some point of the day, as all journeys start and end as a walking trip. Thus, the importance of pedestrian movements is accepted globally and cannot be overlooked. Walking directly influences the use of other modes and a good walking facility is essential in connecting the users with the mass transit facilities. In this age of high fuel cost, encouraging walking also helps in improving the economy to some extent. Further, growing number of road traffic results in an increase of air and noise pollution.

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Journal of Civil Engineering and Environmental Technology (JCEET)

Volume 6, Issue 5; July-September, 2019

Contents

Developing Global Building Energy Efficiency Regulations for Net Zero Energy and Zero Carbon Buildings	302-305
Aggarwal,S. ¹ , Kaur,P. ² , Chani,P.S. ³	
Study on use of Fly ash and Pond ash for Manufacturing of Bricks Aman Deep ¹ , Kuldeep Kumar Mehta ² and Sudha Das Khan ³	306-310
Effect of Clay Fines on Strength and Workability of Concrete Harish Choudhary ¹ , Mohd. Arham Siddiqui ² and Dauji Saha ³	311-315
Investigating Theories of O.M.A. as an Intermediary between Critical and Post-Critical Practice Madhur Agarwal 2 and Sourav Banerjea 2	316-324
A Review on Integrated Water Resources Management for Solving Water-related Issues Md. Hamjala Alam ^{1,*} , Santanu Gayen ² , Dr. Vijay Kumar Dwivedi ³	325-327

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A Review on Integrated Water Resources Management for Solving Water-related Issues

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Abstract-According to the Global Water Partnership (GWP), Integrated Water Resources Management (IWRM) may be defined as a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. This concept was introduced in 1980s to supplement water uses between different water demanding sectors. IWRM gives a holistic approach to integrate water for miscellaneous sectors. Water, as we know, is a transparent, tasteless, adourless, and colourless substance, which is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. It is vital for all known forms of life. Water plans an important role in the world economy. Much of long-distance trade of commodities (such as oil and natural gas) and manufactured products is transported by boats through seas, rivers, lakes, and canals. Large quantities of water, ice, and steam are used for cooling and heating, in industry and homes. Water is indeed the most essential resource which is inevitable to the society as a whole, as well as a pre-requisite to most developmentrelated public institutions. Water is a quintessential element to other important sectors like food, energy, environment, health and transportation. In an increasingly interrelated and complex world, many issues are of pervasive interest for assuring good quality of life of the people. In recent times population, urban population to be precise has increased by many folds. As a consequence, there has been a tremendous increase in competition for water across multiple sectors. Rampant and widespread overexploitation of groundwater is a major issue before us. In addition to that climate change, global warming, agricultural sector's increased water demand and water industry development all increase the challenge for integrated water resources management. Health and transportation. In an increasingly interrelated and complex world, many issues are of pervasive interest for assuring good quality of life of the people.

1. INTRODUCTION

Water is the most valuable and essential of all the resources available to us. It is true that without water life will simply cease to exist. According to a famous Greek philosopher, the best of all things is water. This is a very witry statement and will hold good till eternity. The need for water has been quintessential throughout human history. Almost all the civilizations have flourished on the bank of the major rivers of the world. Water is constantly in motion, passing from one region to another and from one location to another. But be it in any condition, moving or stationary, water invariably contains extraneous materials, some due to natural causes but broadly due to anthropogenic activities. In recent years, urban populations have grown at such phenomenal rates in combination with the growing scarcity and increasing competition for water across multiple sectors.[1]. All these factors, in addition to natural variations in water obtainability, make its coherent planning and management a very arduous and difficult task under the best of circumstances. Today, water concern remains high on many national agendas, and water resources security is an issue that is common to some global threats.[2]. Water may be everywhere, but its usage has always been governed by its availability both quantitatively and qualitatively. All around the world, issues related to water are neither constant nor consistent over time. They always vary very considerably from one region to another, sometimes even within the same country, from one season to another, and also from one timespan to another Solutions to this problem depend not only on water availability, but also on several other factors, among which are the processes through which water is managed; proficiency and capabilities of the establishments that manage them; prevailing socio-political situations and prospects which affect water planning, development and management processes and practices; appropriateness and implementation status of the legal and regulatory frameworks; availability of financial assistance as and when required; climatic, social and environmental conditions of the countries concerned; levels of available and functional technology; national, regional and international approaches and perceptions; modes of governance including issues like political intrusion, transparency, accountability, corruption, etc.; educational and developmental conditions; and quality, effectiveness and relevance of research that are being conducted to address the national, regional and local level water issues. Water is an enormously profound resource that is of direct concern to the society as a whole, as well as to most development-related public institutions at central, state and local levels. Such extensive concern for water is not a unique situation, as many water professionals have often claimed: it is



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Paper No.	Title	Authors	Page
124/R1	Free vibration analysis of laminated composite skew shells	Arpita Mandal, Chaitali Ray, and Salil Haldar	46
130/R1	Nonlinear first ply failure of composite hypars – a finite element application	Arghya Ghosh and Dipankar Chakravorty	47
245/R1	Free vibration characteristics of laminated composite plates	Leena Sinha, Amar Nath Nayak, and Sishir Kumar Sahu	47
295/R1	Effect of actuation procedure in MFC actuators for morphing of bistable laminates	Anilkumar P. M., Ayan Haldar, Eelco L. Jansen, B. N. Rao, and R. Rolfes	48
319/R1	Application of nonlinear finite elements to study failure of composite conoidal shell roofs	Kaustav Bakshi and Dipankar Chakravorty	48
326/R1	Postbuckling analysis of MWCNT-reinforced composite plates under different types of in-plane mechanical loads	Vishal Singh, Rajesh Kumar, and S. N. Patel	49
455/R1	Interior acoustic analysis of arbitrary shaped rigid cavity with absorbent layer	Dibyayati Sahana, Subhankar Pramanik, Sreyashi Das, and Arup Guha Niyogi	49

Concrete Structures

Paper No.	Title	Authors	Page
057/R1	Advanced numerical simulation technique for modelling prestress transfer	Prashant Motwani and Arghadeep Laskar	53
122/R2	Effect of synthetic fiber reinforcement on flexural behaviour of GFRP reinforced beams	Atul Mani, M. Chellapandian, and S. Suriya Prakash	53
125/R1	Study on flexural behaviour RC beams made using sand partially replaced by granite dust	Sonali Upadhyaya. Bharadwaj Nanda, and Ramakanta Panigrahi	54
132/R1	Prediction of flexural strength of steel fibre reinforced concrete beams using modified dimensional analysis	Sneha J. Sancheti and Hemant B. Dhonde	54
250/R1	A comprehensive study on characterization of concrete pavements	Soumydip Das, Aloke K. Datta, Pijush Topdar, and Sanjay Sengupta	55
356/RI	Prediction of flexural capacity of cold formed steel-concrete composite beam	Divya M., Senthilkumar R., and Jayabalan P.	55
371/R1	Inplane force effect on skew RCC slab	Mainak Mallik and Somnath Ghosh	56
383/R1	Comparative study of steel concrete composite system of high rise tapered building	Madhumanti Ghose, Jafar Sadak Ali, and Debasish Bandyopadhyay	56

A COMPREHENSIVE STUDY ON CHARACTERIZATION OF CONCRETE PAVEMENTS

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ABSTRACT (250/R1)

Parements are daily-used civil engineering structures built over soil sub-grade. The analysis and design of concrete parements under moving traffic loads is an important but complex problem. A concrete pavement is a composite system of everbud layer of processed materials. The principal purpose of pavement is to earry vehicle wheel leads and dispense them to the immediately bottom layer which causes futigue and subsequent failure. Therefore, maintenance and rehabilitation strategies are required for pavements and modelling of pavements can serve as a guide for the maintenance. In this study, commencially available software has been used for finite element analysis and concrete slab have been idealized as homogeneous, linear, elamic and morropic material. Two elastic constants, the Young's modulus (E) and Poisson's ratio (g) have been used to represent the material characteristics of the slab. Comparisons were made with the previous results to determine the applicability of the adopted procedure.

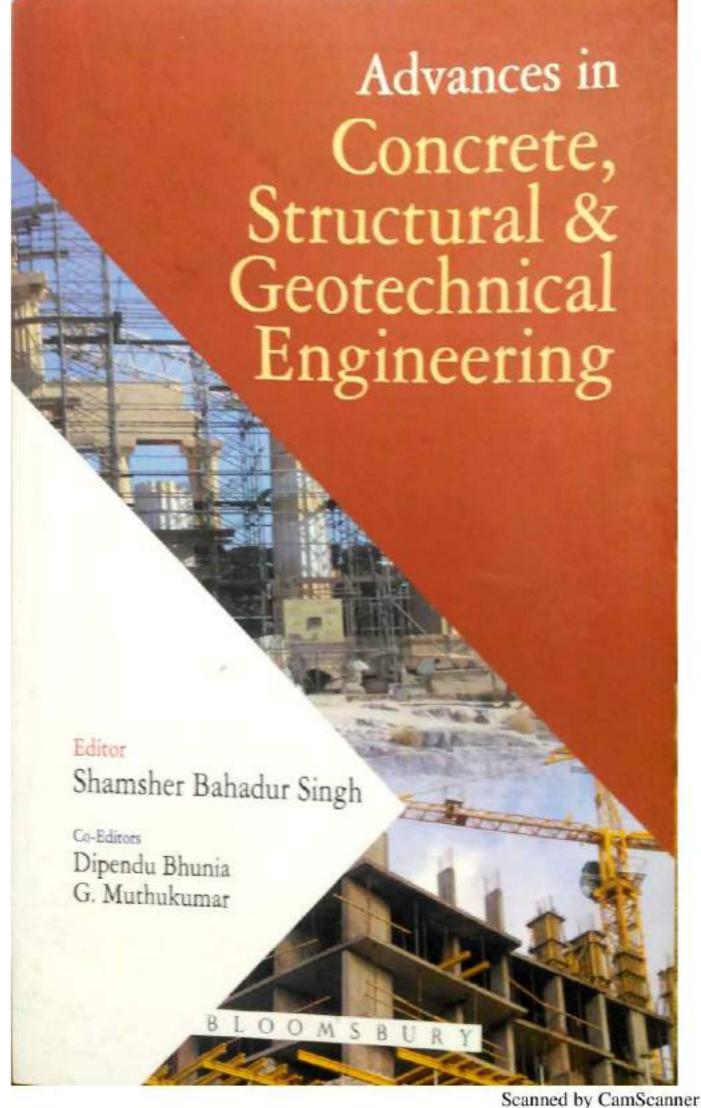
Keywords; Concrete pavements, Fatigue, Finite element analysis

PREDICTION OF FLEXURAL CAPACITY OF COLD FORMED STEEL-CONCRETE COMPOSITE BEAM

Divya M. Seorhilkumar R. and Jayabalan P. 123 Department of Civil Engineering, National Institute of Technology, Tiruchirapalli, India

In the late 20th century, a breakthrough was made in the steel-concrete composite system by using cold formed steel. This new composite system evolved in later arena because of its high scrength to weight ratio and ease of fabrication. Many researchers developed composite beams with different types of cross section and varied the shear connectors to achieve the full shear interaccounted also developed equation for calculating its capacity based on different methods. This paper comprises of studies done on the behaviour of cold formed steel concrete composite beams and compared the proposed equations in literature to predict the flexural capacity of beams and also determines the increase in strength of the member on account of its composite action. The equations proposed by various researchers holds good only when either section should be atleast compact or neutral axis should be on data. So, a detailed study should be made for slender sections for the prediction of its flexural capacity.

Keywords: Steel-Concrete Composite, Cold formed steel, Light gauge beam, flexusal capacity



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Contents	xiii
132. Probabilistic Seismic Hazard Analysis of Coastal Karnataka and its Surrounding Area Shreyasvi C. and Katta Venkataramana	693
133. An Investigation on RCA-Concrete Beam Shiwanand R. Suryawanshi	698
134. Mechanical Properties of Brick Aggregate Concrete with Silica Fume Shilpa Pal, Abhishek Pal and Talakokula Visalakshi	703
135. Subsoil Characteristics of Site using Seismic Refraction Test Shivamanth Angadi, Apurva Hirevennavar, Mayank K. Desai and Chandresh H. Solanki	709
136. Comparative Seismic Response of Soft Storey Composite Columns for Building Model With and Without Infill Walls Shiwanand R. Suryawanshi and Abhishek D. Chaudhari	713
137. Statistical Analysis of Strength Parameters in HVFA Concrete Shreelaxmi Prashant and Himalay Sharma	719
138. Durability Properties of Concrete Containing Used Foundry Sand Smit Kacha and Ankur Bhogayata	723
 Experimental Investigation of Glass Fibre Reinforced Concrete S.V. Joshi, U.P. Waghe 	726
140. An intensive Study of Pavement Performance Models	730
Soumyadip Das, Aloke Kumar Datta and Pijush Topdar	
141. Basic Studies on SCC using Recycled Aggregate N. Srikanth, N.R. Dakshina Murthy and M.V. Seshagiri Rao	735
142. Effect of Water-To-Binder Ratio on the Development of Fly Ash Based Geopolymer Concrete Subhash V. Patankar, Sanjay S. Jamkar and Yuvraj M. Ghugal	739
143. Review on Strengthening of Structural and Non-Structural Members using Fibre Reinforced Polymer Subhrasmita Majumder, Radhikesh Prasad Nanda and Showmen Saha	744
144. Sustainable Performance indicators in Built Environment for Developing Countries A. Suchith Reddy, P. Rathish Kumar and P. Anand Raj	750
145. Experimental Validation and Correlation of Compressive Strength for Stained Concrete Subjected to Delays in Casting Sudhir B. Gayake, Anuja S. Jape and Sunil Y. Kute	755
146. On the Effects of Imperfection and Cutout on Dynamic Response of Composite Plates Sudhir Vummadisetti, Himanshu Chawla, and S.B. Singh	761
147. Feasibility Study on the Use of a Tenary Blend- Coal Ash, Coconut Fibre and Lime for Soil Stabilization Evangelin Ramani Sujatha, Saisree S., Prabalini C. and Aysha Farsana	768
148. A Review on Parametric Study of Geopolymer Concrete Sumanth Kumar B. and Rama Seshu D.	773

AN INTENSIVE STUDY OF PAVEMENT PERFORMANCE

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ABSTRACT: The paper presents a comprehensive review of various pavement performance models, the effect of factors related to pavement materials, environmental conditions, spe and volume of traffic. Performance models related to the pavement distress conditions e.g. cracking, ravelling, roughness etc. have been analyzed and developed by which researchers. The pavement performance models evaluate the complex interaction between vehicles, environment and the surface of the pavement. However the existing models have the condition dependent applications. Therefore, an effort is made to identify the role of the factors in pavement performance and to explore additional factors affecting the performance and to explore additional factors affecting the performance.

Keywords: Pavement Performance, Traffic Factors, Pavement Materials, Environmental Factors.

INTRODUCTION

A highway pavement is a composite system of overlaid layer of processed materials. The principal purpose of the pavement is to carry vehicle wheel loads and dispense them to be immediately bottom layer, having the need of minimum maintenance in its lifespan had holds the second largest network of roads in the world next to USA. Thus for a some like India, there is a need to develop appropriate strategies which can predict the parentee performances more accurately to help and enhance the existing road network. Another important issue for a developing country like India is the challenge of maintaining as well as improving its transportation facilities within allocated budget. Therefore, prioritizates of roads is required for planning best possible maintenance and rehabilitation strategies A number of performance prediction models have been proposed by the researchers over the years. A detailed look into such models shows that the volume of traffic and environment are the major factors affecting the performance of existing roads. Further to this a last been noticed that most of these models are developed using experimental observations and are empirical in nature which only cater to particular traffic and environment condinor. However, a very few models are available which are of mechanistic-empirical type when numerical modelling techniques are used to consider the input parameters. Thus, there is a need to explore additional factors alongside the existing ones to predict the parental performance more logically with acceptable degree of accuracy.

PERFORMANCE INFLUENCING FACTORS

As the pavement deterioration process is influenced by the parameters among which all an not quantifiable or yet fully understood, most of the factors are subject to different level of variations. In order to predict potential pavement condition in future, the statistical modes based on observed past performances of pavements are the most accepted approach. The term performance refers to the general condition of the pavement, including its structural and functional condition. The major factors in the design of a highway pavement are the materials used in pavement, the efficiency of the underlying subgrade soil etc. and its traffic factors with their variety and volume of vehicles present in the traffic stream over a

Sustainable Development

A Value Chain Perspective

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Contents

Preface	,	v
About	the Editors	viii
Part I	Financial Markets and Institution Sustainability	
1.	Digital Financial Inclusion in India: The Road to Sustainability	3
2.	Deciphering the Nature of Customer-Oriented Work Culture in a Nationalised Bank	19
3.	Does Merger and Acquisition Announcement Create Any Returns on the Event Day?	54
4.	Knowledge Management Approach in Banking Sector	66
5.	Role of Digital Marketing in Customer Relationship Management	74
6.	The Impacts of Digitalisation in Selected Banking Sector of Kolkata	101
Part I	Operational Sustainability	
7.	Importance of Technology and Cost Optimization for Wide Area Network (WAN)	121
8.	Pioneering Environmental Sustainability Through Technological Innovation	130
9.	Improving Productivity and Quality by Process Planning in Fly Ash Brick Manufacturing Industry	155

10.	Transformation Through Entrepreneurial Competence	169		
11.	Most Influential Factor Behind Adopting Green Supply Chain Management: A Case Study in Kolkata using APH	175		
Part I	II Human Resource Sustainability			
12.	Organisational Citizenship Behaviour	187		
13.	A Study of Sustainable Development With Respect to HRM in Startups and Well-Established Organisations	200		
Part IV Education and Social Sustainability				
14.	Education Entrepreneurship: Sustainability Challenges and the Way Forward	221		
15.	A Study to Devise Strategies to Curb Student Absenteeism Rates to Ensure Sustainable Development of Private Professional Colleges in West Bengal	241		
16.	Spectrum and Analysis of Various Socio Cultural Themes	258		
17.	Indian Government's Initiatives Towards the Inclusion of Disabled People at Workplace	269		
18.	Customer Green Behaviour towards Green Products	278		

CHAPTER 15

A Study to Devise Strategies to Curb Student Absenteeism Rates to Ensure Sustainable Development of Private Professional Colleges in West Bengal

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ABSTRACT

With the advent of the Internet and its indispensability throughout the world, teaching-learning methodologies have evolved a lot. The impact has been felt in India as well. Over the last decade, lots of changes have been noticed in the professional teaching-learning scenario in our country. There has been a marked impact in the state of West Bengal too. One important change that has taken place in the education scenario of this state over the last 15 to 20 years is the privatisation of professional education and opening up of private colleges. Many students who were deprived of professional education in the past due to shortage of seats are now able to avail these courses, apparently a positive impact for the economy. Hence, professional education has become a flourishing business in this part of the country too. Managing such a knowledgebased business requires specialised strategic acumen as well. Of late, there has been an acute threat looming especially with the placement of these professionals passing out. According to one of the latest UNESCO reports, about 53% of employed youth suffers from some degree of skill deprivation which makes them unemployable. But the question is why