

INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

I
J
R
C
M



A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

Indexed & Listed at:

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., EBSCO Publishing, U.S.A., Cabell's Directories of Publishing Opportunities, U.S.A., Google Scholar,

Indian Citation Index (ICI), J-Gate, India [link of the same is duly available at Infibnet of University Grants Commission (U.G.C.)],

Index Copernicus Publishers Panel, Poland with IC Value of 5.09 (2012) & number of libraries all around the world.

Circulated all over the world & Google has verified that scholars of more than 6303 Cities in 196 countries/territories are visiting our journal on regular basis.

Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

<http://ijrcm.org.in/>

CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	STUDY ON THE IMPACT OF DEMOGRAPHIC VARIABLES ON THE PURCHASE OF BATHING SOAP <i>Dr. ANIL CHANDHOK & Dr. BHAVET</i>	1
2.	AN EMPIRICAL STUDY ON EMPOWERMENT OF WOMEN AND WEAKER SECTIONS THROUGH AGRICULTURAL FINANCE IN REGIONAL RURAL BANKS IN KARNATAKA <i>Dr. GOVINDAPPA.D, RADHAKRISHNA.R & SOUMYA.R</i>	4
3.	DISCRETE SINE TRANSFORM INTERPOLATION APPROACH TO DESIGN A FRACTIONAL ORDER DIFFERENTIATOR <i>HARI PRATAP, NITIN KUMAR & HIMANSHU KUSHWAH</i>	8
4.	CHALLENGES AND OPPORTUNITIES OF GREEN MARKETING <i>SANDABOINA SHIVAKUMAR</i>	14
5.	TO STUDY THE HEALTH AND SAFETY MEASURES OF EMPLOYEES WITH REFERENCE TO PRIVATE TEXTILE COMPANY <i>BHARGAV J. PATEL</i>	17
	REQUEST FOR FEEDBACK & DISCLAIMER	21

FOUNDER PATRON**Late Sh. RAM BHAJAN AGGARWAL**

Former State Minister for Home & Tourism, Government of Haryana
 Former Vice-President, Dadri Education Society, Charkhi Dadri
 Former President, Chinar Syntex Ltd. (Textile Mills), Bhiwani

CO-ORDINATOR**Dr. BHAVET**

Former Faculty, Shree Ram Institute of Engineering & Technology, Urjani

ADVISOR**Prof. S. L. MAHANDRU**

Principal (Retd.), Maharaja Agrasen College, Jagadhri

EDITOR**Dr. PARVEEN KUMAR**

Professor, Department of Computer Science, NIMS University, Jaipur

CO-EDITOR**Dr. A. SASI KUMAR**

Professor, Vels Institute of Science, Technology & Advanced Studies (Deemed to be University), Pallavaram

EDITORIAL ADVISORY BOARD**Dr. CHRISTIAN EHIOBU CHE**

Professor of Global Business/Management, Larry L Luing School of Business, Berkeley College, USA

Dr. SIKANDER KUMAR

Vice Chancellor, Himachal Pradesh University, Shimla, Himachal Pradesh

Dr. JOSÉ G. VARGAS-HERNÁNDEZ

Research Professor, University Center for Economic & Managerial Sciences, University of Guadalajara, Guadalajara, Mexico

Dr. RAJENDER GUPTA

Convener, Board of Studies in Economics, University of Jammu, Jammu

Dr. D. S. CHAUBEY

Professor & Dean (Research & Studies), Uttaranchal University, Dehradun

Dr. TEGUH WIDODO

Dean, Faculty of Applied Science, Telkom University, Bandung Technoplex, Jl. Telekomunikasi, Indonesia

Dr. S. P. TIWARI

Head, Department of Economics & Rural Development, Dr. Ram Manohar Lohia Avadh University, Faizabad

Dr. BOYINA RUPINI

Director, School of ITS, Indira Gandhi National Open University, New Delhi

Dr. KAUP MOHAMED

Dean & Managing Director, London American City College/ICBEST, United Arab Emirates

Dr. MIKE AMUHAYA IRAVO

Principal, Jomo Kenyatta University of Agriculture & Tech., Westlands Campus, Nairobi-Kenya

Dr. M. S. SENAM RAJU

Professor, School of Management Studies, I.G.N.O.U., New Delhi

Dr. NEPOMUCENO TIU

Chief Librarian & Professor, Lyceum of the Philippines University, Laguna, Philippines

Dr. A SAJEEVAN RAO

Professor & Director, Accurate Institute of Advanced Management, Greater Noida

Dr. H. R. SHARMA

Director, Chhatrapati Shivaji Institute of Technology, Durg, C.G.

Dr. CLIFFORD OBIYO OFURUM

Professor of Accounting & Finance, Faculty of Management Sciences, University of Port Harcourt, Nigeria

Dr. SHIB SHANKAR ROY

Professor, Department of Marketing, University of Rajshahi, Rajshahi, Bangladesh

Dr. MANOHAR LAL

Director & Chairman, School of Information & Computer Sciences, I.G.N.O.U., New Delhi

Dr. SRINIVAS MADISHETTI

Professor, School of Business, Mzumbe University, Tanzania

Dr. VIRENDRA KUMAR SHRIVASTAVA

Director, Asia Pacific Institute of Information Technology, Panipat

Dr. VIJAYPAL SINGH DHAKA

Professor & Head, Department of Computer & Communication Engineering, Manipal University, Jaipur

Dr. NAWAB ALI KHAN

Professor & Dean, Faculty of Commerce, Aligarh Muslim University, Aligarh, U.P.

Dr. EGWAKHE A. JOHNSON

Professor & Director, Babcock Centre for Executive Development, Babcock University, Nigeria

Dr. ASHWANI KUSH

Head, Computer Science, University College, Kurukshetra University, Kurukshetra

Dr. ABHAY BANSAL

Head, Department of Information Technology, Amity School of Engg. & Tech., Amity University, Noida

Dr. BHARAT BHUSHAN

Head, Department of Computer Science & Applications, Guru Nanak Khalsa College, Yamunanagar

MUDENDA COLLINS

Head, Operations & Supply Chain, School of Business, The Copperbelt University, Zambia

Dr. JAYASHREE SHANTARAM PATIL (DAKE)

Faculty in Economics, KPB Hinduja College of Commerce, Mumbai

Dr. MURAT DARÇIN

Associate Dean, Gendarmerie and Coast Guard Academy, Ankara, Turkey

Dr. YOUNOS VAKIL ALROAIA

Head of International Center, DOS in Management, Semnan Branch, Islamic Azad University, Semnan, Iran

P. SARVAHARANA

Asst. Registrar, Indian Institute of Technology (IIT), Madras

SHASHI KHURANA

Associate Professor, S. M. S. Khalsa Lubana Girls College, Barara, Ambala

Dr. SEOW TA WEEA

Associate Professor, Universiti Tun Hussein Onn Malaysia, Parit Raja, Malaysia

Dr. OKAN VELI ŞAFAKLI

Professor & Dean, European University of Lefke, Lefke, Cyprus

Dr. MOHINDER CHAND

Associate Professor, Kurukshetra University, Kurukshetra

Dr. BORIS MILOVIC

Associate Professor, Faculty of Sport, Union Nikola Tesla University, Belgrade, Serbia

Dr. IQBAL THONSE HAWALDAR

Associate Professor, College of Business Administration, Kingdom University, Bahrain

Dr. MOHENDER KUMAR GUPTA

Associate Professor, Government College, Hodal

Dr. ALEXANDER MOSESOV

Associate Professor, Kazakh-British Technical University (KBTU), Almaty, Kazakhstan

Dr. MOHAMMAD TALHA

Associate Professor, Department of Accounting & MIS, College of Industrial Management, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia

Dr. ASHOK KUMAR CHAUHAN

Reader, Department of Economics, Kurukshetra University, Kurukshetra

Dr. RAJESH MODI

Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia

WILLIAM NKOMO

Asst. Head of the Department, Faculty of Computing, Botho University, Francistown, Botswana

YU-BING WANG

Faculty, department of Marketing, Feng Chia University, Taichung, Taiwan

Dr. SHIVAKUMAR DEENE

Faculty, Dept. of Commerce, School of Business Studies, Central University of Karnataka, Gulbarga

Dr. TITUS AMODU UMORU

Professor, Kwara State University, Kwara State, Nigeria

Dr. BHAVET

Faculty, Shree Ram Institute of Engineering & Technology, Urjani

Dr. THAMPOE MANAGALESWARAN

Faculty, Vavuniya Campus, University of Jaffna, Sri Lanka

Dr. ASHISH CHOPRA

Faculty, Department of Computer Applications, National Institute of Technology, Kurukshetra

SURAJ GAUDEL

BBA Program Coordinator, LA GRANDIEE International College, Simalchaur - 8, Pokhara, Nepal

Dr. SAMBHAVNA

Faculty, I.I.T.M., Delhi

Dr. LALIT KUMAR

Course Director, Faculty of Financial Management, Haryana Institute of Public Administration, Gurugram

FORMER TECHNICAL ADVISOR

AMITA

FINANCIAL ADVISORS

DICKEN GOYAL

Advocate & Tax Adviser, Panchkula

NEENA

Investment Consultant, Chambaghat, Solan, Himachal Pradesh

LEGAL ADVISORS

JITENDER S. CHAHAL

Advocate, Punjab & Haryana High Court, Chandigarh U.T.

CHANDER BHUSHAN SHARMA

Advocate & Consultant, District Courts, Yamunanagar at Jagadhri

SUPERINTENDENT

SURENDER KUMAR POONIA

CALL FOR MANUSCRIPTS

We invite unpublished novel, original, empirical and high quality research work pertaining to the recent developments & practices in the areas of Computer Science & Applications; Commerce; Business; Finance; Marketing; Human Resource Management; General Management; Banking; Economics; Tourism Administration & Management; Education; Law; Library & Information Science; Defence & Strategic Studies; Electronic Science; Corporate Governance; Industrial Relations; and emerging paradigms in allied subjects like Accounting; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Rural Economics; Co-operation; Demography; Development Planning; Development Studies; Applied Economics; Development Economics; Business Economics; Monetary Policy; Public Policy Economics; Real Estate; Regional Economics; Political Science; Continuing Education; Labour Welfare; Philosophy; Psychology; Sociology; Tax Accounting; Advertising & Promotion Management; Management Information Systems (MIS); Business Law; Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labour Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; International Relations; Human Rights & Duties; Public Administration; Population Studies; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism & Hospitality; Transportation Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic; Web Design and emerging paradigms in allied subjects.

Anybody can submit the **soft copy** of unpublished novel; original; empirical and high quality **research work/manuscript** **anytime** in **M.S. Word format** after preparing the same as per our **GUIDELINES FOR SUBMISSION**; at our email address i.e. infoijrcm@gmail.com or online by clicking the link **online submission** as given on our website ([FOR ONLINE SUBMISSION, CLICK HERE](#)).

GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. **COVERING LETTER FOR SUBMISSION:**

DATED: _____

THE EDITOR

IJRCM

Subject: SUBMISSION OF MANUSCRIPT IN THE AREA OF _____.
(e.g. Finance/Mkt./HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, **please specify**)

DEAR SIR/MADAM

Please find my submission of manuscript titled ' _____ ' for likely publication in one of your journals.

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published anywhere in any language fully or partly, nor it is under review for publication elsewhere.

I affirm that all the co-authors of this manuscript have seen the submitted version of the manuscript and have agreed to inclusion of their names as co-authors.

Also, if my/our manuscript is accepted, I agree to comply with the formalities as given on the website of the journal. The Journal has discretion to publish our contribution in any of its journals.

NAME OF CORRESPONDING AUTHOR :
 Designation/Post* :
 Institution/College/University with full address & Pin Code :
 Residential address with Pin Code :
 Mobile Number (s) with country ISD code :
 Is WhatsApp or Viber active on your above noted Mobile Number (Yes/No) :
 Landline Number (s) with country ISD code :
 E-mail Address :
 Alternate E-mail Address :
 Nationality :

* i.e. Alumnus (Male Alumni), Alumna (Female Alumni), Student, Research Scholar (M. Phil), Research Scholar (Ph. D.), JRF, Research Assistant, Assistant Lecturer, Lecturer, Senior Lecturer, Junior Assistant Professor, Assistant Professor, Senior Assistant Professor, Co-ordinator, Reader, Associate Professor, Professor, Head, Vice-Principal, Dy. Director, Principal, Director, Dean, President, Vice Chancellor, Industry Designation etc. **The qualification of author is not acceptable for the purpose.**

NOTES:

- a) The whole manuscript has to be in **ONE MS WORD FILE** only, which will start from the covering letter, inside the manuscript. ***pdf. version is liable to be rejected without any consideration.***
 - b) The sender is required to mention the following in the **SUBJECT COLUMN of the mail:**
New Manuscript for Review in the area of (e.g. Finance/Marketing/HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)
 - c) There is no need to give any text in the body of the mail, except the cases where the author wishes to give any **specific message** w.r.t. to the manuscript.
 - d) The total size of the file containing the manuscript is expected to be below **1000 KB**.
 - e) Only the **Abstract will not be considered for review** and the author is required to submit the **complete manuscript** in the first instance.
 - f) **The journal gives acknowledgement w.r.t. the receipt of every email within twenty-four hours** and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of the manuscript, within two days of its submission, the corresponding author is required to demand for the same by sending a separate mail to the journal.
 - g) The author (s) name or details should not appear anywhere on the body of the manuscript, except on the covering letter and the cover page of the manuscript, in the manner as mentioned in the guidelines.
2. **MANUSCRIPT TITLE:** The title of the paper should be typed in **bold letters, centered and fully capitalised**.
 3. **AUTHOR NAME (S) & AFFILIATIONS:** Author (s) name, designation, affiliation (s), address, mobile/landline number (s), and email/alternate email address should be given underneath the title.
 4. **ACKNOWLEDGMENTS:** Acknowledgements can be given to reviewers, guides, funding institutions, etc., if any.
 5. **ABSTRACT:** Abstract should be in **fully Italic printing**, ranging between **150 to 300 words**. The abstract must be informative and elucidating the background, aims, methods, results & conclusion in a **SINGLE PARA**. **Abbreviations must be mentioned in full**.
 6. **KEYWORDS:** Abstract must be followed by a list of keywords, subject to the maximum of **five**. These should be arranged in alphabetic order separated by commas and full stop at the end. All words of the keywords, including the first one should be in small letters, except special words e.g. name of the Countries, abbreviations etc.
 7. **JEL CODE:** Provide the appropriate Journal of Economic Literature Classification System code (s). JEL codes are available at www.aea-web.org/econlit/jelCodes.php. However, mentioning of JEL Code is not mandatory.
 8. **MANUSCRIPT:** Manuscript must be in **BRITISH ENGLISH** prepared on a standard A4 size **PORTRAIT SETTING PAPER**. **It should be free from any errors i.e. grammatical, spelling or punctuation. It must be thoroughly edited at your end.**
 9. **HEADINGS:** All the headings must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.
 10. **SUB-HEADINGS:** All the sub-headings must be bold-faced, aligned left and fully capitalised.
 11. **MAIN TEXT:**

THE MAIN TEXT SHOULD FOLLOW THE FOLLOWING SEQUENCE:**INTRODUCTION****REVIEW OF LITERATURE****NEED/IMPORTANCE OF THE STUDY****STATEMENT OF THE PROBLEM****OBJECTIVES****HYPOTHESIS (ES)****RESEARCH METHODOLOGY****RESULTS & DISCUSSION****FINDINGS****RECOMMENDATIONS/SUGGESTIONS****CONCLUSIONS****LIMITATIONS****SCOPE FOR FURTHER RESEARCH****REFERENCES****APPENDIX/ANNEXURE****The manuscript should preferably be in 2000 to 5000 WORDS, But the limits can vary depending on the nature of the manuscript.**

12. **FIGURES & TABLES:** These should be simple, crystal **CLEAR, centered, separately numbered** & self-explained, and the **titles must be above the table/figure. Sources of data should be mentioned below the table/figure. It should be ensured that the tables/figures are referred to from the main text.**
13. **EQUATIONS/FORMULAE:** These should be consecutively numbered in parenthesis, left aligned with equation/formulae number placed at the right. The equation editor provided with standard versions of Microsoft Word may be utilised. If any other equation editor is utilised, author must confirm that these equations may be viewed and edited in versions of Microsoft Office that does not have the editor.
14. **ACRONYMS:** These should not be used in the abstract. The use of acronyms is elsewhere is acceptable. Acronyms should be defined on its first use in each section e.g. Reserve Bank of India (RBI). Acronyms should be redefined on first use in subsequent sections.
15. **REFERENCES:** The list of all references should be alphabetically arranged. **The author (s) should mention only the actually utilised references in the preparation of manuscript** and they may follow Harvard Style of Referencing. **Also check to ensure that everything that you are including in the reference section is duly cited in the paper.** The author (s) are supposed to follow the references as per the following:
- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
 - Use (ed.) for one editor, and (ed.s) for multiple editors.
 - When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc., in chronologically ascending order.
 - Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
 - The title of books and journals should be in italic printing. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
 - For titles in a language other than English, provide an English translation in parenthesis.
 - **Headers, footers, endnotes and footnotes should not be used in the document.** However, **you can mention short notes to elucidate some specific point**, which may be placed in number orders before the references.

PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:

BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

UNPUBLISHED DISSERTATIONS

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 <http://epw.in/user/viewabstract.jsp>

DISCRETE SINE TRANSFORM INTERPOLATION APPROACH TO DESIGN A FRACTIONAL ORDER DIFFERENTIATOR

HARI PRATAP

ASST. PROFESSOR

DEPARTMENT OF MATHEMATICS

PGDAV COLLEGE (EVENING)

DELHI UNIVERSITY

DELHI

NITIN KUMAR

ASST. PROFESSOR

DEPARTMENT OF ELECTRONICS

KESHAV MAHAVIDYALAYA

DELHI UNIVERSITY

DELHI

HIMANSHU KUSHWAH

ASST. PROFESSOR

DEPARTMENT OF ELECTRONICS

KESHAV MAHAVIDYALAYA

DELHI UNIVERSITY

DELHI

ABSTRACT

In this article, discrete sine transforms interpolation approach is presented for designing a digital fractional order differentiator i.e. (DST-II). First described the definition of fractional differentiation. Then, DST based interpolation method i.e. (DST-II) is applied to compute the fractional differentiation of a given digital signal to obtain the transfer function of proposed method i.e. fractional order digital differentiator by using index mapping method. Finally, some numerical problems show their effectiveness of the proposed DST-II method as compared to Radial Basis function and Improved design of digital fractional-order differentiators using fractional sample delay.

KEYWORDS

digital differentiator, fractional derivative, hanning window, discrete sine transform (DST-II).

JEL CODES

C00, C60.

INTRODUCTION

During the past several decades, fractional calculus has played an important role in various fields like fluid flow, automatic control, biomedical applications, electrical networks, electromagnetic theory and image processing [1]-[2]. Fractional dimension is used to measure some real-world data such as coastline, clouds dust in the air and network of neurons in the body [3]-[4], we aim out interest at the realization of digital fractional derivative, which named as digital fractional order differentiator (FOD). Because digital FOD can determine and estimate the more characteristic of a given digital signal than integral order differentiator (IOD), it has been being an especial and useful tool in many increasing application, such as fractional order controls, radar and sonar processing, nonlinear or chaos time series processing and forecasting, geological signal detecting and processing, image signal compress and processing etc. Fractional sample delay has become an important device in the applications of time adjustment in the digital receiver, antenna array processing, speech coding.

Synthesis, modeling of musical instrument, and comb filter design etc [5]-[6]. The integer order n of derivative $D^n f(x) = (d^n f(x)/dx^n)$ of function is generalized

to fractional order $D^\nu f(x)$, where ν is a real number. One of the important research topics in fractional calculus is to implement the fractional operator D^ν in continuous and discrete time domain for continuous-time case, some methods for obtaining an approximated rational function using evaluation, interpolation and curve fitting techniques have been studied. These methods include Carlson's method, Roy's method, Charle 's method and Oustaloup's method. For the discrete -time case, there have been several methods presented to design finite-impulse-response (FIR) and infinite-impulse-response (IIR) filters for implementing operator D^ν , including fractional differencing formula or Euler method, Tustin method, continued fraction method, least square method and Prony's method, continued fraction method [7], fractional sample delay method [8] and radial basis function [9].

On the other hand, the Discrete Sine Transform (DST) which is known to be statistically optimal performance with Karhunen-Loeve transform for highly correlated signal [10]. Until now, DST has been successfully applied to transform domain adaptive filtering [11], signal interpolation [12], image coding and compression [13], speech enhancement [14], image encryption [15].

In this paper, we will use one of the best interpolation method DST-II and Grunwald-Letnikov fractional derivative to design fractional order digital differentiator. In section II, the definitions of fractional derivative will be discussed in briefly. In Section III, the interpolation type of DST method i.e.(DST-II) is applied to design the fractional order digital differentiator. In section IV comparison result are presented. Finally, the conclusion is made.

FRACTIONAL DIFFERENTIATION

There are several definitions for fractional integral and fractional derivative to obtain the transfer function of the fractional order differentiator such as the Riemann-Liouville, the Grunwald-Letnikov and Caputo definitions. But in this paper we will use the Grunwald - Letnikov definition which is given by

$$c_k^v = \frac{\Gamma(v+1)}{\Gamma(k+1)\Gamma(n-k+1)}$$

$$D^v f(x) = \lim_{h \rightarrow 0} \sum_{k=0}^{\infty} \frac{(-1)^k}{h^v} c_k^v f(x - kh) \tag{1}$$

The above notation (Γ) is gamma function. Based on this definition, the fractional derivative of exponential and sinusoidal signals are given by

$$D^v e^{\alpha x} = \alpha^v e^{\alpha x} \tag{2}$$

$$D^v A \sin(\omega t + \varphi) = A \omega^v \sin\left(\omega t + \varphi + \frac{\pi v}{2}\right) \tag{3}$$

$$D^v A \cos(\omega t + \varphi) = A \omega^v \cos\left(\omega t + \varphi + \frac{\pi v}{2}\right) \tag{4}$$

The definition of fractional derivative has been described.

DESIGN METHOD USING DST-II

There are several types of discrete sine transform, namely DST-I, DST-II, DST-III, DST-IV. In this section the DST-II is presented. The continuous signal $x(t)$ are sampled in the discrete-time sequence $x(0), x(1), \dots, x(N-1)$. Firstly, we will study how to compute the fractional order differentiation $D^v x(t)$ using the DST-II method. The DST-II is defined as

$$X(k) = \sqrt{\frac{2}{N}} \sum_{n=0}^{N-1} x(n) c_k \sin\left(\frac{(n+0.5)(k+1)\pi}{N}\right) \tag{5}$$

$$x(n) = \sqrt{\frac{2}{N}} \sum_{k=0}^{N-1} X(k) c_k \sin\left(\frac{(n+0.5)(k+1)\pi}{N}\right) \tag{6}$$

Substituting forward DST-II in equation (5) and into inverse DST-II in equation (6), we get

$$c_k = \begin{cases} \frac{1}{\sqrt{2}} & k = N - 1 \\ 1 & \text{otherwise} \end{cases}$$

$$x(n) = \sqrt{\frac{2}{N}} \sum_{k=0}^{N-1} \left[\sqrt{\frac{2}{N}} \sum_{m=0}^{N-1} x(m) c_k^2 \sin\left(\frac{(m+0.5)(k+1)\pi}{N}\right) \right] \sin\left(\frac{(n+0.5)(k+1)\pi}{N}\right) \tag{7}$$

$$x(n) = \sum_{m=0}^{N-1} x(m) c_k^2 \left[\frac{2}{N} \sum_{k=0}^{N-1} \sin\left(\frac{(m+0.5)(k+1)\pi}{N}\right) \sin\left(\frac{(n+0.5)(k+1)\pi}{N}\right) \right]$$

$$x(t) = \sum_{m=0}^{N-1} x(m) b(m, t) \tag{8}$$

The interpolation basis function is given by

$$b(m, t) = \frac{2}{N} \sum_{k=0}^{N-1} \sin\left(\frac{(m+0.5)(k+1)\pi}{N}\right) \sin\left(\frac{(t+0.5)(k+1)\pi}{N}\right) \tag{9}$$

Taking the v^{th} order fractional differentiation at both sides of equation (8)

$$D^v x(t) = \sum_{m=0}^{N-1} x(m) [D^v b(m, t)] \tag{10}$$

Using Linear property of fractional differentiation

$$[D^v b(m, t)] = \frac{2}{N} \sum_{k=0}^{N-1} \left(\frac{(k+1)\pi}{N}\right)^v \sin\left(\frac{(m+0.5)(k+1)\pi}{N}\right) \sin\left(\frac{(t+0.5)(k+1)\pi}{N} + \frac{\pi v}{2}\right) \tag{11}$$

Substitute the equation 11 into the equation 10 given below:

$$x(t) = \sum_{m=0}^{N-1} x(m) R_m(t) \tag{12}$$

$$P_m(t) = \frac{2}{N} \sum_{k=0}^{N-1} \left(\frac{(k+1)\pi}{N}\right)^v \sin\left(\frac{(m+0.5)(k+1)\pi}{N}\right) \sin\left(\frac{(t+0.5)(k+1)\pi}{N} + \frac{\pi v}{2}\right) \tag{13}$$

To obtain transfer function of fractional order digital differentiator that approximate the following Ideal frequency response is given below :

$$H_d(\omega) = (j\omega)^v e^{-j\omega l} \tag{14}$$

Where l represent delay values. The transfer function of the FIR filter is given as:

$$H(z) = \sum_{r=0}^{N-1} h(r) z^{-r} \tag{15}$$

After integer delayed samples the output will be

$$y(n) = \sum_{r=0}^{N-1} h(r) s(n-r) \tag{16}$$

Now a problem is that how we can determine the filter coefficient $h(r)$ from the equation (12), such that the filter output $y(n)$ is almost equal to the delayed fractional differentiation $D^v s(N-l)$, that is

$$y(n) \approx D^v s(N-l) \tag{17}$$

Index mapping technique can be used to solve task, if

$$\begin{aligned} s(n) &= x(N-1) \\ s(N-1) &= x(N-2) \\ s(n-N+1) &= x(0) \end{aligned} \tag{18}$$

After link the equation (12) and (16), equation (18) can be written as

$$x(m) = s(n - (N-1) + m) \quad 0 \leq m \leq N-1 \tag{19}$$

Putting the values of $x(t) = s(n - (N-1) + t)$ into equation (12), we get

$$D^v s(n - (N-1) + t) = \sum_{m=0}^{N-1} s(n - (N-1) + m) P_m(t) \tag{20}$$

$$h(r) = P_{N-1-r}(N-1-l) \tag{21}$$

Substituting equation (13) into (21), then the filter coefficient will be

$$h(r) = \frac{2}{N} \sum_{k=0}^{N-1} \left(\frac{(k+1)\pi}{N}\right)^v \sin\left(\frac{(N-r-0.5)(k+1)\pi}{N}\right) \sin\left(\frac{(N-l-0.5)(k+1)\pi}{N} + \frac{\pi v}{2}\right) \tag{22}$$

We can modify the filter coefficient by using the optimization techniques and window techniques.

The Hanning window transfer function is given below

$$w(r) = 0.5 - 0.5 * \cos((2 * \pi * r)/(N-1)) \tag{23}$$

So the modified filter coefficients can have determined by

$$h_w(r) = h(r)w(r) \tag{24}$$

To evaluate the performance of the DST-II, the integral square error of frequency response

$$E = \sqrt{\int_0^{2\pi} |H(e^{j\omega}) - H_d(\omega)|^2 d\omega} \tag{25}$$

If the error E is smaller, then the performance of the design method will be better.

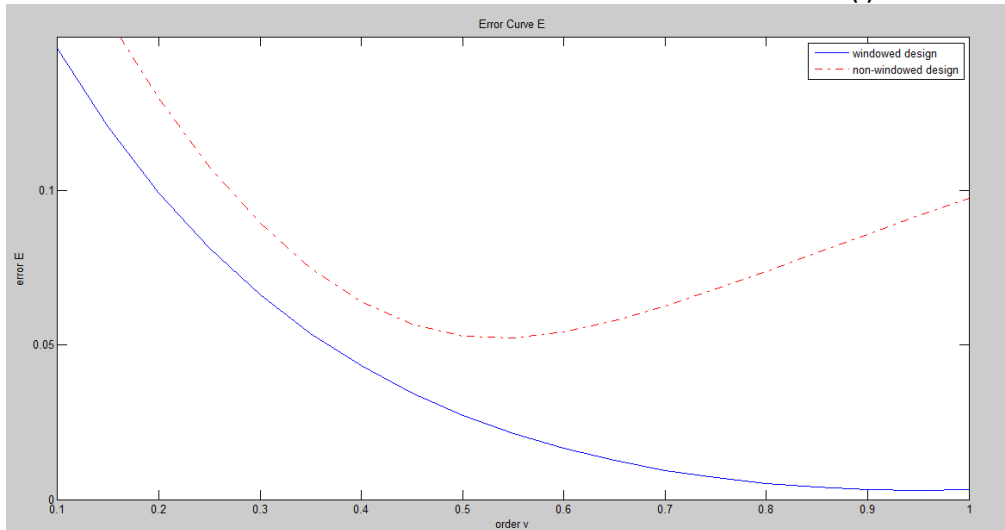
Design Examples

To evaluate the performance of the DST-II, the integral square error of frequency response is defined as

$$E = \sqrt{\int_0^{2\pi} |H(e^{j\omega}) - H_d(\omega)|^2 d\omega} \tag{26}$$

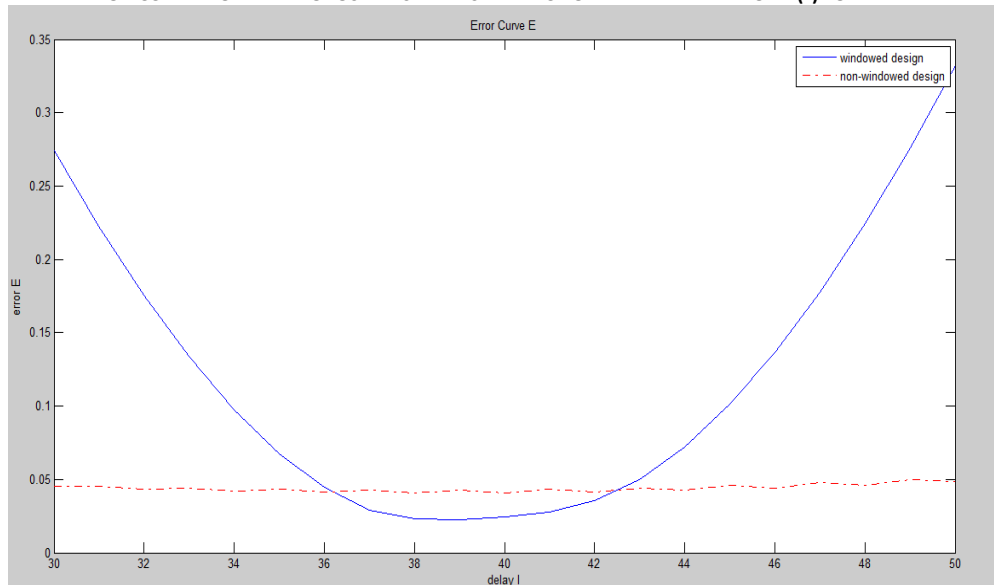
If the error E is smaller, then the performance of the design method will be better. **Example 1:** In this example, we will study the relation between the error E and for the DST-II method and. The design parameters are chosen as $N = 80$, $l = 40$, $v = 0.2$, and $\theta = 0.9$. Moreover, Fig.1 shows the error curve E of the proposed DST-II based fractional order differentiator for the windowed and non-windowed function. In this figure, it can be seen that the windowed design error is minimum than the non-windowed design for the orders.

FIG. 1: THE ERROR CURVE E OF THE PROPOSED DCT-IV BASED FRACTIONAL DIFFERENTIATOR H(z) FOR ORDERS v



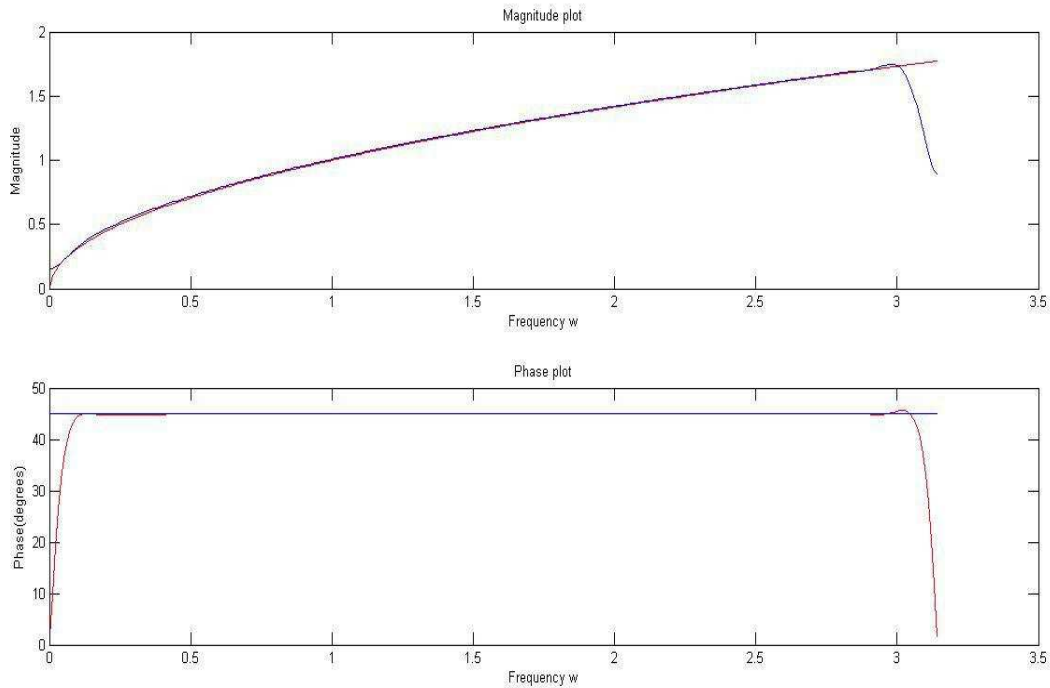
Example 2: In this example, we will study the relation between the error E and delay value I for the DST-II method and The design parameters are chosen as N = 80, I = 40, v = 0:2, and = 0:9. Moreover, Fig.2 shows the error curve E of the proposed DST-II based fractional order differentiator for the windowed and non-windowed function. The value of E is minimum at I = 20.

FIG. 2: THE ERROR CURVE E OF THE PROPOSED DST-II BASED FRACTIONAL DIFFERENTIATOR H(z) FOR THE DELAY VALUES I



Example 3: In this example, we will study the study the magnitude and phase response for the DST-II. The design parameters are chosen as N = 80, I = 40 and = 0:9. Moreover, Fig.3 (a), (b) show the magnitude and phase responses (solid line) for the DST-II and order v = 0:5. In Fig.3(a) the dashed line show the ideal magnitude response w^v . Fig.3 (b) show the phase response $90 [\text{angle}(B(e^{j\omega})) + w*I] = 0:5$. In Fig.3 (b) the dashed line shows the ideal response $90v$.

FIG. 3: THE DESIGNED RESULTS OF THE WINDOWED DST-II BASED DIGITAL FRACTIONAL ORDER DIFFERENTIATOR $H(z)$ FOR $\nu = 0.5$. (a) MAGNITUDE RESPONSE. (b) PHASE RESPONSE. THE DASHED LINE SHOW IDEAL RESPONSE



COMPARISON AND DISCUSSION

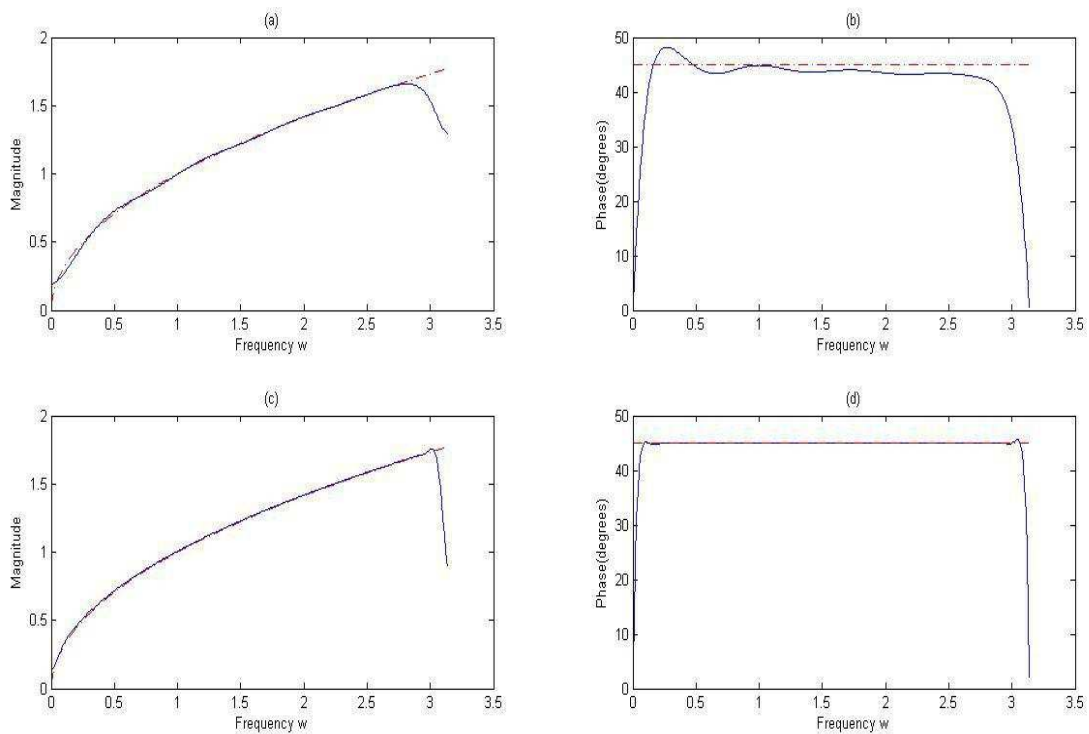
In this section, we will compare the result of DCT-IV with the Radial Basis Function [9] and Fractional Sample Method [8].

A. Comparison with Conventional Method

Here, let us compare the proposed method DST-II with the conventional method (Radial Basis Function in [8]).

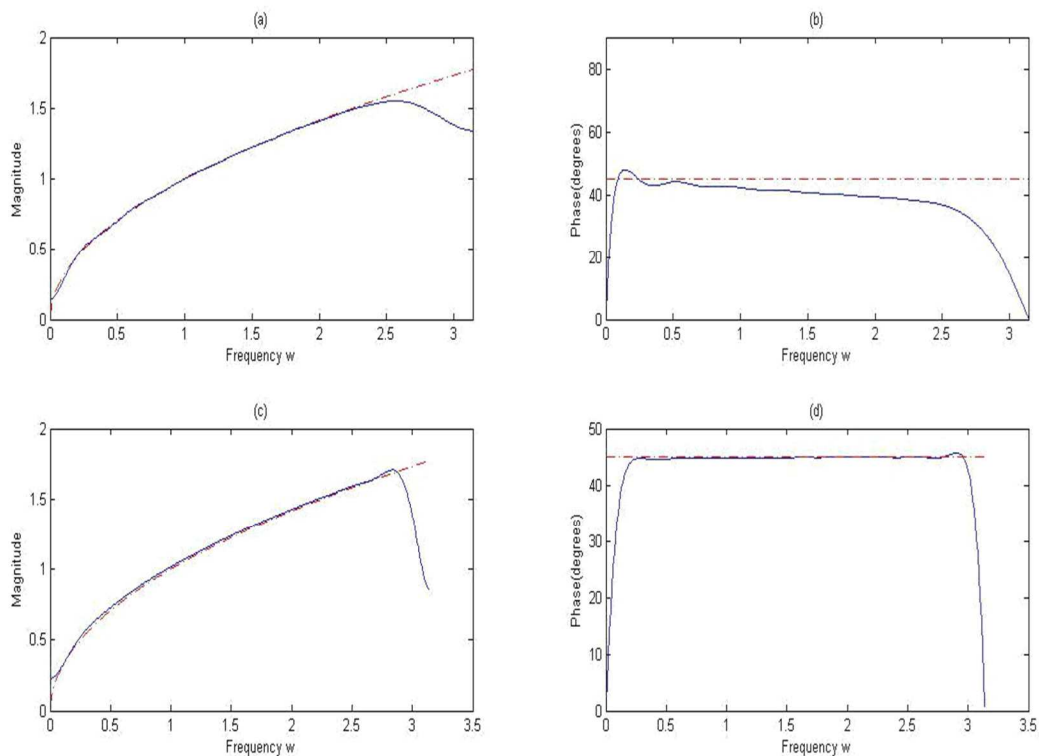
The parameters values are chosen as $N = 100$, $I = 50$ and $\nu = 0.5$. Fig. 4(a) and 4(b) show the magnitude and phase response of Radial Basis Function. 4(c) and 4(d) show the magnitude and phase response of Discrete Sine Transform (DST-II) using windowed. if $\lambda = 0.9$ is chosen then the error E of the RBF method is 0.0356 and using the the DST-II method comes 0.012. Thus the proposed method has smaller design error as compare with the conventional method.

FIG. 4: THE DESIGNED RESULTS (SOLID LINE) OF THE RADIAL BASIS FUNCTION METHOD IN [9]. (a), (b) THE RESULTS OF THE RADIAL BASIS FUNCTION (RBF) METHOD IN [9].(c),(d) THE RESULTS OF THE PROPOSED METHOD (DST-II). THE DASHED LINE SHOW THE IDEAL RESPONSE



B. Here, let us compare the proposed method DCT-IV with the conventional method (Radial Basis Function in [8]). The parameters values are chosen as $N = 40$, $l = 20$ and $\nu = 0.5$. Fig. 5(a) and 5(b) show the magnitude and phase response of Radial Basis Function. 5(c) and 5(d) show the magnitude and phase response of Discrete Sine Transform (DST-II) using windowed. if $\lambda = 0.9$ is chosen then the error E of the RBF method is 0.287 and using the the DST-II method comes 0.012. Thus the proposed method has smaller design error as compare with the conventional method.

FIG. 5: THE DESIGNED RESULTS (SOLID LINE) OF THE FRACTIONAL ORDER FIR DIFFERENTIATOR. (a), (b) THE RESULTS OF THE FRACTIONAL DELAY METHOD IN [8].(c),(d) THE RESULTS OF THE PROPOSED METHOD (DST-II). THE DASHED LINE SHOW THE IDEAL RESPONSE



5. CONCLUSION

In this article, discrete sine transforms interpolation approach are presented for designing a digital fractional order differentiator i.e. (DST-II). Then DST-II is applied to compute the fractional differentiation of a given digital signal to obtain the transfer function of proposed method i.e. fractional order digital differentiator by using index mapping method. Finally, some numerical problems show their effectiveness of the proposed DST-II method as compared to Radial Basis function and Improved design of digital fractional-order differentiators using fractional sample delay. However, 1-D has been studied in this paper. Thus, it is interesting to extend the proposed DST-II method to design the 2-D fractional order differentiator, Hilbert transform and other Optimization method in the future.

REFERENCES

1. C. Tseng, Improved design of digital fractional-order differentiators using fractional sample delay, IEEE Trans. Circuits Syst. I: Reg. Papers, vol.53, pp. 193-203, Jan. 2006.
2. Chien-Cheng and Su-Ling Lee, Design of Fractional Order Digital Differentiator Using Radial Basis Function "IEEE Trans. Circuits Syst. I: reg. Papers," pp. 1-11, Jul. 2010.
3. E.G. Pellaes and Y. Iano, \Image coding using discrete sine transform with axis rotation," IEEE Trans. on Consumer Electronics, pp.1284-1290, Nov. 1998.
4. H. O. Peitgen, H. Jurgens, and D. Saupe, Chaos and Fractals, New Frontiers of Science, 2nd ed. New York: Springer-Verlag, 2004.
5. H. Zhao, Q. Ran, G. Ge, J. Ma and L. Tan, \Image encryption based on random fractional discrete cosine and sine transforms," in Proceedings of the 1st International Workshop on Education Technology and Computer Science, pp.804-808. 2009.
6. H.M. Chen and B. Zeng, "New transforms tightly bounded by DCT and KLT," IEEE Signal Processing Letters, vol.19, pp.344-347, June 2012.
7. J. J. Shyu, S. C. Pei, and Y. D. Huang, Two-dimensional Farrow structure and the design of variable fractional-delay 2-D FIR digital lters, IEEE Trans. Circuits Syst. I: Reg. Papers, vol. 56, pp. 395-404, Feb. 2009.
8. J. Madapura and B. Li, Multi-target tracking based on KLD mixture particle filter with radial basis function support, in Proc. ICASSP, Apr. 2008, pp. 725-728.
9. J.C. Lee and C.K. Un, \Performance of transform-domain LMS adaptive digital _lters," IEEE Trans. on Acoustics, Speech, and Signal Processing, pp.499-510, June 1986.
10. K. B. Oldham and J. Spanier, The Fractional Calculus. New York: Academic Press, 1974.
11. K. S. Miller and R. Ross, An Introduction to the Fractional Calculus and Fractional Differential Equations. New York: Wiley, 1993.
12. T. I. Laakso, V. Valimaki, M. Karjalainen, and U. K. Laine, Splitting the unit delay: Tool for fractional delay filter design, IEEE Signal Processing Mag., pp. 30-60, Jan. 1996.
13. X. Li, H. Xie and B. Cheng, \Noisy speech enhancement based on discrete sine transform," in Proceedings of the 1st International Multi-Symposium on Computer and Computational Sciences, 2006.
14. Y.Q. chen and B.M. Vinagre, "A new IIR-type digital fractional order differentiators," Signal Processing, vol.83, pp.2359-2365, Oct.2003.
15. Z. Wang, G.A. Jullien and W.C. Miller, \Interpolation using the discrete sine transform with increased accuracy," Electronics Letters, pp.1918-1920, Oct. 1993.

REQUEST FOR FEEDBACK

Dear Readers

At the very outset, International Journal of Research in Computer Application & Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue, as well as on the journal as a whole, on our e-mail infoijrcm@gmail.com for further improvements in the interest of research.

If you have any queries, please feel free to contact us on our e-mail infoijrcm@gmail.com.

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward to an appropriate consideration.

With sincere regards

Thanking you profoundly

Academically yours

Sd/-

Co-ordinator

DISCLAIMER

The information and opinions presented in the Journal reflect the views of the authors and not of the Journal or its Editorial Board or the Publishers/Editors. Publication does not constitute endorsement by the journal. Neither the Journal nor its publishers/Editors/Editorial Board nor anyone else involved in creating, producing or delivering the journal or the materials contained therein, assumes any liability or responsibility for the accuracy, completeness, or usefulness of any information provided in the journal, nor shall they be liable for any direct, indirect, incidental, special, consequential or punitive damages arising out of the use of information/material contained in the journal. The journal, neither its publishers/Editors/ Editorial Board, nor any other party involved in the preparation of material contained in the journal represents or warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such material. Readers are encouraged to confirm the information contained herein with other sources. The responsibility of the contents and the opinions expressed in this journal are exclusively of the author (s) concerned.

ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

Our Other Journals

