



Ref no: UPACRI20973984



UPACRI 2020 - July 12, 2020

A Virtual Universal Conference on Multidisciplinary Research & Innovation

Organized by

DHS FOUNDATION New Delhi, INDIA

In collaboration with CAMPBELL UNIVERSITY North Carolina, USA

This is to certify that

Dr. Jyotsana Sharma

Jagannath University, Jaipur, INDIA

has attended this virtual conference and presented Paper titled

"Living with COVID- HR Role in the new Abnormal" using virtual meeting platform.



Certified True Copy

Jagan Nath University, Jaipur

(Handwritten signatures and initials)

Mr. Vivek Agarwal
Convener, UPACRI-2020

Mr. Hemant Kumar
DHS Foundation

Dr. Umesh C. Varma
CAMPBELL UNIVERSITY

In association with - AER Info Services (P) Ltd, Graygraph Technologies (P) Ltd, Digital Guide, DMC, Hilton Travels, Pravah, Electronics, Bharti Publication & Local, com

RESEARCH AND INNOVATIONS
DURING COVID-19
An Integrated Approach

14

Edited by
Prof. (Dr.) P.B. Singh
Deepak Singh Negi

Bharti Publications

New Delhi - 110 002 (India)



Certified True Copy
Registrar
Jagan Nath University, Jaipur

About the Editors



Prof. (Dr.) P. B. Singh: He is throughout a 1st division holder. After completing MSc (Physics) followed by MBA and PhD from MJP Rohilkhand University, he started his teaching career from Bareilly College as Lecturer in 1990 and later joined the Faculty of Management, MJPRI, Bareilly in 1993. He became professor in 2007 and is presently working as Head & Dean. He visited many countries in the Middle East and Africa on various academic assignments. The longest in duration was an assignment of Ministry of Education, Ethiopia, Arera (funded by World Bank) as Professor of Marketing/HRM in Faculty of Business & Economics, Jimma University, Jimma, Ethiopia (AVRICA) from Dec 2007 up to Dec 2009. Regarding his research experience, he has completed two UGC aided research projects in India. Presently one Major Research Project under Centre of Excellence UP Govt is in progress. Under his supervision, nine research scholars got their doctorate (PhD). He has published more than 72 papers in various journals of repute. He has also been on the selection/interview panels of various management institutes to select the faculty members as well as expert in selection panel of Public Service Commissions, India.



Deepak Singh Negi is presently working in Department of Hotel Management, MJP Rohilkhand University Bareilly since 1997. MJP Rohilkhand University a state university which has the credit of being the first university to offer Hotel Management programme in the university campus. Mr. Negi is an alumnus of IIM Lucknow, 1981-84 batch having degree in Sociology, Law and PG in Management. He is having more than 36 years of experience in industry and academics. He has been a resource person, keynote speaker for various national & international conferences and seminars. He is also member of various Government approval bodies, Board of Studies and selection committees of different universities. He has been an active researcher, having presented his work in conferences and published more than 15 research papers on tourism and hospitality in domestic and international journals, and also contributed to several book chapters. He has received various awards in the field of Hospitality education.

Research and Innovations During COVID-19 An Integrated Approach



Research and Innovations During COVID-19: An Integrated Approach

Singh | Negi

Edited by
Prof. (Dr.) P. B. Singh
Deepak Singh Negi



Bharati Publications, New Delhi
E-mail: info@bharatipublications.com
www.bharatipublications.com



Certified True Copy

Registrar
Jagan Nath University, Jaipur



14

Living with COVID: HR Role in the New Abnormal

Dr. Jyotsana Sharma*, Shivani Wadhwa**
& Sanjive Saxena***

ABSTRACT

The COVID pandemic has jostled the world by forcing the business units to re-consider and redesign the workforce role and responsibilities while meeting business objectives. And, in doing so it has meticulously, forced the executive management to embrace the new avatar of HR. This paper is designed to address the revamped role of HR forced by the COVID phenomenon. The design of the paper follows a structured approach. An extant review of the literature, resulted in the formulation of the following research questions (a) What is needed to align the function of HR in the prevailing COVID times so as to ensure that business objectives are met and (b) What needs to be done by HR in addressing the requirements of new abnormal and the workforce responsible for attainment of business objectives. The research methodology is based on the grounded theory. The questionnaire captured the demographic information apart from capturing the responses. The sampling was purposive. The sample size was reduced to 249. The responses were captured by Google forms, TV news channels social media and webinars. MS Excel 2010 was used for data analysis. Exploratory data analysis was applied in this study. The study contributes to existing literature by addressing the issues of HR fraternity across impacted by COVID. A large sample size of more than 500 would have reduced the

* Faculty, Jagannath University Jaipur, Rajasthan.

** Faculty, Jagan Institute of Management Studies, New Delhi

*** Faculty, Jagan Institute of Management Studies, New Delhi.



Certified True Copy

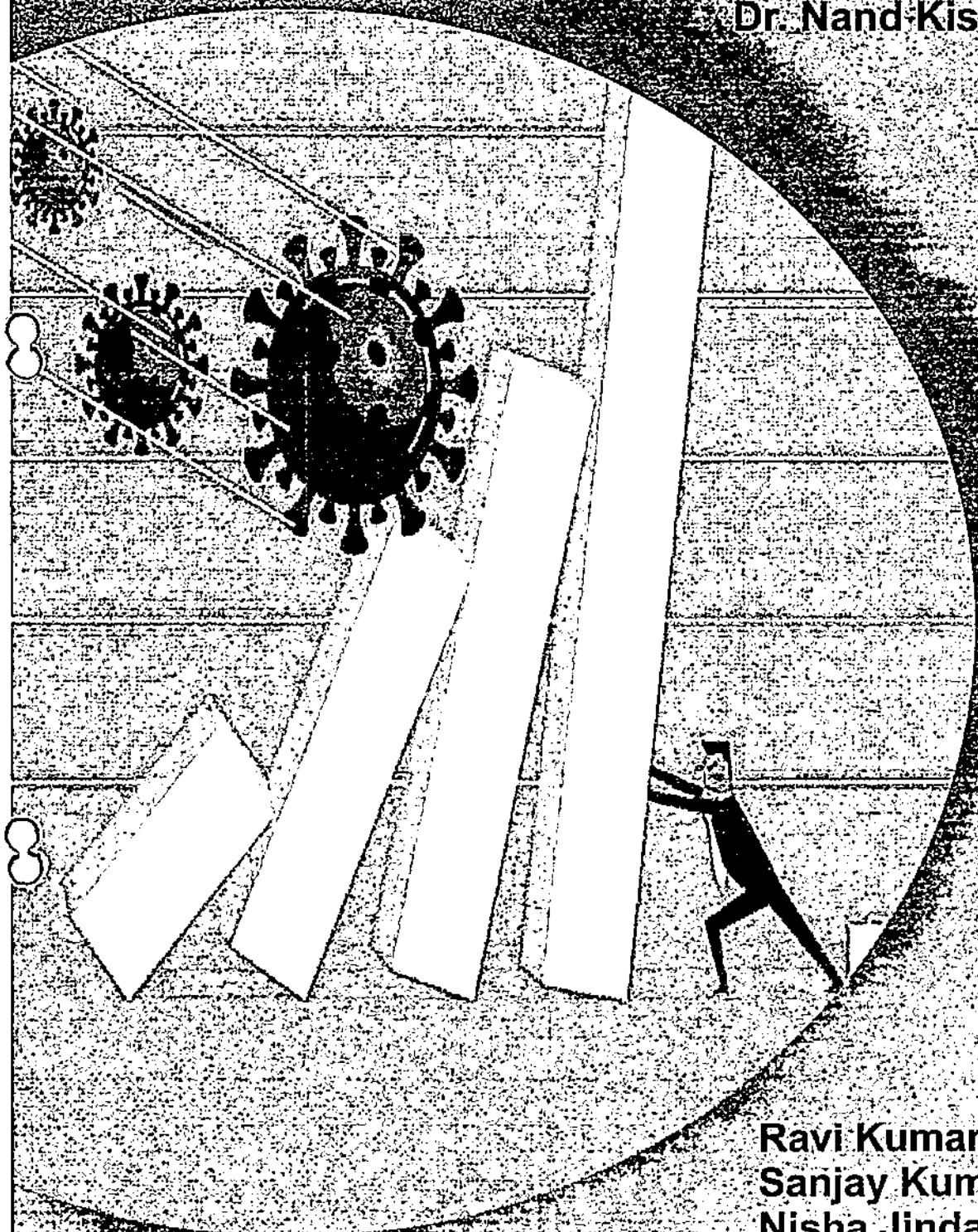
Jagan Nath University Jaipur

Dr. N.K. Gupta

(5)

Global Economic Order in the Post-COVID-19 Era: Challenges, Opportunities and Strategies

Foreword by
Dr. Nand-Kishore Garg



(11)

Ravi Kumar Gupta
Sanjay Kumar Mangla
Nisha Jindal

Maharaja Agrasen University Publication



Certified True Copy

Registrar
Jagan Nath University, Jaipur

5

Editors: *Ravi Kumar Gupta, Sanjay Kumar Mangla and Nisha Jindal*

First Edition: 2020

Copyright © Editors

Published By:

Maharaja Agrasen University Publication
c/o Maharaja Agrasen Technical Education Society
bktyagi001@gmail.com

ISBN No. 978-81-942547-3-7

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, resold, hired out or otherwise circulated without the publisher's prior written consent, in any form of binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser and without limiting the rights under copyrights reserved above. No part of this book may be reproduced, stored in any retrieval system or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise), without the prior written permission of the copyright owner.

Cover Design:

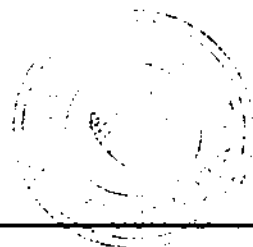
Shri B. M. Gupta Graphics
15, Basant Gaon, New Delhi-110057
Tel: 9718116171

Publisher's Registered office:

Maharaja Agrasen Technical Education Society (Regd.)
PSP Area, Maharaja Agrasen Chowk,
Sector-22, Rohini, New Delhi- 110086
Tel: 8448186935
Fax: 91-11-27582095
E-mail: mait@malt.ac.in
Website: www.malt.ac.in

Price: Rs. 400/-

Disclaimer: The publisher of this book has no responsibility of any kind of legal issues related to this book. The authors/editors of this book are fully responsible for the copyrights, plagiarisms and any other kind of issues, related to the content matter inside this book. In case of any issue with the content or any other matter related to this book, please contact/notify to the authors/editors for corrective action. Editors can be reached at: sam211285@gmail.com



Certified True Copy
Registered
Jagan Nath University, Jaipur

5

*Global Economic Order in the Post-Covid-19 Era:
Challenges, Opportunities and Strategies*
(ISBN No: 978-81-942547-3-7)

Table of Contents

Chapter No.	Title and Author	Page No.
1	Impact of COVID-19 on Insurance Sector in India <i>-Manju Gupta & Sharda Garg</i>	1
2	Twists and Turns in Academic Leadership during COVID-19 Pandemic <i>-Puja Khatri & Sumedha Dutta</i>	8
3	A Study of Corporate Initiatives in India during COVID-19 Pandemic: A Qualitative Analysis <i>-Deepti Prakash, Meenakshi Bisla & Shweta Gupta Rastogi</i>	16
4	An Investigation of Factors Influencing Student Selection of Higher Education Institutes in Oman <i>-Niraj Mishra, S.L Gupta & Marshal Fith</i>	29
5	Mental Stigma due to Communication Crisis in the age of COVID-19: A Study of Delhi-NCR, India and Dhfar, Oman <i>-Sangeeta Tripathi & Vinita Gupta</i>	37
6	Socio-Economic and Psychological Impact of COVID-19 in India <i>-D. R. Agarwal, Deepika Jain & Suruchi Kapur</i>	48
7	COVID-19: Challenges & Opportunities of Education Sector in India <i>-Sangeeta Malik</i>	57
8	Disruptive Innovations in Education for Meeting the Challenges of the Future <i>-Ravinder Kumar Chadha</i>	63
9	Distant Horizon <i>-P.C. Pratihari</i>	69
10	Psychological Impact of COVID-19 Pandemic on College Students in Delhi using Generalized Anxiety Disorder Scale <i>-Ruchika Singh Malyan & Lokesh Jindal</i>	75
11	Brands and their Customer Connectin during COVID-19 <i>-Shweta Bansal & Sarita Garg</i>	83
12	Women Entrepreneurs in the Wake of COVID – 19: The Challenges and the Solutions <i>-Sakshi Gupta & Shilpi Khandelwal</i>	94
13	World Economic Growth during Post COVID-19 Era <i>-Anirudh Goel</i>	103
14	Importance of Behavioral Economics & Nudge Theory in the Light of COVID-19 <i>-Malini Sharma</i>	112
15	An Empirical Study on Comparative Analysis of Volatility in BSE SENSEX and NASDAQ during COVID-19 Epedemic Crisis <i>-Ashish C Makvana</i>	118
16	Public Awareness about Naxal Coverage during COVID-19 <i>-Sudesh Kumari & Manoj Dayal</i>	123
17	Perception about Fake News during COVID-19 Pandemic <i>-Nidhi Chaudhry</i>	132



Certified True Copy
Jagan Nath University, Jaipur

Chapter 12

Women Entrepreneurs in the Wake of COVID – 19: The Challenges and the Solutions

-Sakshi Gupta & Shilpi Khandelwal

Abstract

Introduction: The encounter with the SARS-CoV-2 and the widespread of COVID – 19 has led the Government globally to take drastic measures. Imposing of lockdown in large parts of society and economic and social life has come as an exogenous shock to many economic actors, mainly led by the entrepreneurs. With the practice of social distancing and shifting of demands as a result of COVID – 19, has a severe impact on many small businesses and entrepreneurs. The COVID – 19 pandemic affects men and women associated with various sectors, in the different ways. According to the data and statistics, women are more vulnerable to economic shocks brought up by crises such as the Coronavirus Pandemic.

Purpose: The present paper focuses on the impact of COVID-19 on the Women Entrepreneurs: The Harbingers of Change in the Nation. The paper also discusses the related challenges and suggestive measures related to the growth of Women Entrepreneurs in this time of COVID-19 Pandemic.

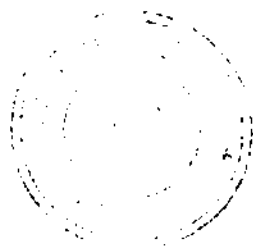
Methodology: The study is designed keeping in mind the emergence of women entrepreneurs in India. The overall study is based on literature review. The research illustrates the challenges a women entrepreneur face as a consequence of the crisis. Further, it also manages to put a light on the ways adopted by women entrepreneurs to deal with the effects of the crisis to protect their ventures.

Findings: Women entrepreneurs are a heterogeneous segment belonging to different age groups and demographic background and there is an urgent need to decode policy imperatives and interventions that can boost an engendered environment for women entrepreneurs in India. On the basis of this analysis some recommendations are given to promote spirit of women entrepreneurship and helping the women to become a successful entrepreneur.

Keywords: *Coronavirus, COVID – 19. Women Entrepreneurs*

Introduction

The COVID – 19 pandemics has affected everyone, including the research community at a glance. Entrepreneurship, being an area of research, has been an immense interest to researchers, policy makers, educators and practitioners. The phenomenon is significantly correlated as driver of societal health and wealth and an engine of economic growth (Schramm, 2006; Baumol et al, 2007) which is regarded as critical in both Universities and Business Schools. Most policy initiatives that have been offered to defend economics during the COVID-19 crisis seem to target recognized corporations (Kuckertz et al: 2020), however, there is a need for research that focuses on challenges faced by the entrepreneurs, as well as the support they receive from the broader entrepreneurial ecosystem. As opined by various studies, the entrepreneurs who shape the future economic activity are suggested to be amongst the most vulnerable actors in the economy (Walsh & Cunningham, 2016), there is need for immediate research attention. Start-ups, due to their newness and smallness (Aldrich & Fiol 1994), as well as their lower legitimacy base (Zimmermann & Zeitz, 2002), are especially vulnerable during the current COVID – 19 crises.



Certified True Copy

[Signature]
Jagan Nath University, Jaipur

72

Research Trends in Agriculture Sciences

Volume - 22

Chief Editor
Dr. R. K. Naresh



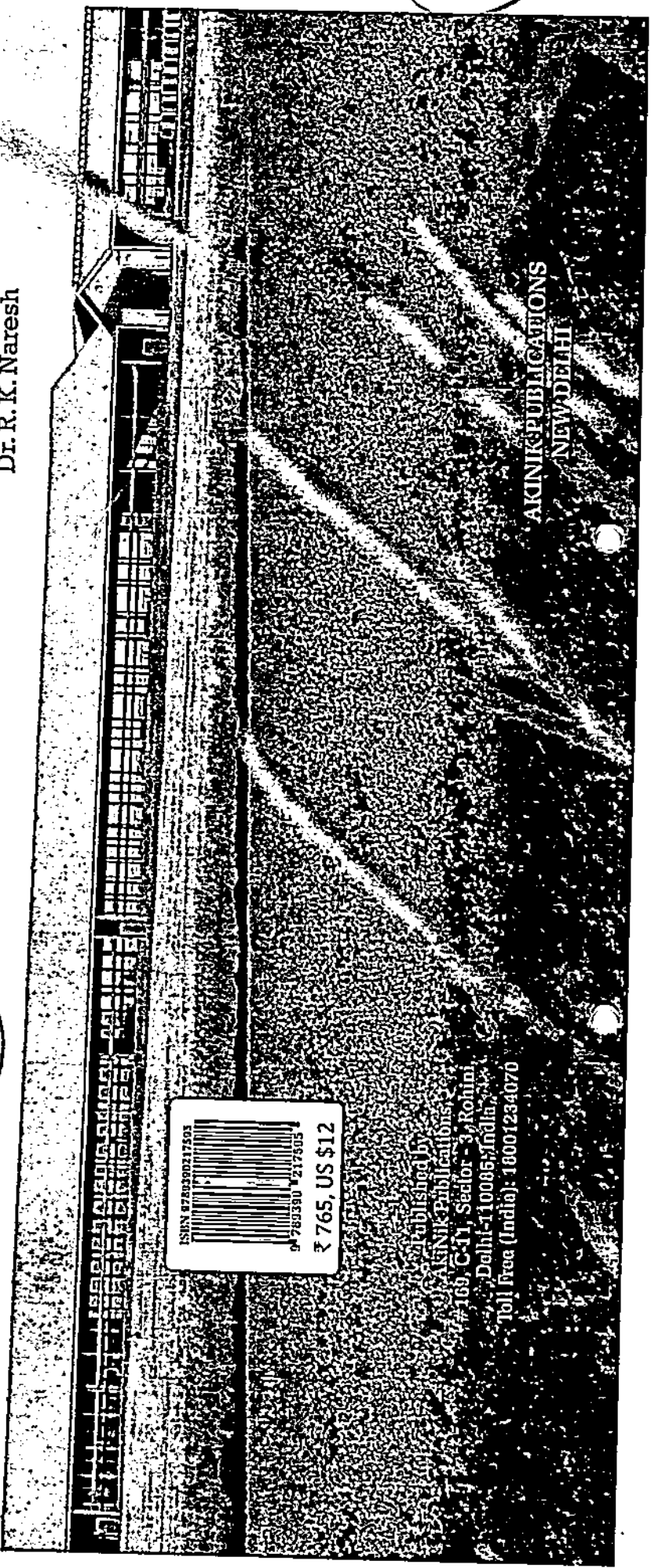
Certified True Copy
Registrar
Jagan Nath University, Jaipur



₹ 765, US \$12

Published by
Ajinkya Publications
169 C-11, Sector 3, Rohini
Delhi-110085, India
Toll Free (India): 18001234070

AJINKYAPUBLICATIONS
NEW DELHI



Research Trends *in* *Agriculture Sciences*

Volume - 22

Chief Editor

Dr. R.K. Naresh

Professor

Department of Agronomy, College of Agriculture, Sardar Vallabhbhai Patel
Univ. of Agri & Tech, Meerut, Uttar Pradesh, India



AkiNik Publications
New Delhi

Certified True Copy

Registrar
Jagan Nath University, Jaipur

Published By: AkiNik Publications

AkiNik Publications
169, C-11, Sector - 3,
Rohini, Delhi-110085, India
Toll Free (India) – 18001234070
Phone No. – 9711224068, 9911215212
Email – akinikbooks@gmail.com

Chief Editor: Dr. R.K. Naresh

The author/publisher has attempted to trace and acknowledge the materials reproduced in this publication and apologize if permission and acknowledgements to publish in this form have not been given. If any material has not been acknowledged please write and let us know so that we may rectify it.

© AkiNik Publications

Publication Year: 2020

Pages: 205

Paperback ISBN: 978-93-90217-59-5

E-Book ISBN: 978-93-90217-60-1

Book DOI: <https://doi.org/10.22271/ed.book.787>

Price: ₹ 765/-

Certified True Copy
Jagan Nath University, Jaipur

Contents

Chapters	Page No.
1. Irrigation Scheduling Criteria for Field Crops <i>(Rahul Makkar)</i>	01-20
2. Biochar: A Sustainable Approach for Plant Growth and Soil Properties <i>(M Kavitha, T Giridhara Krishna, TNVKV Prasad and K Nagaraju)</i>	21-41
3. Impact of ICT in Rural Development: An Agricultural Perspective <i>(Dr. Indrani Karar)</i>	43-62
4. Seasonal Agriculture and Climate Change <i>(PR Ramteke, SS Ransing, AN Humane, NP Navnage and PK Shukla)</i>	63-85
5. Utilization of Bacteriocin as a Potential Food Preservative Agent Isolated From Lactic Acid Bacteria-A Holistic Approach <i>(J. Jayachitra, R. Parthasarathi and G. Kumaresan)</i>	87-110
6. Comprehensive Knowledge on Biosurfactant Production using Certain Agro-Industrial Waste <i>(R. Parthasarathi, S. Nalini and J. Jayachitra)</i>	111-142
7. Climate Change and Agricultural Food Production <i>(Meghna Gogoi, Jamkhogin Lhungdim, Kamal Kant, Gauri Mohan and Urjashi Bhattacharya)</i>	143-165
8. Ecosystem Approach: Shaping the Future of Farming in North Eastern Region of India <i>(Sanjay Swami)</i>	167-191
9. Measures of Soil and Water Conservation <i>(Meera Devi)</i>	193-205

Certified True Copy
Jagan Nath University, Jaipur

Chapter - 7
**Climate Change and Agricultural Food
Production**

Authors

Meghna Gogoi

Ph.D. Agronomy, College of Agriculture, Central Agricultural
University, Imphal, Manipur, India

Jamkhogin Lhungdim

Assistant Professor (Senior Scale), Department of Agronomy,
College of Agriculture, Central Agricultural University,
Imphal, Manipur, India

Kamal Kant

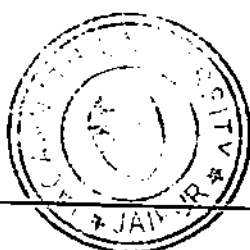
Assistant Professor, Department of Agriculture, Jagannath
University, Jaipur, Rajasthan, India

Gauri Mohan

Ph.D. Agronomy, School of Agricultural Sciences and Rural
Development, Nagaland University, Medziphema, Dimapur,
Nagaland, India

Urjashi Bhattacharya

Ph.D. Agronomy, B.C.K.V. Mohanpur, Nadia, West Bengal,
India



Certified True Copy

R. S. Jagan Nath
Jagan Nath University, Jaipur

Chapter - 7

Climate Change and Agricultural Food Production

Meghna Gogoi, Jamkhogin Lhungdim, Kamal Kant, Gauri Mohan and
Urjashi Bhattacharya

Abstract

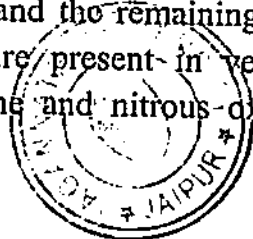
Research shows that there has been a tremendous increase in the greenhouse gas emission due to human activity as man makes this mad race for development. Global warming is caused due to greenhouse effect as the sun's radiation enters into the atmosphere but is not allowed to leave back at the same amount. Some changes will affect agriculture through their direct and indirect effects on crops, soils, livestock, fisheries and pests. This in turn leads to snow/glacier melts due to rise in temperature, sea level (water) rises, salinization of land along with area available for agriculture decreases, more pest and disease attack occur in plants and livestock. Ultimately reducing the yield of crops and endangering life. Climate change is a matter of great concern that questions the existence of life on earth in future and is regarded as the greatest challenge facing humanity. There is thus an urgent need to address the climate change and variability issues holistically. Climate change, energy security and food security are interlinked and require an integrated approach. Thus, an attempt has been made to highlight on the ways agriculture sector can mitigate against this changing climate.

Keywords: climate change, agriculture, greenhouse effect and food security

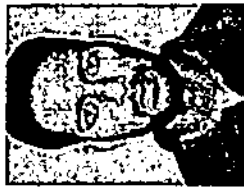
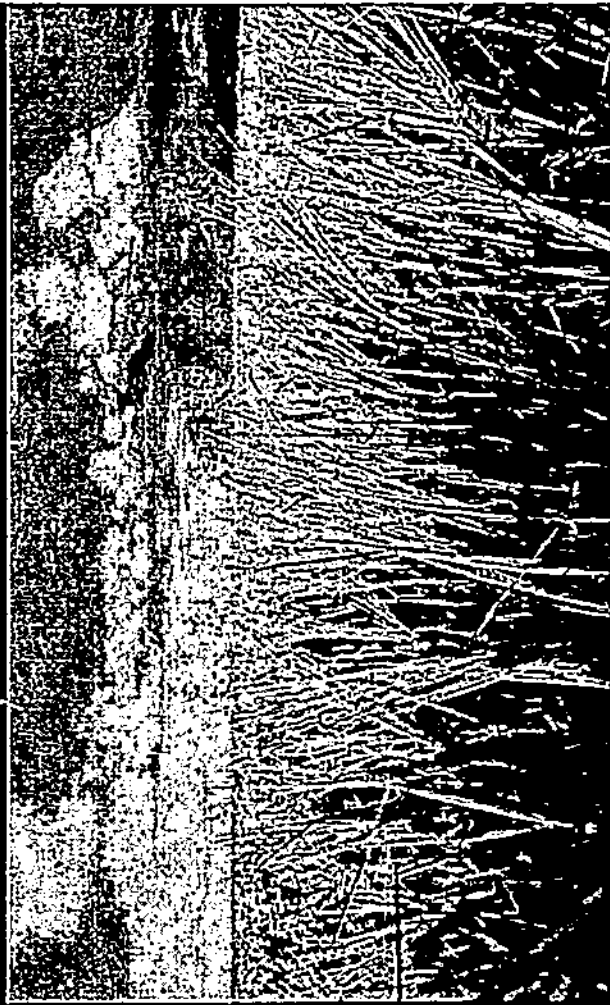
Introduction

The United Nations Framework Convention on Climate Change defines Climate change as, "The change of climate which is attributed directly or indirectly to human activity that alters the composition of global atmosphere and is in addition to natural climate variability observed over comparable time periods".

The atmosphere surrounding the earth is made up of nitrogen (78%), oxygen (21%) and the remaining 1% is made up of trace gases (called so because they are present in very small quantities) that include carbon dioxide, methane and nitrous oxide. These gases also called greenhouse



The work entitled "Diallel analysis for quantitative traits in durum wheat (Triticum durum Desf.)" was undertaken for together the information on magnitude of heterosis over mid-parent, better parent and standard check (H18498), combining ability, genetic components involved in expression of yield and its contributing characters. The data were analysed subjected to heterosis and combining ability analysis (Method-2, Model-1 of Griffing, 1956a). On the basis of all genetic parameters, the cross combinations, RD1151 x DBPY04-4 and MPO1215 x DBPY04-4 were identified as promising. They expressed the highest per se performance, heterosis and specific combining ability effects. These combinations involved one good general combining parent. Another cross H18498 x DBPY08-25 was found promising as, it was superior with respect to per se performance, high heterosis and specific combining ability and one of the parent being a good general combiner. These three crosses found potential to generate desirable segregants for selection of better genotypes.



I am a assistant Professor since 2017. Growing up at Rajasthan studying at SDAU, Dantiwara, Gujarat inspired me a desire to be a teacher and researcher devoted to the agriculture.

Bhupendr Singh Tyagi

DIALLEL ANALYSIS FOR QUANTITATIVE TRAITS IN MACRONI WHEAT

DIALLEL ANALYSIS FOR QUANTITATIVE TRAITS IN MACRONI WHEAT (Triticum durum desf.)



Certified True Copy

Rajendra
Jagan Nath University, Jaipur



978-620-0-48116-0

Tyagi



73

ISBN-13: 978-620-0-48116-0

ISBN-10: 6200481164

EAN: 9786200481160

Book language: English

Blurb/Shorttext:

The work entitled "Diallel analysis for quantitative traits in durum wheat (Triticum durum Desf.)" was undertaken for together the information on magnitude of heterosis over mid-parent, better parent and standard check (H18498), combining ability, genetic component involved in expression of yield and its contributing characters.. The data were analysed subjected to heterosis and combining ability analysis (Method-2, Model-1 of Griffing, 1956a). On the basis of all genetic parameters, the cross combinations, RD1151 x DBPY04-4 MPO1215 x DBPY04-4 were identified as promising. They expressed the highest per se performance, heterosis and specific combining ability effects. These combinations involved one good general combining parent. Another cross H18498 x DBP08-25 was found promising as, it was superior with respect to per se performance, high heterosis and specific combining ability and one of the parent being a good general combiner. These three crosses found potential to generate desirable segregants for selection of better genotypes.

Publishing house: > LAP LAMBERT Academic Publishing

Website: > <https://www.lap-publishing.com/>

By (author) : Bhupendr Singh Tyagi

Number of pages: 120

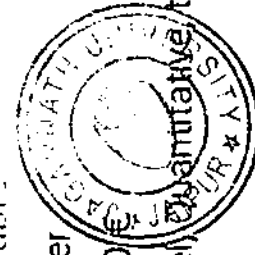
Published on: 2020-02-10

Stock: Available

Category: > Other

Price: 54.90

Keywords: diallel, quantitative traits, Heterosis, Combining Ability, macroni wheat, durum wheat



Certified True Copy

Prof. Dr. Arun
Jagan Nath University, Jaipur

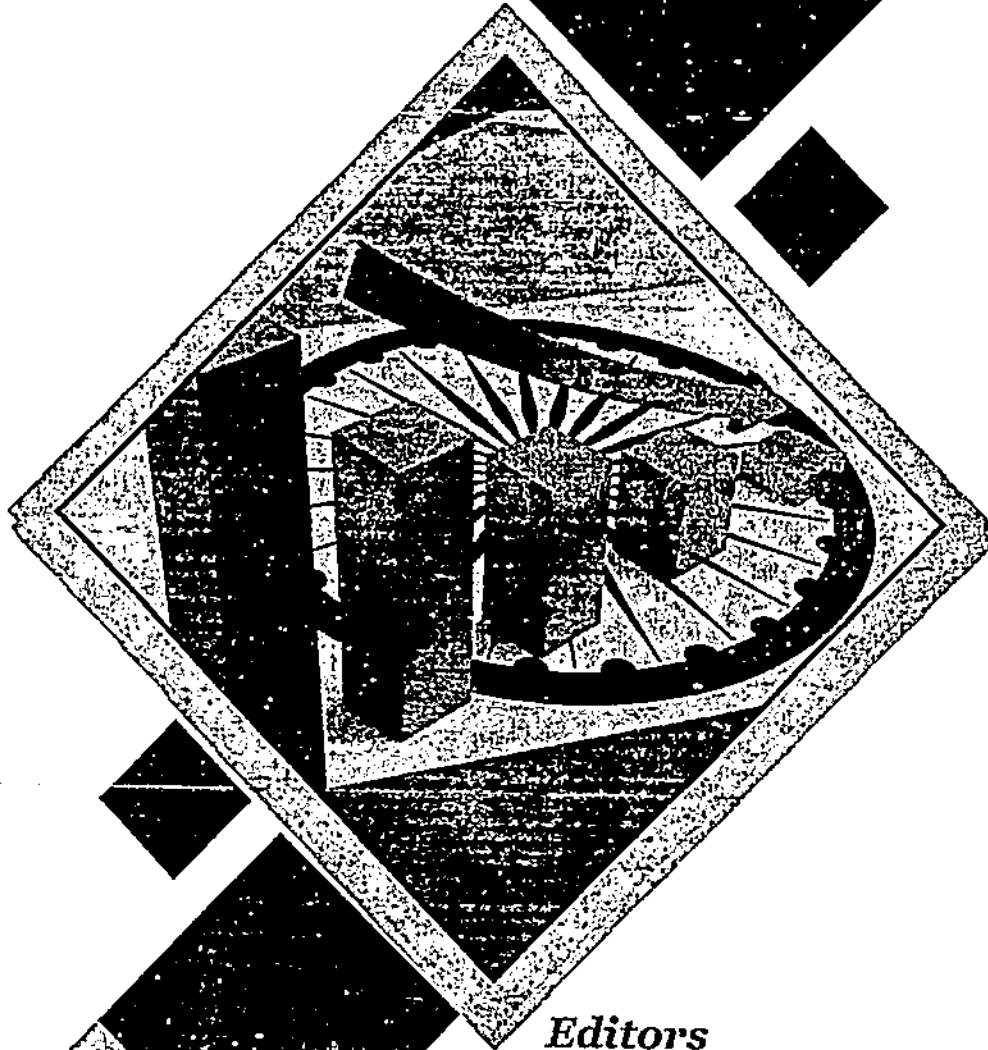
Dr. Chilpr.

(18)

(7)

(74)

Sustainable Management Practices and Economic Slowdown in India



Editors

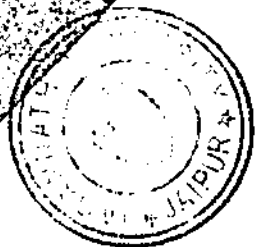
Dr. Ravi K. Dhar

Dr. Nidhi Gupta

Dr. Sartaj Khera

Ms. Anu Bhardwaj

Dr. Manisha Gupta



Certified True Copy

[Signature]
Jagan Nath University, Jaipur

6

A.K. PUBLICATIONS
B-61/E-1, Gali No. 14, Jagatpuri Ext.
Shahdra, Delhi-110 093 (India)
Ph.: +91-9868320502, +91-9999157638
E-mail: akpubs2008@yahoo.com

*Sustainable Management Practices and Economic Slowdown in
India*

© Editors

First Edition 2020

ISBN 978-93-88465-37-3

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by means, electronic, mechanical, photo copying, recording or otherwise, without the prior permission of the publisher.

PRINTED IN INDIA

Published by A.K. Publications and Printed at Global Printers, Delhi.

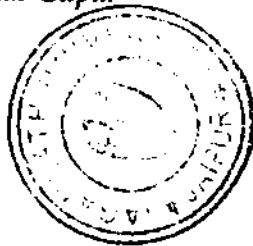


Certified True Copy
Rajendra
Jagan Nath University, Jaipur

(4)

(xiv)

8. Human Values In Current Era 70
Dr. Madhu Sharma & Mr. Shubham Singh
9. Economic War Between China and U.S. and its Effects on India 80
Dr. Ashu Dhiman, Ms. Anshu Punshi & Mr. Paramjeet Singh
10. Role of Artificial Intelligence with Regard to Sustainable Complaints Handling in the Indian Banking Sector 90
Ms. Veronica Madan & Dr. Shilpi Khandelwal
11. Indian Automobile Industry-Trials and Tribulations 101
Ms. Suchitra Srivastava & Ms. Shaifali Jha
12. Assessment of Financial Literacy among University Students 119
Dr. Shruti Bhuttani & Ms. Vidhi Juneja
13. Impact of COVID-19 on Consumer Behaviour in India 127
Ms. Sapna Sood
14. To Study the Impact of Learner's Attitude Towards E-Learning in Current Education Industry 143
Ms. Akansha Rehani
15. Flexible Work Arrangement, Sustainability and Employees 148
Ms. Seema Wadhawan
16. The Influence of Organizational Culture on Creativity, Business Innovation and Job Satisfaction of Employees 160
Dr. Meenakshi Sharma
17. Sustainable Consumption in Transport: A Study on Factors Influencing Electric Vehicles Usage Intention 171
Mr. Saurabh Kumar
18. Sustainability Practices of Corporate: A Comparative Analysis of Indian IT Industry 192
Ms. Dakshita Trikha & Dr. Sartaj Khera
19. Social Good Through Cause Related Marketing 205
Ms. Radhika Soni & Ms. Dhriti S Katyal
20. The Blockchain Phenomenon in Banking Industry 214
Mr. Vishal Khullar & Ms. Divya Gupta
21. Covid-19 And Global Unemployment Crisis 221
Dr. Richa Gupta



Certified True Copy
[Signature]
Jagan Nandan University, Jaipur

9

Role of Artificial Intelligence with Regard to Sustainable Complaints Handling in the Indian Banking Sector

Ms. Veronica Madan¹ & Dr. Shilpi Khandelwal²

ABSTRACT

Artificial Intelligence (AI) and machine learning over a period of time has encompassed itself in our daily lives. Technological advancements are taking shape at an unstoppable rate and they seem to influence the Indian banking sector too. Though, this comes at the cost of employment issues in our vastly populated country yet, the advantages provided are too huge to be ignored. It has brought about a massive change in the perspective of looking at customer data for analysis. The usage of artificial intelligence in banking is an important theme within entrepreneurial research. Within the banking sector, there is an increasing need to resolve customer service issues quickly, and within a specified turn-around time (TAT). The days of snail mail and customer complaint letters are days of the past. As we move ahead, we see customers becoming more evolved with handling their issues through chatbots and the automated self-service techniques as an accessible facility available due to wide spread digitization. What this also means is a bigger and more complex roles for the employees of the banks. This is will definitely enable organizations to manage enquiries instantly, gain better insight into their customer needs, and address issues more efficiently and effectively and in return lead to retention of customer. This study has been conducted to examine the stipulated aspects with respect to the origin and role played by AI in the Indian banking sector pertaining to the complaints management mechanism. It is a qualitative research describing the uses of AI in banks specifically with respect to complaints as well as risk management in the current scenario. This study has useful implication sin terms of newer insights and innovative mechanisms being adopted by the banking sector in Indian context.

Keywords: Artificial Intelligence, Machine Learning, AI in Indian Banking, Digitization, Technology, Challenges.

- 1 Research Scholar, JIMS, Jaipur.
- 2 Associate Professor, JIMS, Jaipur.



Certified True Copy
Rishi Ar
Jagan Nath University, Jaipur

Sigmoidal Spider Monkey Optimization Algorithm



Basudev Sharma, Vivek Kumar Sharma and Sandeep Kumar

Abstract Spider monkey optimization (SMO) algorithm is a recently developed optimizer that is stimulated by the extraordinary social activities of spider monkeys known as fission–fusion social structure. The SMO is developed to find solution of difficult optimization problems in real world, which are difficult to solve by the available deterministic strategies. During the solution search process in SMO, perturbation rate plays very important role. The convergence rate of SMO is highly affected by it. Usually, perturbation rate is defined by a simple function that is linearly in nature. But some application has nonlinear nature, thus a nonlinear function may improve the outcomes of SMO. For that reason, a non linear function, namely sigmoidal function used to decide perturbation in SMO and proposed strategy named as sigmoidal SMO. The investigational outcomes show the superiority of the anticipated technique over other meta-heuristics.

Keywords Spider monkey optimization · Optimization · Fission–fusion social structure · Swarm intelligence · Nature-inspired algorithm

1 Introduction

Bansal et al. [2] developed SMO optimizer based on the extraordinary social movement of spider monkeys. SMO getting popularity very fast due to applicability on wide range of problems. Various modifications are done in SMO to improve performance of basic SMO for various type of problem in last five years.

B. Sharma · V. K. Sharma
Jagannath University, Jaipur, Rajasthan, India
e-mail: bdsharmamkgh@yahoo.com

V. K. Sharma
e-mail: drvivekkr.sharma@gmail.com

S. Kumar (✉)
Amity University Rajasthan, Jaipur, India
e-mail: sandponia@gmail.com

© Springer Nature Singapore Pte Ltd. 2020
M. Pant et al. (eds.), *Soft Computing: Theories and Applications*,
Advances in Intelligent Systems and Computing 1053,
https://doi.org/10.1007/978-981-15-0751-9_10



Certified True Copy
Registrar
Jagan Nath University, Jaipur
109

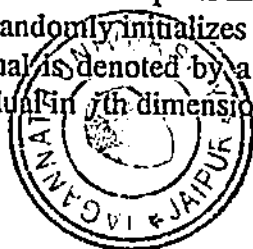
Kumar et al. anticipated customized position update in SMO [13], Self-adaptive spider monkey optimization [14] and improved SMO [22] with some modifications. Pal et al. solved multi-level thresholding problem using SMO [15] and based on experimental study, concluded that SMO outperforms PSO for considered problem. A tournament-selection-based probability computation strategy introduced in SMO [5] to avoid premature convergence as it enhance diversity of population. In basic SMO, [2] solutions with higher fitness are considered more suitable for next iteration that results in attraction of swarm in the proximity of highly fitted solution. Sometimes, solution with low fitness also contains useful information. In order to provide a chance to low-fitted solution to update their position, a tournament-selection strategy introduced in SMO by Gupta et al. [5]. The SMO was expended by Sharma et al. [17] for optimization of parameters in PIDA controller. Another local search strategy incorporated by Sharma et al. [18] in SMO is based on limaçon local search. Gupta et al. [6] also added a local search step in SMO to get rid of unconstrained optimization problems using quadratic approximation. Some other variant of SMO are modified SMO [8] using metropolis principle, constrained SMO using Debs technique [7], hybrid of SMO and GA [1] and fitness-based position update in [9]. Detailed study of SMO available in [19]. Here, a new variant of SMO proposed with new strategy to decide perturbation rate (pr) using sigmoidal function and named as sigmoidal SMO (SSMO). The modified pr in SSMO shows better convergence accuracy, efficient global search and faster convergence rate.

Rest of the paper is arranged as follows. Section 2 encapsulates SMO in brief. Section 3 illustrates the proposed sigmoidal spider monkey optimization. Experimental results of SSMO on different benchmarks along with statistical analyses has been discussed in Sect. 4. Section 5 concludes this paper.

2 SMO Algorithm

Spider monkeys are mostly found in Mexico, Brazil and South America. They belong the family of Ateles. It is from the class of genus, it is an endangered species. Mostly spider monkeys live in a band of 40–50 monkeys but they divide the large group into small-size groups to forage in morning and combine in a single group in the evening. Here, initially, the group is headed by senior-most female member (GL) and she is liable for all the activities of group. If food is not sufficient then she has to decide about the division of group. Subsequently, all the sub groups are also headed by female leader (LL). This phenomenon is termed as fission–fusion social structure ($FFSS$). The SMO stimulates this $FFSS$ organization of spider monkeys and a mathematical model proposed by Bansal et al. [2]. The SMO comprises six phases as per the behaviour of spider monkeys in real life.

Initially, all SM randomly initializes N spider monkeys that is analogous to solutions. Each individual is denoted by a vector SM_{ij} of D -dimension. Where SM_{ij} represent i th individual in j th dimension. Initialization of SM_{ij} is defined by Eq. 1:



Certified True Copy

Registrar

Jagan Nath University, Jaipur

$$SM_{ij} = SM_{\min j} + \phi(0, 1) \times (SM_{\max j} - SM_{\min j}) \quad (1)$$

where $SM_{\min j}$ and $SM_{\max j}$ are bounds of SM_i in j th direction and $\phi(0, 1)$ denotes an arbitrary value between 0 and 1. Next subsections illustrate phases of SMO.

2.1 Local Leader Phase (LLP)

During LLP, every individual update it's position using Eq. (2) according to the intelligence and experience of members of group as well as local leader (LL). Greedy selection mechanism used to update position of individuals.

$$SM'_{ij} = SM_{ij} + \phi(0, 1) \times (LL_{kj} - SM_{ij}) + \phi(-1, 1) \times (SM_{rj} - SM_{ij}) \quad (2)$$

here, position of local leader denoted by LL_{kj} and r th SM denoted by SM_{rj} .

2.2 Global Leader Phase (GLP)

During GLP, knowledge of global leader (GL) and participants of group employed to decide new position of individuals as shown in Eq. (3)

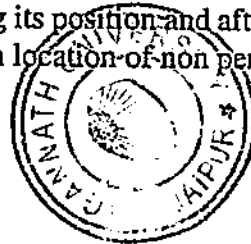
$$SM'_{ij} = SM_{ij} + \phi(0, 1) \times (GL_j - SM_{ij}) + \phi(-1, 1) \times (SM_{rj} - SM_{ij}) \quad (3)$$

Additionally, selection of certain dimension during position update takes place using probability of selection ($prob_i$). Probability computed with the help of fitness of solution using Eq. (4).

$$prob_i = \frac{fitness_i}{\sum_{i=1}^N fitness_i} \quad (4)$$

2.3 Global Leader Learning (GLL) Phase

The GLL phase identifies a GL with highest fitness. It makes use of a global limit counter to track the changes in position of global leader. The counter gets incremented if leader is not modernizing its position and after a certain amount of iterations, new global leader established in location of non performing.



Certified True Copy
 Registrar
 Jagannath University, Jaipur

2.4 Local Leader Learning (LLL) Phase

Similar to GLL, this phase update the location of the *LL* within group with best-fitness value and the local limit counter incremented by one if *LL* is not able to update itself.

2.5 Local Leader Decision (LLD) Phase

During this phase, the *LL* randomly re-initialize every group members by using Eq. (5) if its limit counter reaches to a predecided threshold.

$$SM'_{ij} = SM_{ij} + \phi(0, 1) \times (GL_j - SM_{ij}) + \phi(-1, 1) \times (SM_{rj} - SM_{ij}) \quad (5)$$

2.5.1 Global Leader Decision (GLD) Phase

During this phase, *GL* decides about division or merging of groups. If it reached to the limit of maximum number of groups (*MG*) then *GL* creates a large group by merging all subgroups and thus, mimic the FFSS of spider monkeys. Algorithm 1 shows a basic SMO algorithm.

Algorithm 1 SMO Algorithm [2]

Initialization of parameters (Perturbation Rate (*pr*), *GlobalLeaderLimit*, *LocalLeaderLimit*, Population Size).

Evaluate each solution using fitness.

Identify local and global leader.

while Termination condition is not fulfilled do

(I) Identify new location for each group member using LLP.

(II) Selection of best-fitted individuals.

(III) Probability (*prob_i*) calculation for every individual using Eq. (4).

(IV) The GLP identify new positions for every group member based on *prob_i*.

(V) All the *LL* and *GL* update their position using greedy approach.

(VI) Each group member channelised for foraging by LLD phase if *LL* is not modernizing itself.

(VII) If the *GL* is unable to update her position for *MG*, small-size subgroups are devised by GLD phase.

end while



Certified True Copy
 Registrar
 Jagan Nath University, Jaipur

3 Sigmoidal SMO

During the solution search process in SMO algorithm, perturbation rate play very important role. The convergence rate of SMO is highly affected by it. Usually, perturbation rate is defined by a simple function that is linearly in nature. But some application has nonlinear nature thus a nonlinear function may improve the outcomes of SMO. Some nonlinear perturbation rate strategies in SMO are introduced in [10–12] by using nonlinear functions like chaotic, exponential and hyperbolic functions. Hence, in order to get better results of optimization problems, here, a this paper presents a new modification in SMO. A nonlinear function, namely sigmoidal function used to decide perturbation in SMO. The proposed strategy named as sigmoidal SMO with a novel perturbation rate strategy.

In case of a probabilistic algorithm, quality of solution depends on balance between exploitation and exploration during solution search process. These two contradictory process accelerate the convergence and depends on perturbation rate. In case of SMO, the most important factor that influence the convergence rate of SMO is *pr*. Bansal et al. [2] initially suggested a linearly increasing function for perturbation rate that varies with iterations counter. Sometimes at downstream iterations, SMO is trapped into local solution due to dearth of diversity. To overcome these problems, in the proposed optimization algorithm, the *pr* is adapted by sigmoid increasing function instead of conventional approach. In SSMO, the parameter perturbation rate is decided by to sigmoid increasing function as exhibited in Eq. (6).

$$pr(t) = 1 - \frac{1}{(1 + \alpha) + \exp^x} \quad (6)$$

$$x = \left(\frac{2u(t-1)}{\max_{it} - 1} - u \right) \quad (7)$$

$$u = 10^{(\log(\max_{it}) - 2)} \quad (8)$$

where, current iteration denoted by *t*, *max_it* denote the counter for maximum iterations and the value of α is capriciously chosen in between 0 and 1. Rest all phases of SSMO are same as in basic SMO.

4 Experimental Setup and Result Analysis

The newly prepared SSMO is tested on a set of 12 benchmark problems as depicted in Table 1 [20, 23] and result analysed using some statistical test as discussed in subsequent section.



Certified True Copy
Registrar
Jagan Nath University, Jaipur

Table 1 Considered standard benchmark functions used for comparative analysis

S. No.	Function	D	Range	OV
1	$F_1(X) = \sum_{i=1}^D x_i^2$	30	[-100, 100]	0
2	$F_2(X) = \prod_{i=1}^D x_i + \sum_{i=1}^D x_i $	30	[-10, 10]	0
3	$F_3(X) = \max_i \{ x_i , 1 \leq i \leq D\}$	30	[-100, 100]	0
4	$F_4(X) = \sum_{i=1}^D ((0.5 + x_i)^2)$	30	[-100, 100]	0
5	$F_5(X) = \sum_{i=1}^D i x_i^4 + \text{random}[0, 1)$	30	[-1.28, 1.28]	0
6	$F_6(X) = e + 20 - 20 \exp\left(-0.2\sqrt{\frac{1}{D} \sum_{i=1}^D x_i^2}\right) - \exp\left(\frac{1}{D} \sum_{i=1}^D \cos(2\pi x_i)\right)$	30	[-32, 32]	0
7	$F_7(X) = \sum_{i=1}^D u(x_i, 5, 100, 4) + 0.1\{\sin^2(3\pi x_1) + \sum_{i=1}^D (x_i - 1)^2[1 + \sin^2(3\pi x_i + 1)] + (x_D - 1)^2[1 + \sin^2(2\pi x_D)]\}$	30	[-50, 50]	0
8	$F_8(X) = \sum_{i=1}^{11} \left[a_i - \frac{x_i(b_i^2 + b_i x_2)}{b_i^2 + b_i x_3 + x_4} \right]^2$	4	[-5, 5]	0.0003
9	$F_9(X) = 4x_1^2 - 2.1x_1^4 + \frac{1}{3}x_1^6 + x_1x_2 - 4x_2^2 + 4x_2^4$	2	[-5, 5]	-1.0316
10	$F_{10}(X) = [30 + (2x_1 - 3x_2)^2 \times (18 - 32x_1 + 12x_1^2 + 48x_2 - 36x_1x_2 + 27x_2^2)] \times [1 + (x_1 + x_2 + 1)^2(19 - 14x_1 + 3x_1^2 - 14x_2 + 6x_1x_2 + 3x_2^2)]$	2	[-2, 2]	3
11	$F_{11}(X) = -\sum_{i=1}^4 c_i \exp(-\sum_{j=1}^3 a_{ij}(x_j - p_{ij})^2)$	3	[1, 3]	-3.86
12	$F_{12}(X) = -\sum_{i=1}^4 c_i \exp(-\sum_{j=1}^6 a_{ij}(x_j - p_{ij})^2)$	6	[0, 1]	-3.32

D dimensions, OV optimal value

4.1 Result Analysis of SSMO

In order to perform experiments over selected problems using SSMO, population size selected as 50 and number iterations are taken 1000. The results of SSMO are compared with basic SMO and three other popular algorithms, namely DE [21], GSA [16] and PSO [4], over the selected problems (refer Table 1). Parameter settings for considered algorithms are same as mentioned in the corresponding literature. All the experiments are repeated 30 times to reduce the inter-dependencies.

Table 2 shows the resultant mean fitness values SSMO and considered algorithms. From the table, it has been observed that SSMO outperform DE, GSA and PSO for all problems except F_9 with regard to mean fitness value. In case of F_9 , DE returns slightly better outcomes. In comparison to SMO, the proposed method shows better or almost equivalent results except F_1 and F_8 functions. To validate the results of Table 2, a statistical test [3] has been performed with NULL hypothesis. The test performed at significance level of 5%. The wilcoxon rank sum tests have been shown



Certified True Copy
Registrar
Jagan Nath University, Jaipur

Table 2 Outcomes (mean fitness value) of SSMO and considered methods over standard benchmarks

Benchmarks	SSMO	PSO	GSA	DE	SMO
F_1	2.09E-08	1.67E-05	1.12E-05	4.35E+03	1.98E-08
F_2	4.61E-08	3.03E-07	5.28E-04	2.6E+02	3.09E-08
F_3	2.15E-08	5.81E-05	2.4733	81.9	2.62E-08
F_4	2.23E-08	1.15E-07	2.81E-05	6.8E+03	2.25E-08
F_5	1.49E-02	2.24E-01	7.13E-02	4.90	1.39E-02
F_6	4.62E-08	19.97	1.41E-04	19.32	4.79E-08
F_7	1.99E-08	1.1E-02	3.39E-05	1.03E+08	2.47E-08
F_8	3.44E-04	2.04E-02	1.68E-03	9.68E-04	3.39E-05
F_9	4.93E-08	4.65E-08	6.23E-08	4.65E-08	4.91E-08
F_{10}	3.0000	3.0000	30.000	3.0000	3.00000
F_{11}	-3.8628	-3.005	-3.002	-3.72E-35	-3.8628
F_{12}	-3.0425	-2.9810	-3.0425	-1.3355	-3.0425

Table 3 The results of wilcoxon rank sum test

Benchmark	SSMO-SMO	SSMO-GSA	SSMO-DE	SSMO-PSO
F_1	-	+	+	+
F_2	=	+	+	+
F_3	+	+	+	+
F_4	=	+	+	+
F_5	=	=	+	+
F_6	+	+	+	+
F_7	+	+	+	+
F_8	-	+	+	+
F_9	=	+	=	=
F_{10}	=	+	=	=
F_{11}	=	+	+	+
F_{12}	=	=	+	+

in Table 3 in between SSMO and considered algorithms. The '+' symbol denotes that the results are significantly different and results for SSMO are better, whereas '-' sign says that results are significantly different but results for SSMO are poor. From Table 3, it can be observed that for maximum number of functions, SSMO gives improved outcomes except F_1 and F_8 function where SMO performs better. Based on these outcomes, it can be decided that SSMO gives better results in comparison to SMO and other considered algorithms.



Certified True Copy
 Recd. at
 Jagannath University, Jaipur

5 Conclusion

This manuscript anticipated a new deviant of SMO that is named as sigmoidal SMO as it used sigmoidal function to select perturbation rate. The nonlinear nature of sigmoidal function improves balancing between exploration and exploitation process. The outcomes of SSMO have been contrasted with DE, GSA, PSO and SMO algorithms. The statistical and experimental results prove that the SSMO method surpasses the existing nature-inspired algorithms. Additionally, the newly proposed system has been analysed for mean fitness value with DE, GSA, PSO and SMO. In future, SSMO can be used for real-world clustering and classification problems.

References

1. Agrawal, A., Farswan, P., Agrawal, V., Tiwari, D.C., Bansal, J.C.: On the hybridization of spider monkey optimization and genetic algorithms. In: Proceedings of Sixth International Conference on Soft Computing for Problem Solving, pp. 185–196. Springer, Berlin (2017)
2. Bansal, J.C., Sharma, H., Jadon, S.S., Clerc, M.: Spider monkey optimization algorithm for numerical optimization. *Memetic Comput.* 6(1), 31–47 (2014)
3. Derrac, J., García, S., Molina, D., Herrera, F.: A practical tutorial on the use of nonparametric statistical tests as a methodology for comparing evolutionary and swarm intelligence algorithms. *Swarm Evol. Comput.* 1, 3–18 (2011)
4. Eberhart, R., Kennedy, J.: A new optimizer using particle swarm theory. In: Proceedings of the Sixth International Symposium on Micro Machine and Human Science, 1995. MHS'95, pp. 39–43. IEEE, New York (1995)
5. Gupta, K., Deep, K.: Tournament selection based probability scheme in spider monkey optimization algorithm. In: Harmony Search Algorithm, pp. 239–250. Springer, Berlin (2016)
6. Gupta, K., Deep, K., Bansal, J.C.: Improving the local search ability of spider monkey optimization algorithm using quadratic approximation for unconstrained optimization. *Comput. Intell.* 33(2), 210–240 (2017)
7. Gupta, K., Deep, K., Bansal, J.C.: Spider monkey optimization algorithm for constrained optimization problems. *Soft Comput.* 21(23), 6933–6962 (2017)
8. Hazrati, G., Sharma, H., Sharma, N., Bansal, J.C.: Modified spider monkey optimization. In: International Workshop on Computational Intelligence (IWCi), pp. 209–214. IEEE, New York (2016)
9. Kumar, S., Kumari, R., Sharma, V.K.: Fitness based position update in spider monkey optimization algorithm. *Proc. Comput. Sci.* 62, 442–449 (2015)
10. Kumar, S., Nayyar, A., Nguyen, N.G., Kumari, R.: Hyperbolic spider monkey optimization algorithm. *Recent Patents Comput. Sci.* 12(1) (2019)
11. Kumar, S., Sharma, B., Sharma, V.K., Poonia, R.C.: Automated soil prediction using bag-of-features and chaotic spider monkey optimization algorithm. *Evol. Intell.* pp. 1–12 (2018)
12. Kumar, S., Sharma, B., Sharma, V.K., Sharma, H., Bansal, J.C.: Plant leaf disease identification using exponential spider monkey optimization. *Sustain. Comput.: Inf. Syst.* (2018)
13. Kumar, S., Sharma, V.K., Kumari, R.: Modified position update in spider monkey optimization algorithm. *Int. J. Emerg. Technol. Comput. Appl. Sci.* 2, 198–204 (2014)
14. Kumar, S., Sharma, V.K., Kumari, R.: Self-adaptive spider monkey optimization algorithm for engineering optimization problems. *Int. J. Inf. Commun. Comput. Technol.* 2(2), 96–107 (2014)



Certified True Copy
 Registrar
 Jagan Nath University, Jaipur

76

An M/M/2 Heterogeneous Service Markovian Feedback Queuing Model with Reverse Balking, Reneging and Retention of Reneged Customers



Bhupender Kumar Som, Vivek Kumar Sharma and Sunny Seth

Abstract To stay ahead in today's competitive business environment, understanding the behavior of the customer in advance is of utmost importance for every organisation. Mathematical queuing model developed in this paper can help organisations to theoretically derive the performance measures of the system in advance taking into consideration various customer behaviors. The model developed in this paper is solved iteratively to derive various probabilistic measures and performance measures of the system. Results obtained from the model with above-mentioned contemporary issues presented in this paper are of enormous use for designing effective strategies for efficient and smooth functioning of the system.

Keywords Reverse balking · Queuing systems · Heterogeneous service · Impatient customers · Reneging · Retention · Feedback queue

1 Introduction and Literature Survey

Unlike classical balking behavior in queuing theory studied by Ancher and Gafarian [1, 2] and Haight [3], Jain et al. [4] observed that in many businesses like in restaurants and healthcare large customer base attracts newly arriving customers to join the system with higher probability due to perceived notion of better/affordable service and coined the term reverse balking. Reverse balking leads to increase in waiting time of the customers and some customers after waiting for longer time than their threshold limit leave the queue without receiving service, which is known as reneging in queuing literature studied by Haight [5]. Robert [6] discussed single-channel queuing model in which n th arrival reneges if his waiting time exceeds some random time Z_n and presented results in general cases. Baccelli et al. [7] studied queuing

B. K. Som · S. Seth (✉)
Jagan Institute of Management Studies, Rohini Sec
e-mail: Sunnyseth2005@gmail.com

V. K. Sharma
Jagannath University, Jaipur, Rajasthan, India

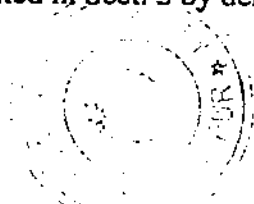


© Springer Nature Singapore Pte Ltd. 2020
H. Sharma et al. (eds.), *Advances in Computing and Intelligent Systems*,
Algorithms for Intelligent Systems,
https://doi.org/10.1007/978-981-15-0222-4_25

Certified True Copy
Jagan Nath University, Jaipur
291

model with customer impatience where an arriving customer can estimate the waiting time in the queue and can either decide to balk or joins the queue and leaves when his patience expires. Wang et al. [8] presented a detailed review of impatient behavior in queuing models and investigated numerical solutions, analytical solutions and simulation models. Increase in waiting times often puts pressure on service facility due to which some customers may experience dissatisfaction in the service received and may rejoin the queue from the beginning for satisfactory service and are known as feedback customers. Takács [9] studied feedback queue to determine the queue size and studied the distribution function of the expected waiting time of a customer in the system. Davignon and Disney [10] also studied queues in which customer either permanently leaves the queue or may join the queue again with some probability and the also worked out waiting time distribution of such queuing systems. Santhakumaran and Thangaraj [11] considered M/M/1 queues with Bernoulli feedback process and impatient behavior of customers. As losing a customer is loss to the business, so firms employ various retention strategies to retain these impatient customers. Kumar et al. [12–16] studied retention of customers leaving the queue without availing service. They also incorporated feedback customers and customer impatience with retention and studied various dimensions of such queuing models. As no two servers can provide service exactly at the same rate, the concept of heterogeneous service comes into the picture. The pioneer work in queuing theory on heterogeneous servers is done by Morse [17]. Krishnamoorthi [18] discussed two heterogeneous servers queuing model in which instead of joining any server randomly upon arrival, customer prefers to join the waiting line of the server with higher service rate. Singh [19] studied queuing model with two-heterogeneous servers with balking having common waiting line. He also obtained conditions under which heterogeneous server model is more efficient than homogeneous server model. Som and Seth [20] studied a heterogeneous two-server queuing model with encouraged arrivals and customer impatience. The concept of encouraged arrivals is another form of reverse balking wherein instead of considering the probability, percentage increase in number of customers joining the system due to offers and discounts by firms to attract customers is considered. Som and Seth [21] also studied finite capacity multi-server queuing model with encouraged arrivals, feedback customers, renegeing and retention and discussed various special cases as well. Kumar and Som [22] studied finite capacity queuing model with reverse balking and feedback customers and also studied the concept of reverse renegeing and retention. Som and Seth [23] studied infinite capacity queuing model with reverse balking and feedback and extended the work in [24] by combining the concept of renegeing and retention of impatient customers.

In this paper an infinite capacity Markovian two-server heterogeneous service queuing model with contemporary challenges of feedback customers, customer impatience, retention of impatient customers and reverse balking is developed. The validity of the model is then tested using Laplace transform. Model is then solved iteratively to derive various probabilistic measures and performance measures of the system. Flow of the paper is as follows: Mathematical model is formulated in Sect. 2. Solution of the model is presented in Sect. 3 by deriving various probabilistic measures.



Certified True Copy
Registrar
Jagan Nath University, Jaipur

Measures of performance are discussed in Sect. 4. Finally, conclusion and future scope are discussed in Sect. 5.

2 Mathematical Model Formulation

The classical method for development of queuing model by listing all mutually exclusive cases is used with following assumptions:

1. Arrivals follow Poisson process with parameter λ .
2. Customers are serviced through two servers, with heterogeneous service rates, μ_1 and μ_2 respectively. Service times are exponentially distributed.
3. Capacity of system is infinite.
4. A customer waiting for service in queue may get impatient after threshold time T and decides to abandon the queue with an exponentially distributed parameter ξ .
5. A leaving customer may be retained with probability $q = (1 - p)$ by using some retention strategy.
6. A customer not satisfied with the service may rejoin the queue with probability $r = (1 - s)$.
7. The queue discipline is FCFS.
8. At $n = 0$ probability of reverse balking is $q' = (1 - p')$. For $n > 0$ an arriving customer may reverse balk with the probability $\left(\frac{1}{n+1}\right)$ may not reverse balk with the probability $\left(\frac{n}{n+1}\right)$.

Based on assumptions mentioned above equations of the model in steady state are formulated as follows:

$$0 = -\lambda p' P_0 + \mu_1 s P_{10} + \mu_2 s P_{01}; n = 0 \quad (1)$$

$$0 = \lambda p' \pi_1 P_0 - \left(\frac{\lambda}{2} + \mu_1 s\right) P_{10} + \mu_2 s P_{11}; n = 1 \text{ at server 1} \quad (2(a))$$

$$0 = \lambda p' \pi_2 P_0 - \left(\frac{\lambda}{2} + \mu_2 s\right) P_{01} + \mu_1 s P_{11}; n = 1 \text{ at server 2} \quad (2(b))$$

$$0 = \lambda \left(\frac{n-1}{n}\right) P_{n-1} - \left\{ \frac{\lambda n}{n+1} + \mu_1 s + \mu_2 s + (n-2)\xi p \right\} P_n + \{\mu_1 s + \mu_2 s + (n-1)\xi p\} P_{n+1}; n \geq 2 \quad (3)$$

Certified True Copy
 Registrar
 Jagan Nath University, Jaipur

3 Solution of the Model—Probabilistic Measures

Probabilistic measures of the model derived using iterative method are as follows:

$$P_1 = \frac{\left[\frac{\lambda}{2} + \mu_1 s \pi_2 + \mu_2 s \pi_1\right]}{[\lambda + \mu_1 s + \mu_2 s]} \cdot \frac{\lambda}{\mu_1 \mu_2 s} \cdot (\mu_1 + \mu_2) \cdot p' P_0$$

$$P_2 = \frac{\left[\frac{\lambda}{2} + \mu_1 s \pi_2 + \mu_2 s \pi_1\right]}{[\lambda + \mu_1 s + \mu_2 s]} \cdot \frac{1}{2} \cdot \frac{\lambda}{\mu_1 s} \cdot \frac{\lambda}{\mu_2 s} \cdot p' P_0$$

$$P_n = \frac{\left[\frac{\lambda}{2} + \mu_1 s \pi_2 + \mu_2 s \pi_1\right]}{[\lambda + \mu_1 s + \mu_2 s]} \cdot \frac{1}{n} \cdot \frac{\lambda}{\mu_1 s} \cdot \frac{\lambda}{\mu_2 s} \cdot \left\{ \prod_{k=3}^n \frac{\lambda}{[\mu_1 s + \mu_2 s + (k-2)\xi p]} \right\} p' P_0, \quad n \geq 3$$

Using condition of normality $\sum_{n=0}^{\infty} P_n = 1$, we get

$$P_0 = P_r \{\text{system is empty}\}$$

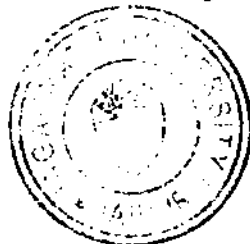
$$= \left[1 + z \left(\frac{\lambda}{2} + \mu_1 s + \mu_2 s \right) - \frac{z}{2} (\lambda + 2(\mu_1 s + \mu_2 s)) \right. \\ \left. \left[1 - {}_p F_q \left((1, 1); \left(2, \frac{(\mu_1 s + \mu_2 s)}{\xi p} \right); \left(2, \frac{\lambda}{\xi p} \right) \right) \right] \right]^{-1}$$

where $z = \frac{\left[\frac{\lambda}{2} + \mu_1 s \pi_2 + \mu_2 s \pi_1\right]}{[\lambda + \mu_1 s + \mu_2 s]} \cdot \frac{\lambda p'}{\mu_1 \mu_2 s^2}$ and ${}_p F_q$ represents generalized Hyper-geometric function and this expression is computed through WolframAlpha. ${}_p F_q(a; b; z)$ has series expansion. $\sum_{k=0}^{\infty} (a)_k \dots (a_p)_k / (b_1)_k \dots (b_q)_k z^k / k!$, where $(a)_k$ is the Pochhammer symbol representing rising factorial and is defined as $(a)_k = a(a+1)(a+2) \dots (a+k-1)$.

4 Measures of Performances

Having calculated probabilistic measures various performance measures can be calculated as

1. L_s {Expected System Size} = $\sum_{n=0}^{\infty} n P_n$
2. L_q {Expected Queue Length} = $\sum_{n=3}^{\infty} (n-2) P_n$
3. R_r { Expected Rate of Reneging} = $\sum_{n=3}^{\infty} (n-2) \xi q P_n$
4. R_R { Expected Rate of Retention} = $\sum_{n=3}^{\infty} (n-2) \xi p P_n$
5. R_{Rb} {Expected Rate of Reverse Balking} = $\sum_{n=0}^{\infty} \left(\frac{1}{n+1}\right) \lambda p' P_n$.



Certified True Copy

Jagan Nath University, Jaipur

5 Conclusions and Future Scope

In this paper, an infinite capacity Markovian two server heterogeneous feedback queuing model with reverse balking, reneging and retention of reneged customers is developed. This model addresses practically valid contemporary challenges. The mathematical results obtained are of enormous use for business organisations undergoing the above mentioned challenges. The model can be adopted and implemented to measure overall performance of the system theoretically. By implementing this model efficiency of any business organisation can be improved and better service can be provided to the customers which helps any business organisation to stay ahead in this era of cut-throat competition.

Further cost model can be developed for this model and cost-profit analysis of the model can be performed. Model can also be optimized for specific parameters. Transient state solution of the model can also be studied. Model can also be simulated for various parameters involved in the model.

References

1. Ancker, C. J., Jr., & Gafarian, A. V. (1963). Some queuing problems with balking and reneging I. *Operations Research*, 11, 88-100.
2. Ancker, C. J., Jr., & Gafarian, A. V. (1963). Some queuing problems with balking and reneging II. *Operations Research*, 11, 928-937.
3. Haight, F. A. (1957). Queuing with balking I. *Biometrika*, 44, 360-369.
4. Jain, N. K., Kumar, R., & Som, B. K. (2014). An M/M/1/N queuing system with reverse balking. *American Journal of Operational Research*, 4(2), 17-20.
5. Haight, F. A. (1959). Queuing with reneging. *Metrika*, 2, 186-197.
6. Robert, E. (1979). Reneging phenomenon of single channel queues. *Mathematics of Operations Research*, 4(2), 162-178.
7. Baccelli, F., Boyer, I. P., & Hebuterne, G. (1984). Single-server queues with impatient customers. *Advances in Applied Probability*, 16, 887-905.
8. Wang, K., Li, N., & Jiang, Z. (2010). Queuing system with impatient customers: A review. In *2010 IEEE International Conference on Service Operations and Logistics and Informatics* (pp. 82-87), July 15-17, 2010, Shandong.
9. Takács, L. (1963). A single-server queue with feedback. *Bell System Technical Journal*, 42(2), 505-519.
10. Davignon, G. R., & Disney, R. L. (1976). Single server queue with state dependent feedback. *INFOR*, 14, 71-85.
11. Santhakumaran, A., & Thangaraj, V. (2000). A single server queue with impatient and feedback customers. *Information and Management Science*, 11, 71-79.
12. Kumar, R., & Sharma, S. K. (2012). M/M/1/N queuing system with retention of reneged customers. *Pakistan Journal of Statistics and Operation Research*, 8(4), 719-735.
13. Kumar, R., & Sharma, S. K. (2012). An M/M/1/N queuing model with retention of reneged customers and balking. *American Journal of Operational Research*, 2(1), 1-5.
14. Kumar, R., & Sharma, S. K. (2012). A Markovian feedback queue with retention of reneged customers. *AMO-Advanced Modelling and Optimization*, 14(3), 673-679.
15. Kumar, R., & Sharma, S. K. (2012). A Markovian feedback queue with retention of reneged customers and balking. *AMO-Advanced Modelling and Optimization*, 14(3), 681-688.



16. Kumar, R., & Sharma, S. K. (2013). An $M/M/c/N$ queuing system with reneging and retention of reneged customers. *International Journal of Operational Research*, 17, 333–340.
17. Morse, P. M. (1958). *Queues, inventories and maintenance*. New York: Wiley.
18. Krishnamoorthy, B. (1963). On Poisson queues with heterogeneous servers. *Operations Research*, 11, 321–330.
19. Singh, V. P. (1970). Two-server Markovian queues with balking: Heterogeneous vs homogeneous servers. *Operations Research*, 18, 145–159.
20. Som, B. K., & Seth, S. (2017). An $M/M/2/N$ queuing system with encouraged arrivals, heterogeneous service and retention of impatient customers. *Advanced Modelling and Optimization*, 19, 97–104.
21. Som, B. K., & Seth, S. (2018). $M/M/c/N$ queuing systems with encouraged arrivals, reneging, retention and feedback customers. *Yugoslav Journal of Operations Research*, 28(3), 333–344.
22. Kumar, R., & Som, B. K. (2015). An $M/M/1/N$ feedback queuing system with reverse balking, reverse reneging and retention of reneged customers. *Indian Journal of Industrial and Applied Mathematics*, 6(2), 173–183.
23. Som, B. K., & Seth, S. (2017). A multi-server infinite capacity markovian feedback queuing system with reverse balking. In *Fifth International Conference on Business Analytics and Intelligence*, December 11–13, 2017, IIM Bangalore.
24. Som, B. K., & Seth, S. (2018). A stochastic multi-server infinite capacity feedback queuing system with reverse balking, customer impatience and retention of impatient customers. In *The 13th International Conference on Queuing Theory and Network Applications (QTNA2018)*, July 25–27, 2018, Tsukuba, Japan.



Certified True Copy
Registrar
Jagan Nath University, Jaipur

12

SpringerLink

An M/M/2 Heterogeneous Service Markovian Feedback Queuing Model with Reverse Balking, Reneging and Retention of Reneged Customers

Advances in Computing and Intelligent Systems

pp 291-296 | Cite as

Conference paper

First Online: 03 January 2020

1

1

238

Citations Mentions Downloads

Part of the Algorithms for Intelligent Systems book series (AIS)

Abstract

To stay ahead in today's competitive business environment, understanding the behavior of the customer in advance is of utmost importance for every organisation. Mathematical queuing model developed in this paper can help organisations to theoretically derive the performance measures of the system in advance taking into consideration various customer behaviors. The model developed in this paper is solved iteratively to derive various probabilistic measures and performance measures of the system. Results obtained from the model with above-mentioned contemporary issues presented in this paper are of enormous use for designing effective strategies for efficient and smooth functioning of the system.



Certified True Copy

Registered

Jagan Nath University, Jaipur

10/30/2020, 4:56 PM

78

Algorithms for Intelligent Systems

Series Editors: Jagdish Chand Bansal · Kusum Deep · Atulya K. Nagar

Harish Sharma · Kannan Govindan ·

Ramesh C. Poonia · Sandeep Kumar ·

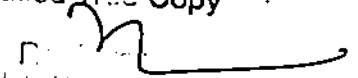
Wael M. El-Medany *Editors*

Advances in Computing and Intelligent Systems

Proceedings of ICACM 2019



Certified True Copy


Jagan Nath University, Jaipur

Innovative Review on Artificial Bee Colony Algorithm and Its Variants



Pooja and Gajendra Shirmal

Abstract The popular swarm-based algorithm is being inspired by the intelligent behavior of the honeybees that helps in finding the optimal solutions for getting the best food source. This paper is focused on highlighting the concept of the swan intelligence and the concept of the ABC algorithm, its variant, and also about its applications.

Keywords ABC algorithm · Swarm intelligence · Scouts

1 Introduction

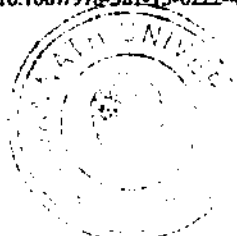
Over the previous decades, various optimization algorithms have been utilized broadly in basic and assembling optimization assignments. These strategies may not be utilized productively in finding worldwide ideal arrangements. As an option in contrast to customary procedures, populace-based optimization approaches, for example, hereditary calculation, molecule swarm optimization calculation, counterfeited safe calculation, cuckoo seek calculation, differential advancement, subterranean insect state optimization, and fake honeybee settlement calculation have been created to take care of complex issues in building configuration, account and for finding the ideal arrangement or unconstrained maxima or minima of constant and differentiable capacities. These algorithms can be effectively connected to take care of numerous genuine issues. The issues to be improved by swarm intelligence algorithms should not be scientifically spoken to as ceaseless, curved, as well as differentiable capacities; they can be spoken to in any structure [1].

Swarm intelligence (SI) is a developing examination field reused by aggregate intelligence of social insects or creatures in gathering, for example, subterranean insect states, honeybee provinces, winged creature runs, and fish schools. The idea of aggregate intelligence was initially acquainted in [1] with talk about oneself sorting out and keen conduct of ants and clarify how the ants pick between various courses to

Pooja (✉) · G. Shirmal
Department of Computer Science and Engineering, Jagannath University, Jaipur, India
e-mail: 18poojadhaka@gmail.com

© Springer Nature Singapore Pte Ltd. 2020
H. Sharma et al. (eds.), *Advances in Computing and Intelligent Systems*,
Algorithms for Intelligent Systems,
https://doi.org/10.1007/978-981-15-0222-4_14

165



Certified True Copy
Jagan Nath University, Jaipur

sustenance sources with changing quality. Nonetheless, the idea was bit-by-bit disposed of and it began reemerging in the late 1980s with the expansion in research on counterfeit life and complex framework hypothesis. Aggregate intelligence might be considered as the gathering of extensive number of agents that communicate among themselves, just as dynamic condition to produce versatile conduct [1]. The expression "swarm intelligence" was presented with regards to cell mechanical frameworks [2]. The connection between an individual and the general public was better clarified as far as aggregate investigation and gathering conduct of social insects. Their unbelievable qualities, for example, self-association, aggregate choices, division of labor, and positive and negative input assume a noteworthy job in the planning of complex frameworks for various applications [2].

2 ABC Algorithm

Artificial bee colony algorithm (ABC) created by Karaboga and further created by Karaboga and Basturk is a nature-motivated algorithm dependent on the smart scrounging conduct of a honeybee swarm. The ABC algorithm portrays the scavenging conduct, picking-up, remembering, and data-sharing attributes of honeybees [3].

The colony of the artificial bees comprises three gatherings of bees: utilized bees, spectators bees, and scouts bees. The colony of the artificial bees is separated into two gatherings, the first 50% of the colony comprises the utilized artificial bees and the second half incorporates the spectator bees. Scout bees are the utilized bees whose food source has been deserted. In the ABC algorithm, the situation of a food source is concerned with the planning of the sources of food and collection of the food or nectars [3].

The utilized bees arbitrarily look for food-source positions (arrangements). At that point, by moving, they share data (convey) about that food source, for example, nectar sums (arrangements characteristics), with the spectator bees holding up in the move zone at the hive. The distance to be covered is on the basis of the nectar to be collected. The spectators will try out different sources before finding out the main food source location [4].

The area of artificial bees in the ABC algorithm involves three kinds of bumble bees [5]: utilized bees, always searching for explicit food sources, spectator bees, and then watching the waggle move of utilized bees in the hive for food source determination, and scout bees, also the food source searcher. Spectator and scouts are otherwise called jobless bees. The places of all the food sources are found by the scout bees. These of the sources of food are drained by utilized bees and also the passerby bees, and this nonstop procedure of investigation will prompt the end of food sources. Which results that, the utilized bee turns into a scout bee and begins seeking for other sources of the food?

In the ABC process, food source position is distinguished as the answer for problem and wellness (quality) speaks of the measure of a food wellspring of the related



Certified True Copy

Jagan Nath University, Jaipur

arrangement. The algorithm in its essential structure, speaks of the quantity of utilized bees that are equivalent to the quantity of food sources accessible, as the utilized bees are related with only one single food source at a time.

3 Extensions of ABC Algorithm

Artificial bee colony algorithm keeps on drawing in light of a legitimate concern for specialists from different fields over the globe and this came about into various alteration or upgrade to the essential ABC algorithm.

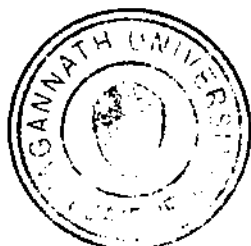
Karaboga and Basturk [5] have shown ABC improvement calculation for dealing with obliged streamlining issues [5]. In this work, the methodology of obliged improvement was joined into the fundamental ABC calculation. The makers used Deb's precepts of managing constrained method in an ABC assurance framework. The execution of the proposed calculation was surveyed on a ton of obliged issues and complexity and state-of-workmanship calculation. It was assumed that the proposed ABC can adequately be used for handling constrained upgrade issues.

The execution of ABC calculation with the compromise move neighborhood structures and avaricious randomized adaptable look heuristic for a summed up errand issue was investigated by Baykasoglu et al. [6]. ABC was connected through compromise of the used and onlooker stages with move neighborhood structures associated consecutively. The reenactment results showed that the proposed ABC can settle little to medium size summed up assignment issues sufficiently.

Quan and Shi exhibited the Improved Artificial Bee Colony Algorithm [7]. In this work, another interest cycle chairman reliant on the fixed point speculation of contractive mapping in seat spaces was proposed. The execution of the proposed algorithm took a stab at ten multivariable benchmark limits. The generation results revealed that the proposed calculation had an unbelievable display in the overall streamlining and can be capably used to deal with multimodal issues with high dimensionality.

The change of ABC calculation with three decision frameworks was finished by Narasimhan [8]. The makers changed the assurance of sustenance sources by onlooker honeybees in order to avoid the less than ideal blend and augmentation masses grouped assortment. Three assurance techniques fuse problematic decision, position decision, and rivalry decision.

An overhauled ABC progression calculation named natural ABC improvement algorithm was proposed by Tsai et al. [9]. The makers introduced the possibility of comprehensive gravitational power for the improvement of bystander honeybees. This thought was used to improve the examination limit of the ABC calculation. The execution of IABC took a stab at five numerical benchmark works and was differentiated as one of a kind ABC, PSO. The reenactment results demonstrated that IABC performed better and can be effectively associated with handling combi-national improvement issues.



Certified True Copy
Jagan Nath University, Jaipur

Akay and Karaboga changed the ABC calculation to light up the veritable DAD parameter progression [10]. The makers modified basic ABC by showing a control parameter that chooses what number of parameters to be balanced. A scaling component was moreover exhibited that tuned the movement gauge adaptively. The execution of the proposed ABC was differentiated and crucial ABC and state of craftsmanship calculation was recorded as a hard copy. The results showed that balanced ABC can settle blended work profitably.

4 Modified Approaches in ABC Algorithm

N. Pathak et al. 2017 proposed an incremental ABC algorithm which performs the local search which results in reducing the negative interaction without increasing the complexity for the agent behavior. The algorithm also integrates some part of the genetic approach.

Y. Wang et al. 2019 proposed the modified ABC algorithm equipped with the advanced search ability. The proposed algorithm works by adding the scouts on comparison of the maximum value denoted by Bas Max, and then base second followed by Bas thirds, then the results are compared using some parameters for proving its efficiency with the base ABC algorithm.

4.1 Best-so-Far Artificial Bee Colony Algorithm

It was proposed by Anan Banhamsakun, Tiranee Achalakul, and Booncharoen Sirinaovakul. This calculation expands the neighborhood seek capacity of the passerby honeybees. In BSFABC, passerby honeybees analyze the data from every single utilized honeybee to choose the best-so-far hopeful nourishment source [11]. In this, misuse and investigation the two procedures are adjusted. This technique is connected to improve the common data in a picture enrollment application. A few picture sets were utilized in the analyses. The outcomes demonstrated that this calculation can land at the assembly state all the more rapidly.

In 2014, another altered BSFABC was proposed by Gajendra Shirmal and Rakesh Rathi. In this, BSFABC and brilliant segment seek calculations were joined together to improve the achievement rate of the ABC calculation [12]. The cross-breed calculation alters the scout honeybee period of unique BSFABC. It is connected on a few capacities and for each structure better on different capacities.



Certified True Copy

Researcher
Jagan Nath University, Jaipur

4.2 Global Best Artificial Bee Colony Algorithm

It was proposed by the Weifeng Gao, Sanyang Liu, and Lingling Huang. It improves the abuse that is the disadvantage of unique ABC. In this, every honeybee seeks just around the best arrangement of the past emphasis so as to improve the misuse [13]. It is roused by differential advancement (DE) system. The calculation is connected on 26 benchmark capacities and it performs better than ABC.

4.3 Memetic Search in Artificial Bee Colony Algorithm

In Memetic Search, new arrangements are created around the best arrangement and it improves the abuse ability of ABC. It is built up as an adjusted ABC calculation through examinations of more than 20 test issues of various complexities and four understood building advancement issues [14]. To adjust among assorted variety and combined capacity of the ABC, another neighborhood inquiry stage is integrated with the fundamental ABC to misuse the hunt space recognized by the best individual in the swarm. In the proposed stage, ABC fills in as a nearby hunt calculation where the progression estimate that is required to refresh the best arrangement is constrained by the Golden Section Search approach.

In 2014, another improved Memetic Search in artificial bee colony calculation is master presented by Kumar et al. [15–17]. In this, both utilized honeybee stage and spectator honeybee stage are improved with the assistance of a nearby hunt procedure invigorated by memetic calculation [15]. It is tried with more than 13 unbiased benchmark elements of various complexities and two genuine word issues are likewise considered to demonstrate the proposed calculations with predominance over unique ABC calculation and its ongoing variations.

5 Applications of ABC Algorithm

5.1 Traveling Salesmen Problem

Traveling Salesman Problem (TSP) has a place with the class of NP-Complete problems. ABC discovers preferred arrangement over GA and other ABC is broadly utilized for optimization [18, 19].



Certified True Copy
Jagan Nath University, Jaipur

5.2 Chart Shading

Chart shading has been finished utilizing artificial bee colony (ABC) optimization algorithm. In Graph shading, no two neighboring edges have the same shading. This is illuminated by utilizing ABC with preferable outcome over the other algorithms [18].

5.3 Bioinformatics Application

In the field of Bioinformatics, ABC enhances the DNA sequencing problem with a better outcome when contrasted with different algorithms [18].

5.4 Image Processing Applications

ABC has its application to image processing. A few troublesome problems exist in example acknowledgment and image processing research territories. ABC optimization works better and upgrades the example acknowledgment problem, so it is broadly utilized for image processing [18].

5.5 Benchmarking Optimization

Various capacities exist which can be enhanced utilizing the ABC algorithm [18].

5.6 Clustering

Clustering implies parceling a given arrangement of information into gatherings or class. Information clustering is utilized in different fields like information mining, AI, design acknowledgment, and so on. It is additionally connected in a vast assortment of applications, for example, image division, articles and character acknowledgment, and report recovery [19]. There are different strategies which are utilized in information clustering like various leveled clustering, segment-based clustering, thickness-based clustering, and artificial knowledge based clustering.



Certified True Copy

Jagan Nath University, Jaipur

One prominent class of clustering strategy is the inside-based clustering, i.e., K-implies. K-implies algorithm is utilized in clustering because of its straightforwardness and fast clustering in the vast informational index yet it has two burdens: (i) reliance on beginning state and (ii) convergence to neighborhood optima and worldwide optima arrangements of expansive problems cannot be found with a sensible measure of calculation exertion. To defeat the neighborhood ideal problem, heaps of concentrates are done on information clustering and it is found that bumblebees are the best contrast with other arrangements.

6 Experimental Results

We have taken 10 real-world problems and applied original ABC, Best-so-far ABC, Gbest ABC algorithm, and Memetic Search on them.

The result includes Mean Function Values (MFV), Standard Deviation (SD), Error, Total Mean Function Evaluation, and also Success Rate (SR) (Table 1).

Table 1 Result comparison

Test problem	Algorithm	MFV	SD	Error	Total mean function evaluation	SR
Parabola	ABC	8.17E-06	2.02E-06	8.17E-06	20409	100
	BSFABC	7.49E-06	2.15E-06	7.49E-06	30063	100
	Gbest	8.11E-06	1.81E-06	8.11E-06	14347.5	100
	Memetic	9.30E-06	8.57E-07	9.30E-06	20120.78	100
Salomon	ABC	9.56E-01	6.25E-02	9.56E-01	149071.4	68
	BSFABC	9.53E-01	6.58E-02	9.53E-01	184747.8	74
	Gbest	9.32E-01	3.38E-02	9.32E-01	75922.34	98
	Memetic	9.26E-01	2.91E-02	9.26E-01	24485.13	100
Griewank	ABC	1.54E-04	1.03E-03	1.54E-04	51613.72	98
	BSFABC	5.55E-06	3.07E-06	5.55E-06	63511.08	100
	Gbest	6.29E-06	2.67E-06	6.29E-06	31367.86	100
	Memetic	7.96E-04	2.78E-03	7.96E-04	69791.56	92
Rosenbrock	ABC	1.69E+00	3.73E+00	1.69E+00	175170	27
	BSFABC	1.75E+00	2.90E+00	1.75E+00	193968	17
	Gbest	6.12E+00	1.03E+01	6.12E+00	186061.2	18
	Memetic	1.65E+01	1.71E+01	1.65E+01	99796.42	3

(continued)



Certified True Copy

Jagan Nath University, Jaipur

Table 1 (continued)

Test problem	Algorithm	MFV	SD	Error	Total mean function evaluation	SR
Rastrigin	ABC	5.00E-06	3.14E-06	5.00E-06	49223	100
	BSFABC	4.36E-06	3.21E-06	4.36E-06	121740.5	100
	Gbest	6.15E-06	2.80E-06	6.15E-06	33973.5	100
	Memetic	4.82E-01	5.71E-01	4.82E-01	98320.46	18
Ackley	ABC	8.30E-06	1.74E-06	8.30E-06	49140.5	100
	BSFABC	8.27E-06	1.53E-06	8.27E-06	72675	100
	Gbest	8.75E-06	1.40E-06	8.75E-06	30497.5	100
	Memetic	2.97E-05	1.67E-05	2.97E-05	100003.6	5
Alpine	ABC	8.41E-06	1.67E-06	8.41E-06	76104	100
	BSFABC	7.45E-06	2.46E-06	7.45E-06	145072.5	99
	Gbest	8.23E-06	1.99E-06	8.23E-06	59417.52	100
	Memetic	6.89E-03	4.27E-03	6.89E-03	100048	0
Inverted cosine wave function	ABC	-8.98E+00	1.27E-01	2.10E-02	76166.66	96
	BSFABC	-8.89E+00	2.90E-01	1.09E-01	121795	85
	Gbest	-9.00E+00	2.20E-06	6.83E-06	45446.43	100
	Memetic	-8.82E+00	3.55E-01	1.81E-01	72080.52	65
Exponential	ABC	-1.00E+00	2.62E-06	7.26E-06	16967	100
	BSFABC	-1.00E+00	2.17E-06	7.63E-06	18737	100
	Gbest	-1.00E+00	1.53E-06	8.27E-06	11728.5	100
	Memetic	-1.00E+00	6.00E-07	9.35E-06	9455.38	100
Zakharav	ABC	9.73E+01	1.52E+01	9.73E+01	200000	0
	BSFABC	8.49E+01	1.22E+01	8.49E+01	200000	0
	Gbest	9.73E+01	1.89E+01	9.73E+01	200000	0
	Memetic	1.01E-02	1.54E-03	1.01E-02	87293.8	86

Comparison of Success Rates in Different Functions
See Figs. 1, 2, and 3.

Comparison of Mean Error in different Functions
See Figs. 4 and 5.



Certified True Copy

Jagan Nath University, Jaipur

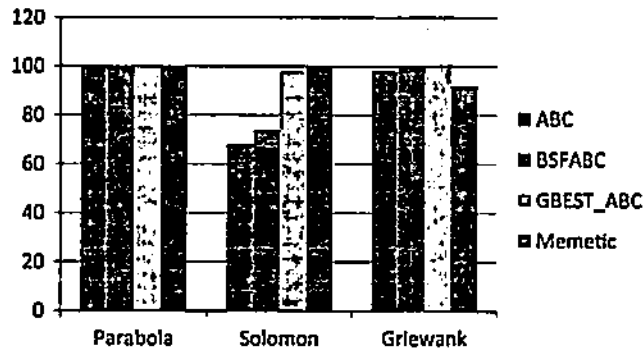


Fig. 1 Comparison of success rate for Parabola, Solomon, and Griewank

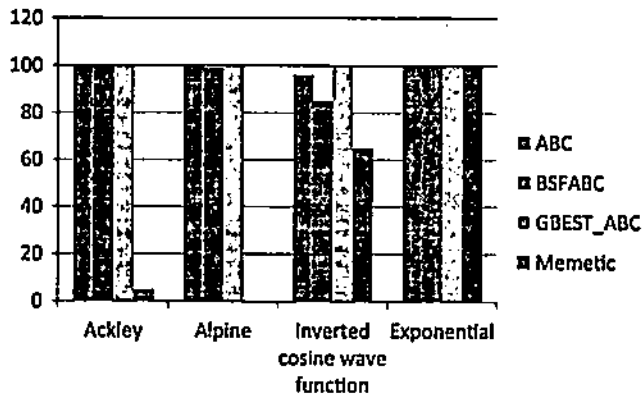
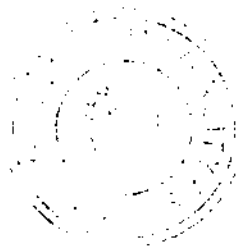


Fig. 2 Comparison of success rate for Ackley, Alpine, ICWF, and Exponential function

From the above result experiments, it is clear that the performance of these algorithms changes according to the test problems. The result of Mean Function Values (MFV), Standard Deviation (SD), Error, Total Mean Function Evaluation, and Success Rate (SR) are different for the test problems.

ABC algorithm performs best for some problems. Similarly, BSFABC, Gbest, and Memetic Search perform best for different problems.



Certified True Copy

Jagan Nath Choudhary, IITP

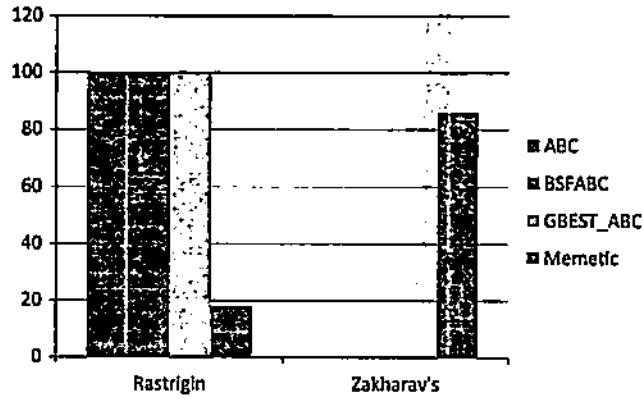


Fig. 3 Comparison of success rate for Rastrigin and Zakharav's function

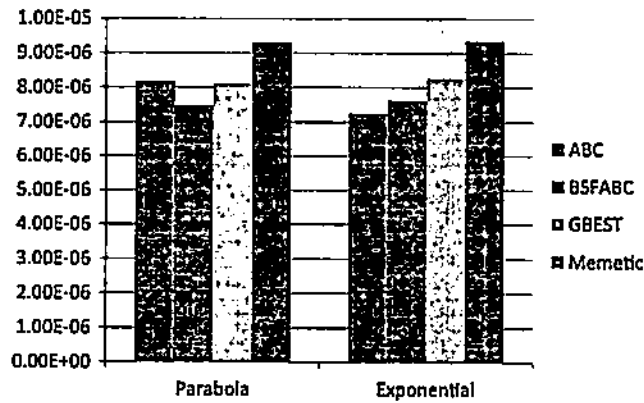


Fig. 4 Comparison of mean error for Parabola and Exponential function

7 Conclusion

This paper reviews the various concepts of the ABC algorithm and the variants which are created on the basis of the concept of the ABC algorithm, and also highlights the applications in which the ABC algorithm can be applied. This paper also describes the comparison between the ABC algorithm, BSFABC, Gbest, and Memetic Search. These algorithms perform differently for different problems.



Certified True Copy

Professor
Jagan Nath University, Jaipur

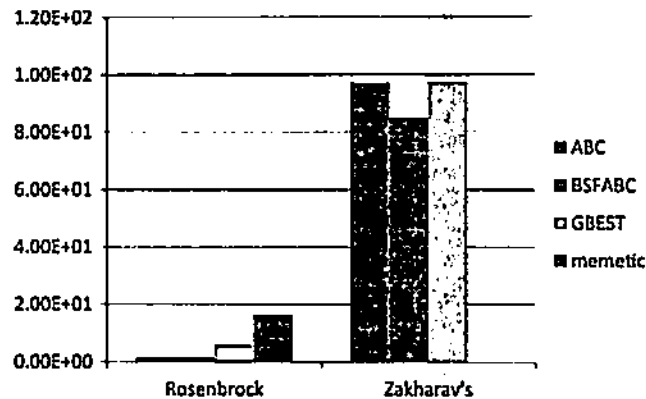


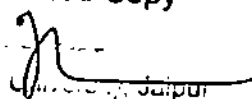
Fig. 5 Comparison of mean error for Rosenbrock and Zakharav's function

References

1. Neelima, S., Satyanarayana, N., & Krishna Murthy, P. (2016). A comprehensive survey on variants in artificial bee colony (ABC). *International Journal of Computer Science and Information Technologies*, 7(4).
2. Kumar, A., Kumar, D., & Jarial, S. K. (2017). A review on artificial bee colony algorithms and their applications to data clustering. *Cybernetics and Information Technologies*, 17.
3. Yurtkuran, A., & Emel, E. (2016). An enhanced artificial bee colony algorithm with solution acceptance rule and probabilistic multisearch. *Hindawi Publishing Corporation Computational Intelligence and Neuroscience*.
4. Qin, Q., Cheng, S., Zhang, Q., Li, L., & Shi, Y. (2015). Artificial bee colony algorithm with time-varying strategy. *Hindawi Publishing Corporation Discrete Dynamics in Nature and Society*.
5. Karaboga, D., & Basturk, B. (2007). Artificial bee colony (ABC) optimization algorithm for solving constrained optimization problems. In *Foundations of fuzzy logic and soft computing* (pp. 789-798).
6. Baykasoglu, A., Ozbakir, L., & Tapkan, P. (2007). Artificial bee colony algorithm and its application to generalized assignment problem. In *Swarm intelligence: Focus on ant and particle swarm optimization*.
7. Quan, H., & Shi, X. (2008). On the analysis of performance of the improved artificial-bee-colony algorithm. *Natural Computation*.
8. Narasimhan, H. (2009). Parallel artificial bee colony (PABC) algorithm. In *Nature & Biologically Inspired Computing*.
9. Tsai, P. W., Pan, J. S., Liao, B. Y., & Chu, S. C. (2009). Enhanced artificial bee colony optimization. *International Journal of Innovative Computing, Information and Control*.
10. Akay, B., & Karaboga, D. (2010). A modified artificial bee colony algorithm for real parameter optimization. *Information Sciences*.
11. Banharsakun, A., Achalakul, T., & Sirinaovakul, B. (2011). The best-so-far selection in artificial bee colony algorithm. *Applied Soft Computing*.
12. Shrimal, G., Rathi, R. (2014). A hybrid best so far artificial bee colony algorithm for function optimization. *International Journal of Computer Science and Information Technologies*.
13. Gao, W., Liu, S., & Huang, L. (2012). A global best artificial bee colony algorithm for global optimization. *Journal of Computational and Applied Mathematics*.
14. Bansal, J. C., Sharma, H., Arya, K. V., & Nagar, A. (2013). Memetic search in artificial bee colony algorithm. *Soft Computing*. <https://doi.org/10.1007/s00500-013-1032-8>.



Certified True Copy

Jagan Nath

 Jagan Nath, Jaipur

15. Kumar, S., Sharma, V. K., & Kumari, R. (2014). An improved memetic search in artificial bee colony algorithm. *International Journal of Computer Science and Information Technologies*.
16. Kumar, S., Sharma, V. K., & Kumari, R. (2014). Randomized memetic artificial bee colony algorithm. *International Journal of Emerging Trends & Technology in Computer Science*, 3(1), 52-62.
17. Kumar, S., Kumar, A., Sharma, V. K., & Sharma, H. (2014, August). A novel hybrid memetic search in artificial bee colony algorithm. In *2014 Seventh International Conference on Contemporary Computing (IC3)* (pp. 68-73). IEEE.
18. Choubey, A., & Prajapati, G. L. (2015) An understanding of ABC algorithm and its applications. *Indian Technical Research Organization*.
19. Pandey, S., & Kumar, S. (2013). Enhanced artificial bee colony algorithm and it's application to travelling salesman problem. *HCTL Open International Journal of Technology Innovations and Research*, 2.
20. Wang, Y., You, J., Hang, J., Li, C., & Cheng, L. (2018). An improved artificial bee colony (ABC) algorithm with advanced search ability. In *International Conference on Electronics Information and Emergency Communication (ICEIEC)*.

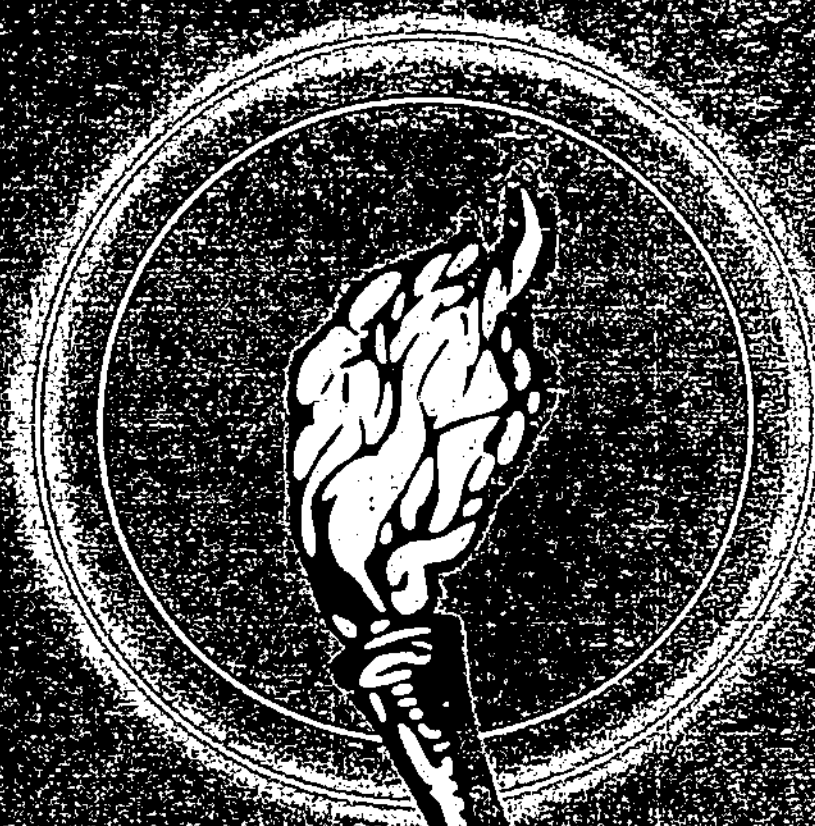


Certified True Copy

Doc No. _____
Jagan Nath University, Jaipur

Indian Social Reformer

भारतीय समाज सुधारक



डॉ. सूर्यकांत कापशीकर

भारतीय समाज सुधारक

डॉ. सुर्यकांत कापशीकर

Indian Social Reformer

Dr. Suryakant Kapsikar

● सौजन्य

डॉ. धनराज शेटे, प्राचार्य
यशोदा गर्ल्स आर्ट्स अँड कॉमर्स कॉलेज
नागपूर

● प्रकाशक

तृप्ती सूर्यकांत कापशीकर
कापशीकर प्रकाशन
बेलतरोडी, नागपूर-४४००३४

प्रथम आवृत्ती : २०२०

● मुद्रक

दिनेश ग्राफीक
त्रिमुर्ती नगर, सिंग रोड,
नागपूर-४४००२२

● मुखपृष्ठ

दिनेश गुडधे

किंमत : ३००/-

ISBN : 978-81-943484-7-4



978-81-943484-7-4



Certified True Copy
Registered
Jagan Nath University, Jaipur

- 13) **Mahatma Gandhi And Babasaheb Ambedkar:
As National Reformers of India**
Dr. K J Sibi
- 14) **Gandhian Philosophy is a Boon for
Sustainable Development**
Dr. Dipti Ranjan Malik
- 15) **Mahakavi Subramania Bharati - Champion of
Women's Emancipation**
By Dr. Latha Venkataraman
- 16) **Kadamibini Ganguly and the Age of Consent Bill**
Dr. Sananda Sen
- 17) **Contribution of P.N. Kaula in Library Science**
Dr Prema Anandrao Kumbhalkar
- 18) **Contribution of Dr. S. R. Ranganathan: A Father
of Indian LIS Profession**
Dr. Sudhakar S. Thool
- 19) **Melvil Dewey: A Historical Perspective**
Mr. Rajendra R. Latpate
- 20) **Contribution of Prof. P. N. Kaula : A Boon for
LIS Profession**
Dr. B. K. Thawkar
- 21) **राधास्वामी मत: दर्शन एवं सिद्धांत**
प्रीती वर्मा
- 22) **ब्रह्म समाज के सामाजिक सुधारक—राजा राममोहन रॉय**
डॉ. अल्पना वैद्य
- 23) **भारतीय समाज सुधारक और शिक्षाविद् हंसा मेहता**
डॉ. मंजू गुप्ता
- 24) **रूमा देवी— बाड़मेर की शान**
दीपिका शर्मा
- 25) **मानवता की अवधारणा और सामाजिक समता**
(डॉ. भीमराव आम्बेडकर के संदर्भ में)
डॉ. अनुभुती सेंडीमन, डॉ. सरोज एस. घोडेश्वर
- 26) **डॉ. अम्बेडकर का सामाजिक चिंतन**
प्रो. विद्या महोदिया



Certified True Copy

Registered
Jagan Nath University, Jaipur

Indian Social Reformer

भारतीय समाज सुधारक



डॉ. सूर्यकांत कापशीकर

Certified True Copy
Registrar
Nath University, Jaipur

भारतीय समाज सुधारक

डॉ. सुर्यकांत कापशीकर

Indian Social Reformer

Dr. Suryakant Kapsikar

● सौजन्य

डॉ. धनराज शेते, प्राचार्य
यशोदा गर्ल्स आर्ट्स अँड कॉमर्स कॉलेज
नागपूर

● प्रकाशक

तृप्ती सूर्यकांत कापशीकर
कापशीकर प्रकाशन
बेलतरोडी, नागपूर-४४००३४

प्रथम आवृत्ती : २०२०

● मुद्रक

दिनेश ग्राफीक
त्रिमुर्ती नगर, रिग रोड,
नागपूर-४४००२२

● मुखपृष्ठ

दिनेश गुडघे

किंमत : ३००/-

ISBN : 978-81-943484-7-4



978-81-943484-7-4



Certified True Copy

Registrar
Jagan Nath University, Jabpur

- 13) Mahatma Gandhi And Babasaheb Ambedkar:
As National Reformers of India
Dr. K J Sibi
- 14) Gandhian Philosophy is a Boon for
Sustainable Development
Dr. Dipti Ranjan Malik
- 15) Mahakavi Subramania Bharati - Champion of
Women's Emancipation
By Dr. Latha Venkataraman
- 16) Kadamibini Ganguly and the Age of Consent Bill
Dr. Sananda Sen
- 17) Contribution of P.N. Kaula in Library Science
Dr. Prema Anandrao Kumbhalkar
- 18) Contribution of Dr. S. R. Ranganathan: A Father
of Indian LIS Profession
Dr. Sudhakar S. Thool
- 19) Melvil Dewey: A Historical Perspective
Mr. Rajendra R. Latpate
- 20) Contribution of Prof. P. N. Kaula : A Boon for
LIS Profession
Dr. B. K. Thawkar
- 21) राधास्वामी मतः दर्शन एवं सिद्धांत
प्रीती वर्मा
- 22) ब्रह्म समाज के सामाजिक सुधारक—राजा राममोहन रॉय
डॉ. अल्पना वैद्य
- 23) भारतीय समाज सुधारक और शिक्षाविद् हंसा मेहता
डॉ. मंजू गुप्ता
- ✓ 24) रुमा देवी— बाडमेर की शान
दीपिका शर्मा
- 25) मानवता की अवधारणा और सामाजिक समता
(डॉ. भीमराव आम्बेडकर के संदर्भ में)
डॉ. अनुभुती सेंडीमन, डॉ. सरोज एस. घोडेश्वर
- 26) डॉ. अम्बेडकर का सामाजिक चिंतन
प्रो. विंदिया महोदिया

Certified True Copy

Registrar
Jagan Nath University, Jaipur



Published By: IMMORTAL PUBLICATIONS
ISBN No: 978-93-5419-649-2

Title of the Book
Global Environmental Governance, Policies and Ethics

Relevance of Environment Education in Current Perspective

Dr. Manju Gupta
(Associate Professor) Jagannath University, Jaipur (Raj.)
E-mail: manjuguptagoner@gmail.com, Mob. No. : 9166114404

Article Info

Article History

Received : 28 - 09 - 2020

Revised : 02 - 10 - 2020

Accepted : 10 - 10 - 2020

Abstract:

The significance of environmental education is self-evident. It is an education that teaches humans how to live. It shows the path that is the path of balance and coordination between man's development journey and nature's ecosystem. It guarantees life to future generations and teaches us to live alongside the geography of nature and the history of man. The importance of environmental education has been accepted worldwide. The whole world is worried about the terrible forest destruction, uncontrolled pollution, indiscriminate exploitation of resources, silly blind race of nuclear scriptures and rude manipulation of nature in the name of industrial advancement, not only mankind, but the entire living world. Will make you stand on the verge of destruction. There are many author wants to get consistent and sufficient textual content at every point, neither unnecessary detail nor under appreciation. He is looking for material that can give him a true vision of the environment. This is a humble attempt in the presented book. books about the environment; But most are such that half-incomplete points have been taken or some points are overemphasized by neglecting other points. Instead of tying the author to an idea, all ends of the idea are kept open; So that the reader can reflect on the subject problem from his own perspective. This book will prove useful for the scholars of the courses as well as general readers

Keywords:- Relevance, environment, education, current, perspective

Contact Author

Dr. Manju Gupta
(Associate Professor) Jagannath
University, Jaipur (Raj.)



Certified True Copy

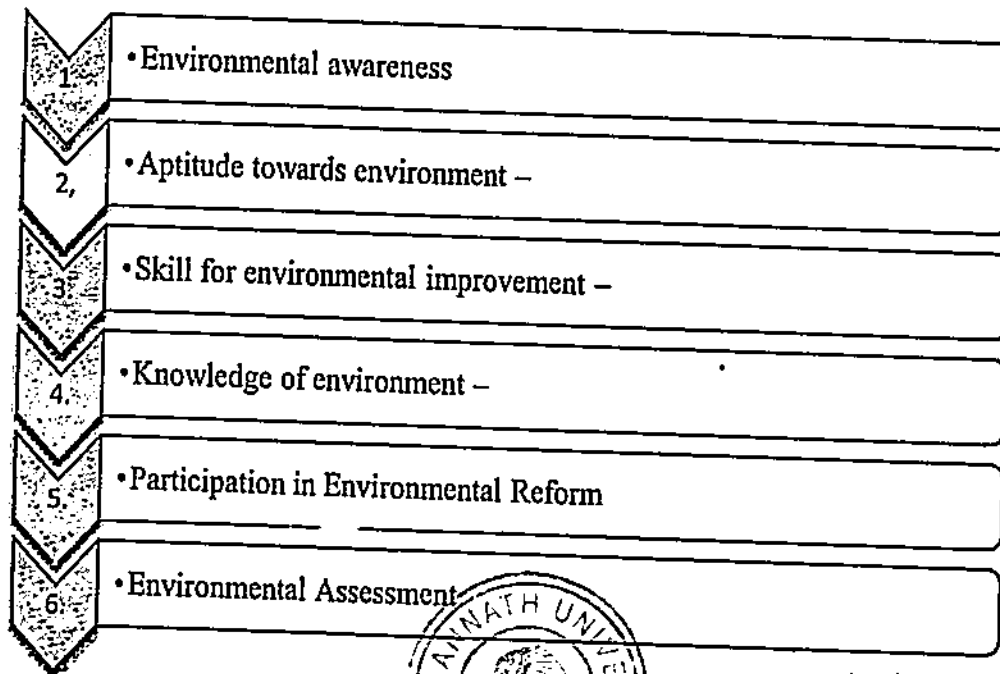
Manju Gupta
Jagan Nath University, Jaipur

Published By: IMMORTAL PUBLICATIONS
ISBN No: 978-93-5419-649-2

Title of the Book
Global Environmental Governance, Policies and Ethics

1. To make children, youth and adults knowledge of natural resources and natural environment.
2. Knowledge of the consequences of exploiting natural resources and polluting the natural environment.
3. Knowledge of natural resources exploitation and reasons for polluting the natural environment
4. To take measures to protect them from exploitation of natural resources and pollution of the natural environment and to induce them to comply.
5. To develop an attitude towards natural imbalance and pollution prevention.
6. To develop an attitude towards cleanliness in them.
7. To develop the attitude of public interest in them.

The main objectives of environmental education can be written in a forward-looking manner.



Certified True Copy

Registered
Jagan Nath University, Jaipur

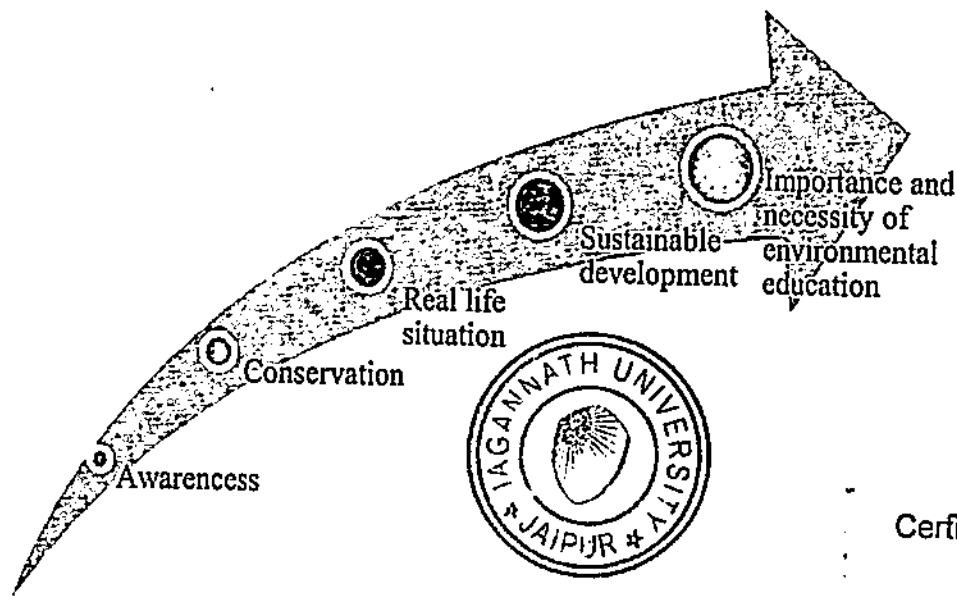
Environmental education curriculum

Scholars, especially academics, are not unanimous on the curriculum of environmental education, but the main elements in the general curriculum designed so far in the country and abroad are the following.

environmental education.

- (1) The nature of environmental education should be such that the students should be aware of the environment.
- (2) Environmental education should be such that human beings realize that they themselves are a part of nature.
- (3) Environmental education should be such that citizens are aware of national policy, rules and laws related to environment.
- (4) Different courses should be made for different levels of education, at the primary level only the knowledge of the local environment should be made, at the secondary level, the relationship between environment and human beings should be explained and at the higher level special knowledge and training related to the environment should be given.

Scope of environment education



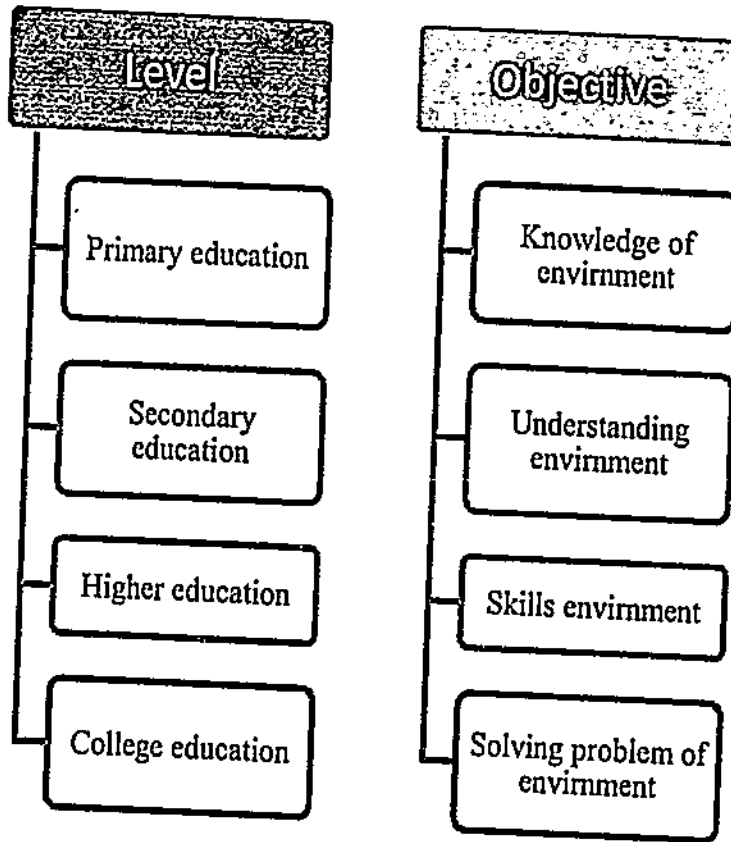
Certified True Copy

Registrar
Jagan Nath University, Jaipur

Importance and necessity of environmental education

Today, due to the increasing phase of science, industrial and increasing population, natural resources are being exploited all over the world, ecological imbalance is increasing and natural pollution is increasing. While government rules and laws are being enacted to prevent this, on the other hand, environmental education is being taken to make people aware of it. The truth is that not all works are possible with government rules and laws for that public awareness is also

Providing environment education of different levels of education



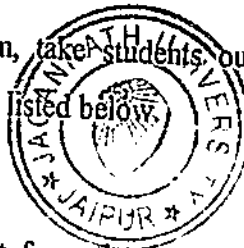
Benefits of Environmental Education

Education is the basis of everything in today's world, including the environment. Environmental education connects us to the world around us and imparts knowledge about the current state and future possibilities of nature. It raises awareness about issues affecting the environment and teaches people to explore all problems related to the environment and engage in intelligent ways to preserve it.

Whether we bring nature into the classroom, take students outside to learn. Environmental education has many benefits. Some of them are listed below.

1. Imagination and excitement grow

Places with natural surroundings are the best for artists to create their masterpieces. Poetry, painting, sculptures etc. are all products of imagination. Environmental education is an interactive learning that sparks imagination and unlocks creativity



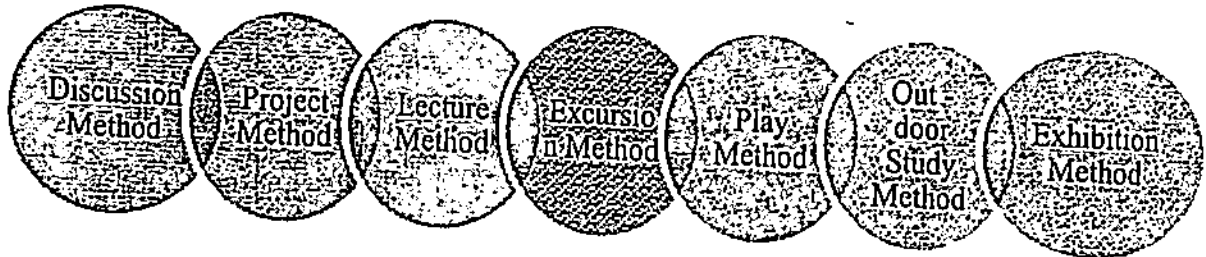
Certified True Copy

[Signature]
Jagan Nath University, Jaipur

Published By: IMMORTAL PUBLICATIONS
ISBN No: 978-93-5419-649-2

Title of the Book
Global Environmental Governance, Policies and Ethics

Methods of environmental education



Conclusion

After independence, various commissions were formed for reforming education in the country. All these commissions made various suggestions for improving education, but did not pay any attention to environmental education. Today, the pace of rapid development to the developed and developing countries of the world has advanced people's life. But with this development, natural resources have been heavily exploited. For this reason, climate change and environmental crisis are being created. Today, the problem of environment is not a problem of any one country, but a major problem of the world. Due to this climate change is happening. Not a single developing or developed country is responsible for this, but all countries are equally responsible. If seen, the developed countries have contributed more in doing more harm to the environment. These developed countries heavily exploited natural resources to advance in the race for development. Today, developing countries are increasing the environmental imbalance by following the footsteps of developed countries. By reading or teaching one or two chapters on 'Environment' in the current education books is not going to work. We are joining the false race of development of developed countries. It will become a curse for our lives. It is a race for the blind race of development, destruction of natural environment with human life. In today's education, there is a need to make the child aware of the present and the future for environmental protection and by being aware himself, it will have to be told how clean the water of all the rivers of the world was. Today it is not worth drinking. Earlier fatal diseases were less, today there are more than before. There is a need to seriously adopt measures to make the environment aware and prevent its pollution. All the people of the society have to be made aware of this task, along with scientists, geographers, environmentalists, sociologists and politicians, economists and administrators and

Published By: IMMORTAL PUBLICATIONS
ISBN No: 978-93-5419-649-2

Title of the Book
Global Environmental Governance, Policies and Ethics

References:-

- [1] <https://yashrajeducatuon.school.blog/2019/12/29>
- [2] <https://m.dailyhunt.in/news/nepal/hindi/gs+junction+epaper+gsjun/paryavaran+shiksha+ka+parichay+itih+aur+mahatv-newsid-n140962288>
- [3] <https://in.ilearnlot.com/2019/05/principles-of-environmental-studies.html>
- [4] <https://www.drishtias.com/hindi/mains-practice-question/question-2007>
- [5] <https://gyanapp.in/hindi/questions/2681/%>
- [6] <https://www.prabhatbooks.com/paryavaran-shiksha.htm>
- [7] <https://hindi.indiawaterportal.org/content/adhaunaika-saikasaa-maen-parayaavarana-varatamaana-sandarabha/content-type-page/47070>
- [8] <https://www.franchiseindia.com/hi/education/why-environmental-studies-is-important-at-all-levels-of-education.11183>



Certified True Copy
Rajendra
Jagan Nath University, Jaipur

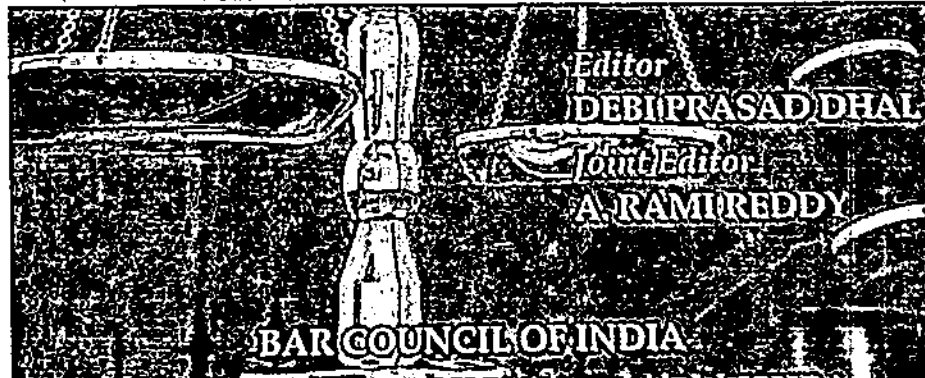


INDIAN BAR REVIEW

Vol. 47 (1) 2020

A Referred Journal

Special Issue on
**WHITE COLLAR CRIME AND
ITS IMPACT ON THE SOCIETY**



Editor
DEBIPRASAD DHAL

Joint Editor
A. RAMIREDDY

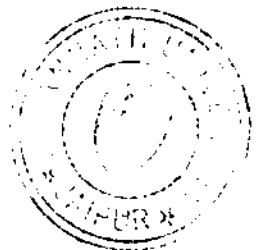
BAR COUNCIL OF INDIA

Chairman **MANANKUMAR MISHRA**

Vice Chairman **SATISHABARAO DESHMUKH**

Chairman E.C. **APURBA KUMAR SHARMA**

BAR COUNCIL OF INDIA TRUST
NEW DELHI



Certified True Copy

Jagan Nath

PERCEPTION OF WHITE COLLAR CRIME IN SOCIETY: CHANGING DIMENSION IN THE NEW ERA OF GLOBALIZATION

*Dr. C.P. Gupta**
*Tarun Batra***

INTRODUCTION

WHITE Collar Crime was defined by Edwin Sutherland as a "crime committed by a person of respectability and high social status in the course of his occupation". In general and ambiguous terms, non violent crimes for financial gain were considered to be under this category. Some of the most common activities under white collar crimes include antitrust violations, different types of fraud (computer and Internet, credit card, bankruptcy mail, financial and healthcare frauds), insider trading and environmental law violations. Powers of the members of the government, through another means of checks and balances, are also limited by including public corruption and money laundering under white-collar crimes as well.

In the modern judicial systems, common sanctions given to white-collar crimes offenders include house arrest, fines and financial penalties, sentences of up to 30 years, and offenders of economic crimes can be sentenced as much as that of offenders for violent street crime.

The original idea was to give a name to crimes or conspiracies committed by members of wealthy classes who use their influence



Certified True Copy

Jagan Nath University, Jaipur

* Dean, Faculty of Law, Jagannath University, Jaipur, Rajasthan.

** Assistant Professor, Faculty of Law, Jagannath University, Jaipur, Rajasthan.



ELSEVIER

Contents lists available at ScienceDirect

Materials Today: Proceedings

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

EDM machining of die steel EN8 and testing of surface roughness with varying parameters

Anurag Joshi^{a,*}, Amit Kumar Saraf^b, Ravi Kumar Goyal^c

^a Department of Mechanical Engineering, Manipal University Jaipur, Rajasthan 303007, India

^b Department of Engineering & Technology, Jagannath University Jaipur, Rajasthan 303901, India

^c School of Manufacturing Skills Bhartiya, Skill Development University, Jaipur, Rajasthan 303042, India

ARTICLE INFO

ABSTRACT

Article history:

Received 29 April 2020

Received in revised form 9 May 2020

Accepted 11 May 2020

Available online xxx

Keywords:

EDM

Surface roughness

Alloy steel

Die

Sinker EDM

EN-8

EN 8 belongs to BS 970 standard and is an unalloyed medium carbon steel used for where some better than normal mild steel which is having carbon ranges from 0.3 to 0.6%. The surface roughness of die while machining on EDM machine depends upon the working parameters of the machine. These working parameters will give fine, super fine and coarse roughness surface on the work piece. The main methodology consists of gauging of these parameters and analyzing the surface roughness. For this the experiment has conducted on EDM machine and the surface roughness will be measured and analyzed. Concept of single variable at a time approach at a time will be used to find out the effect of input parameters on the Surface Roughness. A series of experiments would be conducted to study the effects of various machining parameters of EDM. In each experiment, one input variable would be varied while keeping all other input parameter at fixed value. Studies will be undertaken to observe the effect of selected parameters viz: discharge current, T-ON pulse on time, T-OFF pulse off time, wire feed, servo voltage, MRR and Surface Roughness.

© 2020 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Advances in Mechanical Engineering and Nanotechnology.

1. Introduction

The also known as spark machining, spark eroding, burning, die sinking, wire burning or wire erosion, is a manufacturing process whereby a desired shape is obtained by using electrical discharges (sparks). Material is removed from the work piece by a series of rapidly recurring current discharges between two electrodes, separated by a dielectric liquid and subject to an electric voltage. One of the electrodes is called the tool-electrode, or simply the "tool" or "electrode," while the other is called the work piece-electrode, or "work piece." The process depends upon the tool and work piece not making actual contact. The EDM process is most widely used by the mold-making, tool, and dies industries, but is becoming a common method of making prototype and production parts, especially in the aerospace, automobile and electronics industries in which production quantities are relatively low. In low cost dies which are useful for making general components like plastic buttons and small clips the die need to be tested and can not be of

plain carbon steel. Experimental work done to enhance the surface hardness and wear resistant of plain EN8 steel by flame hardening and to check how it behaves on Electrical discharge machining (EDM). The die sinking method of machining give performance on various process parameters such as discharge current, pulse on time, pulse off time, wire feed, servo voltage and MRR. According to these parameters the machining quality need to be assessed. The fine, super fine finishing and coarse roughness are end result of variation of these machining parameters [1-3].

2. Objective

The main objective of this work is to find a way for machining of work piece through EDM with optimum surface finish. There are many parameters in EDM die sinking that can be considered. Three level process parameter such as voltage (V), T-On pulse on time (μ s), T-Off pulse OFF time (μ s) and peak current (A) with two level of factor (High) and (Low) considered for this study. By controlling the chosen processes parameters the required surface roughness will be derive and the final result will be evaluate in order to get

Certified True Copy

* Corresponding author.

E-mail address: anurag.joshi@jaipur.manipal.edu (A. Joshi).

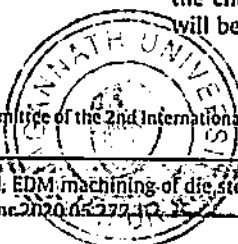
<https://doi.org/10.1016/j.matpr.2020.05.277>

2214-7853/© 2020 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Advances in Mechanical Engineering and Nanotechnology.

Jagan Nath University, Jaipur

Please cite this article as: A. Joshi, A. K. Saraf and R. K. Goyal, EDM machining of die steel EN8 and testing of surface roughness with varying parameters, Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2020.05.277>



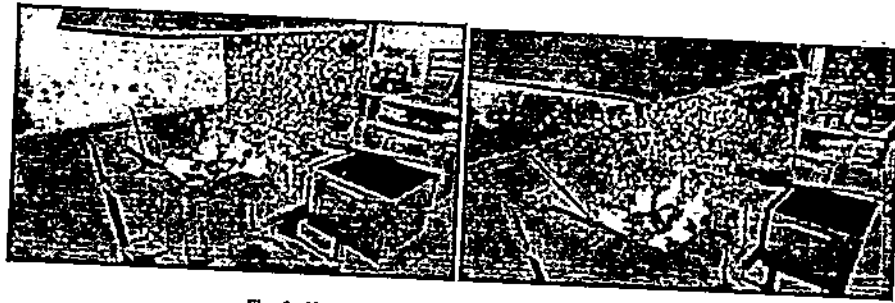


Fig. 1. Heat Treatment of EN8 alloy steel sample.



Fig. 2. Final work piece of EN8 alloy steel.

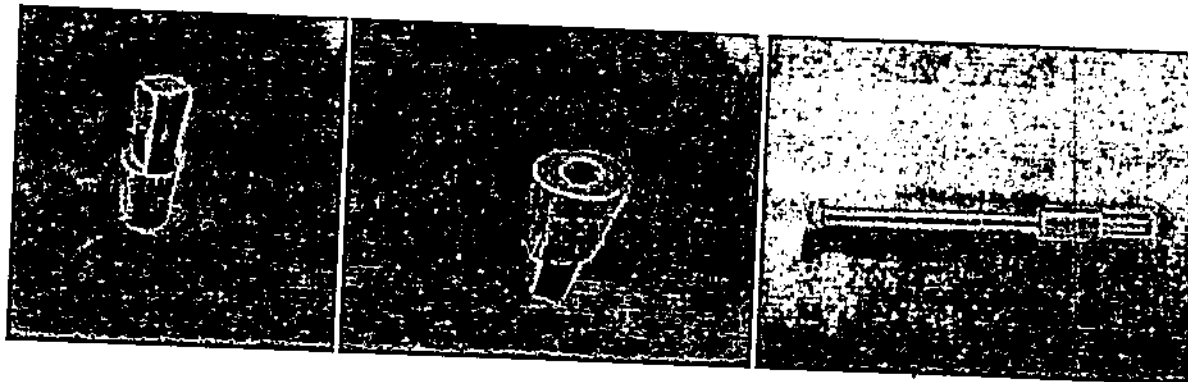


Fig. 3. Copper Electrode of EDM Machine.

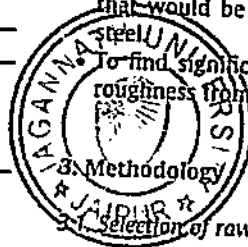
Table 1
The chemical composition of EN8 and EN24 alloy steel.

M.	Carbon%	Silicon %	Manganese%	Sulphur%	Phosphorus%
EN8	0.36-0.44	0.1-0.4	0.6-0.1	0.05 max	0.05 max

Table 2
Dimensions of the copper electrode.

Total length of electrode	50 mm
Tool length	24 mm
Tool breadth	7 mm
Tool width	7 mm
Diameter of base cylinder	12.67 mm

- To evaluate and compare the quality of the surface roughness that would be produced from the EDM machining EN-8 tool
- To find significant parameter and optimum value of surfaces roughness from the surfaces quality evaluation.



Certified True Copy

Jagan Nath University, Jaipur

the most significant machining parameter that influences fine surfaces roughness (see Figs. 1-3 and Tables 1 and 2).

- To produce a die of EN-8 tool steel by the process of die sinking EDM machine.

The workpiece materials which we have used in this research is EN-8. EN-8 is a medium strength steel that is suitable where good all-round performance is required. Achieving a fine finish is more difficult in the case of EN-8 because the material tends to 'rip', especially evident during fine pitch dry screw cutting. The objec-

Please cite this article as: A. Joshi, A. K. Saraf and R. K. Goyal, EDM machining of die steel EN8 and testing of surface roughness with varying parameters, Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2020.05.277>

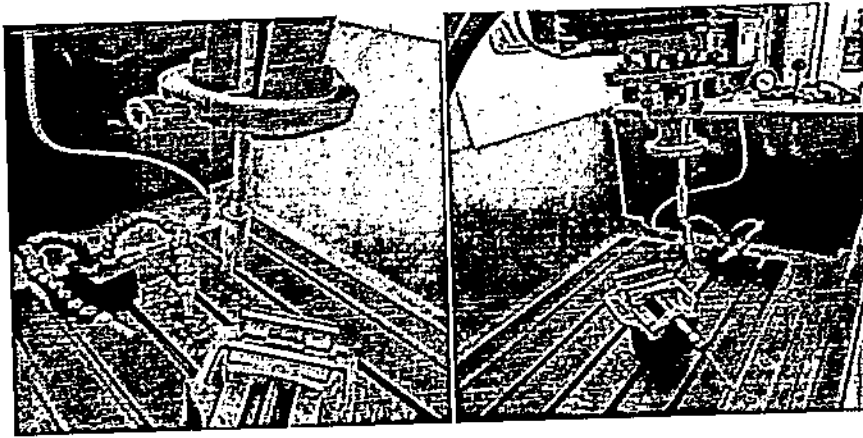


Fig. 4. Copper electrode adjusted in a Die sinking EDM machine.

tive of using this materials is because of the reason that the used material have good strength and we could define the parameters for other high strength material too (see Figs. 4 and 5).

The difference being the composition of Manganese, Sulphur and phosphorus in both the materials is the main reason for some of the difference in their properties. This variance in properties would let use determine the best way for optimizing the surface finish for different type of materials (see Table 3).

3.2. Preparation of samples

The initial samples of EN8 alloy steel are not fit for EDM machining. The mechanical process that took place to produce the final workpiece ready for EDM machining is as follows.

- Cutting a required amount of piece from the initial sample with a hex saw producing a sample with fixed dimensions and allowance.
- Hardening and oxidizing the material by heating it in a Hearth furnace with the use of coke, wood coal to 1073 K.
- Turning operation is applied upon the sample piece after hardening.

- Surface grinding and cylindrical grinding operations are performed and a smooth finished workpiece is obtained which could be then used for machining [4-6].

The dimension of final workpiece has a Diameter of $32^{+0.005}$ mm and the length is $25^{+0.001}$ mm.

3.3. Preparation of tool

The tool that we have used in this research is made of copper. The base is of cylindrical one and the front end of the tool has a rectangular face. Copper and copper alloys have better EDM wear resistance than brass. We use the copper electrode as it would give a fine finish as compared to electrode of other materials [7,8].

3.4. Final testing

The size and dimensional accuracy of the die and the hole produced in the die of EN8 alloy steel are observed and analyzed by metrological operations. The surface roughness testing would be done in two ways for higher precision of the result [9,10]. One would be the manual inspection and calculation and other would be the spectroscopy method which would give us a high quality high precision result. After machining a surface roughness tester MITUTOYO SJ 210 series is used to obtain Ra, Rb and Rz values. MRR is calculated by the ratio of metal removed in single spark vs cycle time [11-13].

Table 3 Specifications of SZNC-EDM.

SR.No.	Description	Unit	S-50-6040
1	Work Tank Dimensions	MM	900 x 600 x 400
2	Table Size	MM	600 X 400
3	X-Axis Travel With Ball Screw.	MM	325
4	Y-Axis Travel With Ball Screw.	MM	225
5	Z-Axis Travel With Ball Screw.	MM	250
6	Table assembly construction	MM	With LM Guides
7	Maximum Job Height	MM	250
8	Maximum Job Weight	KG	800
9	Day Light	MM	600
10	No. Of Filters	NO	3
11	Dielectric tank capacity	LITRES	400

Table 5 Surface Roughness Observation.

Slot No.	Ra (µm)	Rb (µm)	Rz (µm)
1	9.790	12.188	50.906
2	7.069	13.672	68.909
3	5.795	7.069	30.795



Certified True Copy

Jagan Nath University, Jaipur

Table 4 Parameters Set.

Slot No.	T-ON (Pulse on time in seconds)	T-OFF (Pulse Off time in seconds)	Current (A)	Voltage (V)	Time Taken
1	10	20	10	45	1 min and 50 s
2	15	15	20	45	1 min and 37 s
3	15	30	20	45	58 s

Please cite this article as: A. Joshi, A. K. Saraf and R. K. Goyal, EDM machining of die steel EN8 and testing of surface roughness with varying parameters, Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2020.05.277>

Table 6
EWR v/s MRR EWR - Electrode Wear Rate MRR - Metal Removal Rate.

EWR	3.9	3.5	4.7	3.5	4.1	5.9	7.4	5.7	5.8	7.2	12.9	11.6	10.9	13.8	10.2
MRR	14.00	14.53	14.608	15.66	16.16	17.80	18.26	18.86	18.87	19.56	20.96	23.37	26.42	28.99	29.03

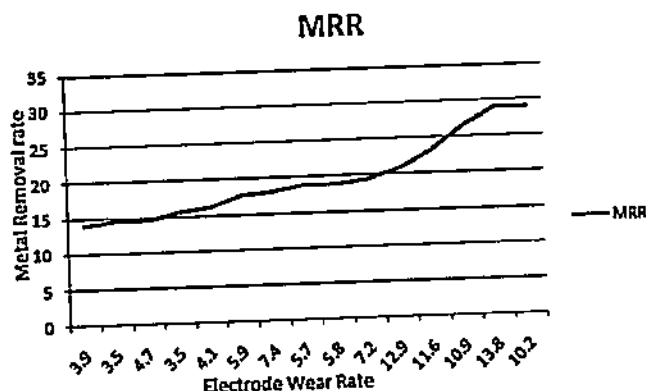


Fig. 5. Relation between EWR and MRR.

4. Implementation

4.1. Tools required

- EDM Machine and its accessories
- Specimen
- Surface Roughness Tester MITUTOYO SJ 210
- Work piece material of EN-8
- Copper electrode

4.2. Parameters set

See Table 4

4.3. Surface Roughness Observation

See Tables 5 and 6, Fig. 5.

5. Results and conclusion

A study of the surface integrity of EN-8 tool steel workpiece in die sinking EDM is presented in this paper. Die sink EDM was conducted on a SAVITA S-50-6040, 7*7*50 mm copper piece as the electrode in distilled water as dielectric fluid. The EDM Machining has low MRR but it has its own implication with parameters. The low MRR machining always needed to set output of good surface finishing and low surface roughness. The experiment conducted in varying operational parameters to check the surface roughness value for EN8 die material. According to the results if T-On (Pulse On time - The duration on which pulse is applied in form of voltage) and T-Off (Pulse off time) with values 10-20, 15-15 and 20-30 with set current and voltage not much varying in nature but the Rz value is changing drastically. This is not because of material properties and its observed where the same value to process

parameters the time taken for machining is playing an important role for machining quality, surface finishing and surface roughness. According to the data collected it can be concluded that if we are taking more time for machining on EDM where low MRR is observed the more time taken more the Rz value and less time taken for machining less the Rz value. The EWR Electrode wear rate is in proportion to the MRR for higher values of process parameters.

CRedit authorship contribution statement

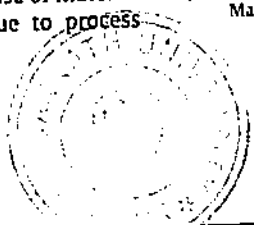
Anurag Joshi: Conceptualization, Data curation, Formal analysis, Writing - original draft, Writing - review & editing. Amit Kumar Saraf: Resources, Software, Supervision, Validation. Ravi Kumar Goyal: Supervision, Validation, Visualization.

Acknowledgement

We sincerely acknowledge that in this experimental work Department of Mechanical Engineering, Manipal University Jaipur 303007 has provided us support to work in Machine Shop and Metrology lab.

References

- [1] H.M. Chow, L.D. Yang, C.T. Lin, Y.F. Chen, The use of SiC powder in water as dielectric for micro-slit EDM machining, *J. Mater. Process Technol.* 195 (2008) 160-170.
- [2] F. Han, Y. Wang, M. Zhou, High speed EDM milling with moving electric arcs, *Int. J. Mach. Tools Manuf.* 49 (2009) 20-24.
- [3] B. Ekmekci, O. Elkoca, A.E. Tekkaya, A. Erden, Residual stress state and hardness depth in electric discharge machining: de-ionized water as dielectric liquid, *Mach. Sci. Technol.* 9 (2005) 39-61.
- [4] S.H. Kang, D.E. Kim: Effect of electrical discharge machining process on crack susceptibility of nickel based heat resistant alloy, *Mater. Sci. Technol.* 21, pp. 817-823.
- [5] A. Sharma, M. Iwai, K. Suzuki, T. Uematsu, Potential of electrically conductive chemical vapor deposited diamond as an electrode for microelectrical discharge machining in oil and water, *New Diamond Front. Carbon Technol.* 15 (2005) 181-194.
- [6] S.L. Chen, B.H. Yan, F.Y. Huang, Influence of kerosene and distilled water used as dielectric on the electric discharge machining characteristics of Ti-6Al-4V, *J. Mater. Process. Technol.* 87 (1999) 107-111.
- [7] W. König, F.-J. Siebers, Influence of the working medium on the removal process in EDM sinking, *American Society of Mechanical Engineers, Production Engineering Division (Publication) PED* 64, 1993, pp. 649-658.
- [8] M.I. Gokler, A.M. Ozanozgu, Experimental investigation of effects of cutting parameters on surface roughness in the WEDM process, *Int. J. Machine Tools Manuf.* 40 (2000) 1831-1848.
- [9] Y.S. Targ, S.C. Ma, L.K. Chung, Determination of optimal cutting parameters in wire electrical discharge machining, *Int. J. Machine Tools Manuf.* 35 (129) (1995) 1693-1700.
- [10] S. Saha, M. Pachon, A. Ghoshal, M.J. Schulz, Finite Element Modeling and optimization to prevent wire breakage in electro discharge machining, *Mech. Res. Commun.* 31 (2004) 451-463.
- [11] N. Tosun, C. Cogun, An investigation on wire wear in WEDM, *J. Mater. Process. Technol.* 134 (2003) 273-278.
- [12] Y.F. Lun, Rupture failure and mechanical strength of the electrode wire used in wire EDM, *J. Mater. Process. Technol.* 94 (1999) 208-215.
- [13] Anand Pandey et al., Current research trends in variants of Electrical Discharge Machining: A review, *Int. J. Eng. Sci. Technol.* 2 (6) (2010) 2172-2191.



Certified True Copy

Ravi Kumar
Jagan Nath University, Jaipur



University Book House (Pvt.) Ltd.

PUBLISHER • DISTRIBUTOR • LIBRARY SUPPLIER

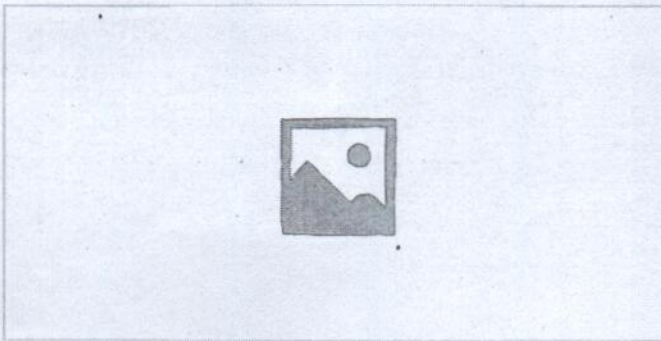
Login Enquiry Feedback Cart 0 item

✉ uni_bookhouse@yahoo.com ☎ 0141-2313382

Home About us Books ▾ Author's Invitations New Releases Shop
Stock Contact us E Book Catalogue ▾

Select ▾

Browse



Emerging trends in computation of compensation under the Motor Vehicle Act,1988

₹895.00

Author : Dr. C.P. Gupta

ISBN : 9788194001607

Year : 2020

1

Add to cart

Category: Law

Reviews (0)

Reviews

There are no reviews yet.

Be the first to review "Emerging trends in computation of compensation under the Motor Vehicle Act,1988"

Your email address will not be published. Required fields are marked *

Your rating *

