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# Abstracts

Sl. No.	Title of the paper	Abstract
01	On Fuzzy Context Free Languages And Fuzzy Push Down Automata	The paper studies the relationship among fuzzy context free languages and fuzzy push down automata. The degree of membership of the words to the fuzzy language generated by a context free grammar, calculated in a monoid, introduces an additional burden for the accepting push down weighted automaton. Even in the case of languages accepted by fuzzy deterministic push down automata, the relationship with respect to fuzzy context free grammars is complex. A general effective algorithm to deduce one model from the other is still missing. The paper intends to draw attention to some of the open problems in this area.
02	Pole-Placement Controller Design For A Robot Using Output Feedback	In this research, we present a pole-placement method for designing of a linear time-invariant feedback controller for a robot. The idea is inspired from the fact that the internal signals of feedback control systems can be eliminated by executing row operations on the governing matrix. After choosing the appropriate closed-loop poles, the design method can be implemented easily and directly on Diophantine equations. In this paper, a 5-bar-linkage manipulator robot is considered as a case study and the proposed controller is designed based on the governing Euler-Lagrange equations on the robot. The analytical and operator-based design procedures verify the simplicity and flexibility of the proposed method. Hence, the method is appropriate to apply on various control systems.
03	Independent Component Analysis Based on Constrained Bacterial Foraging Optimization Technique	Independent Component Analysis, a computationally efficient statistical signal processing technique has been an area of interest for researchers for many practical applications in various fields of science and engineering. The present paper proposes a novel bacteria foraging optimization based independent component analysis (BFOICA) algorithm assuming a linear noise free model. The application and performance of a novel evolutionary computation based optimization technique known as bacteria foraging optimization (BFO) in independent component analysis (ICA) problem is investigated in this work. It is observed that the proposed constrained bacteria foraging optimization based ICA algorithm overcomes the long standing permutation ambiguity and recovers the independent components in a fixed order which is dependent on the statistical characteristics of the signals to be estimated. The paper compares the performance of proposed ICA algorithm with the constrained the genetic algorithm based ICA (CGAICA) and the most popular fast ICA algorithm. The proposed algorithm offers comparable or even better performance as compared to the fast ICA algorithm. The BFOICA algorithm is demonstrated to have faster convergence and better mean square error performance compared to the CGAICA.
04	Design And Analysis Of One Optimal Respiratory Control System	In the present work the effective design of one artificial respiratory control mechanism of a human system is described. The system basically consists of the lungs, blood circulatory system in cascade and the chemoreceptor in the feedback path. One compensating proportional plus integral (PI) control mechanism is incorporated in cascade to the lungs and circulating systems to attain desired performance of the overall system. The PI compensation is designed so as to have minimum integral square error (ISE). The efficacy of the present control system is that the system is a stable one having appropriate gain margin (GM) and phase margin (PM). The design of the system and the results are analyzed in this work. The system is also analyzed in sample data control (s.d) system. The system is found to be stable in that domain as well. The system offers an in depth sight for the biomedical engineering application of one artificial respiratory control system operated under optimal condition.
05	A Short Report On The Workshop On “Low Energy Nuclear Reactions (LENR): Prospective Third Route To Nuclear Energy”	There is an emerging third route to tapping nuclear energy which was referred to initially as “Cold Fusion” when it first burst upon the scientific scene 19 years ago but more appropriately has now come to be known as “Low Energy Nuclear Reactions” (LENR) or even “Condensed Matter Nuclear Science” (CMNS). The history of science has time and again witnessed this phenomenon namely that whenever a new idea representing a significant paradigm shift in our understanding of nature comes up, there is invariably intense opposition to the new idea. But eventually, as more valid scientific evidence accumulates, the new phenomenon begins to get assimilated into mainstream science.

- 06 Proxy Based Authentication And Management Of Multiple User Credentials For Grid Services
- Authentication is a crucial security component in almost all computing systems. The main problems related to authentication are of Single sign-on and Delegation, especially in distributed environments. In a large scale distributed computing system like grid, the security requirements of different services vary widely with respect to the type of security credentials they need to authenticate users. Different services require different credentials like username: password, X.509 Certificates, Kerberos Tickets, Custom Security Tokens etc. to verify the identity of the user. As a result, users end up having multiple security credentials for accessing different services. This gives rise to another problem that is management of multiple user credentials. Forcing users to manage and present credentials manually for each service is a tedious, error-prone and insecure task. In this paper we propose a framework for handling authentication related issues like single sign-on, dynamic delegation of access rights, privacy, integrity and confidentiality of messages and a service to dynamically store, retrieve and manage multiple user credentials in a grid. We will also discuss a prototype implementation of the proposed framework.
- 07 Short Note On Photo-Plethysmo-Graphy [PPG] For Monitoring Breathing Effects On The Human Brain
- Photoplethysmography (PPG) is a simple and low-cost optical technique that can be used to detect blood volume changes in the micro vascular bed of tissue. It is often used non-invasively to make measurements at the skin surface. It has widespread application in medicine. For example in pulse oximeters, vascular diagnostics and digital beat-to-beat blood pressure measurement systems. The basic form of PPG technology requires only a few opto-electronic components: a light source to illuminate the tissue (e.g. skin), and a photo detector to measure the small variations in intensity associated with changes in perfusion. PPG is most often employed non-invasively and operates at a red or a near infrared wavelength. The most recognized waveform feature is the peripheral pulse, and it is synchronized to each heartbeat. There are two main PPG operational configurations: 1.transmission mode operation where the tissue sample (e.g. fingertip) is placed between the source and detector, and reflection mode operation where the LED and detector are placed side-by-side. Clearly, transmission mode PPG imposes more restrictions than the reflection mode PPG on the body locations available for study. There are other sources of artifact that need to be considered in the measurement technology. This paper deals with some details about PPG.
- 08 Nonlinear System Identification Using Bacterial Foraging Optimization Technique
- This paper presents a novel and promising approach for nonlinear system identification using recently developed modified Bacterial Foraging Optimization (BFO) technique. An adaptive algorithm to update the weights of the adaptive model using BFO is presented in the paper. Simulation study has been carried out to identify various nonlinear systems whose output are contaminated with additive white Gaussian noise. The simulation results demonstrate that the BFO based learning algorithm is much faster during training, provides lower MSE floor level and offers, in general, superior identification performance compared to its GA based counterpart. In addition the new approach requires less input samples.
- 09 Structuring Elements For 3D Morphological Image Processing
- The basic operations of mathematical morphology are the two dual operations of *Dilation* and *Erosion*. These two operations and their combinations allow one to modify the form and shape of a digital image. The given digital image is processed by another image called *Structuring Element* whose shape decides the shape of the given image. The given image and the structuring element are viewed as sets and thus their union and intersection respectively are termed as dilation and erosion. Intensive research has already been carried out by a number of people in this morphological processing of two dimensional images, whereas very little work has been found in the literature related to the morphological processing of three dimensional digital images has been used to calculate the quantity of earthwork in cut and fill applications. As in the case of 2-D morphological image processing, structuring elements are not confined to 3x3x3 neighborhood alone. One can visualize structuring elements in neighborhoods of size 5x5x5 or 7x7x7 or even more. One should be clear with the concept that a structuring element is essentially a digital image and so it admits the possibility of being represented in large neighborhoods. Note that the number of structuring elements that could be generated depends on the size of the neighborhood.
- 10 Design Tool For An Edge Router Using Appropriate Mathematical Model
- This paper presents the formulation, modeling and analysis of network traffic for the purpose of designing an edge router, catering for a large campus. Presuming packet arrival in Poisson's process, and departure or service time distribution to be exponential, a Markov model has been developed.. The stochastic characteristics of the traffic has been monitored and studied over long durations through different times of a day and different days of a week. Traffic data was captured from the internet backbone. Different packet distribution parameters have been

derived. Different design parameters like buffer capacity, out going link speed and various other key parameters for an edge router have been derived. Additionally, an algorithm has been suggested to manipulate the weights of the queues dynamically in a weighted round robin scheduling, thereby changing the packet departure rate of the flows. The algorithm eventually provides a control over the load factors and the probability of packet drop of the flows as per the need of Quality of Service and Differentiated Service. The basic objective is to provide the best possible Quality of Service by maximizing the utilization of the existing resources. The model, proposed in this work may be considered as a tool for the design of an edge router.

11 Hand Geometry Based Human Identification And Recognition System Using Some Selected Hand Attributes

Hand geometry is one among the first biometrics to find practical use across an assortment of real-world security applications. A hand geometry based recognition system works by acquiring the image of a hand to determine the geometry and metrics namely the finger length, width and other attributes. Some of the existing hand geometry biometrics systems measure different parameters for efficient recognition. An important aspect of geometry based approach is the assumption that an individual's hand does not drastically change after a certain age. Most of the existing systems use more number of attributes to describe a hand of which some like finger width may slightly vary over time. Including such attributes in the process of distance metric will notably reduce the accuracy of the system during practical implementation. So, we consider only some of the selected attributes which will not change significantly over short periods of time. Several segmentation algorithms were used in the process of extracting different kinds of features from the hand image. In this paper we present a model for hand geometry based human recognition. The paper proposes and uses some distinct features that enhance the accuracy of the recognition. In our previous work we successfully implemented a simple and very fast algorithm for hand image segmentation employing filtering, edge detection and region labeling techniques and arrived at comparable segmentation results. This technique has been employed to segment the hand images. In addition, in this paper, we implemented three different matching policies to find the better match, and the best one can be used to recognize hands in a better way.

12 "Manix 3D": A 3D Tracking Device With Tactile Feedback

In this work a desktop based 3D tracking device along with Tactile Feedback has been designed and developed. This Technology can also be extended to Immersive Virtual Environment, even though it is designed for desktop based non-Immersive Virtual Environment. The main context was to develop an intuitive device along with cost effective solution. The complete hardware, with the device drivers and libraries required for easy integration of the device is developed. A Fluid Flow application is used to demonstrate our work.

13 Virtual Reality In Medicine

Three dimensional computer graphics initiated the development of virtual reality technology several decades ago. The principal aim is to generate images with virtual objects or complete scenes in a near photorealistic manner. Two major components are needed to reach this goal: appropriate algorithms to calculate the visual appearance of the virtual scene to be visualized (rendering); and physical devices (in most cases graphical displays) to present the resulting images to the user. A vast collection of methods has been developed during the past decades for rendering. They basically simulate the interaction of light with the geometry of the virtual objects, which can be represented as a collection of surfaces (surface rendering) or as volumetric models (volume rendering). In order to achieve real time performance for large objects different specialized accelerator units have been developed, which are readily available today—even for personal computers. The level of realism can be considerably improved by the use of texture mapping techniques, allowing the coloration of the represented surfaces by detailed photographic images.

14 Face Recognition Using Principal Component Analysis

In this paper we have discussed low dimensional representation in the context of face recognition using Principal Component Analysis (PCA). It aims to find second order correlation of patterns. First the eigenspace is generated and all the training images are projected onto this subspace. They are called as eigenfaces. Each test image is projected onto this subspace, compared with all the training images by a similarity or distance measure. The computational time of eigenspace projection is directly proportional to the number of eigenvectors used to generate the eigenspace. The effectiveness of PCA is tested on BioID database and ORL database. We were able to design a prototype system, which provides user authentication via facial features. The proposed system of face recognition may be applied in identification systems, document control and access control.

- 15 Circuit Partitioning For Mapping Onto Dynamically Reconfigurable FPGAs  
Dynamically Reconfigurable FPGAs (DRFPGAs) provide a platform to realize big circuit by partitioning it into smaller sub-circuits or contexts. To remember signal values between the contexts, one needs to use memory elements. Performance of partitioning algorithms thus depend upon the usage of memory elements. This paper presents a genetic algorithm based partitioning strategy using the most general gate-level model of DRFPGA computation, known as Time-Multiplexed Communicating Logic. Apart from this generality, the partitioning results obtained are much superior to the existing ones reported in the literature.
- 16 (2n+1)-ary Discrete Logics And Their Switching Functions (A Brief Introduction)  
Multi Valued Logic (MVL) has been a topic of interest especially among mathematicians and computer scientists for the past ten years. Many paradigms have evolved so far to study and implement MVL with Systemics, Cybernetics and Informatics (SCI) point of view. This paper is the result of a continuous effort due to E G Rajan (the third author) in developing a formal theory for switching functions working on multiple logic levels. The basic idea of (2n+1)-ary logics has been drawn from Thaitheeya Upanidhad, a condensed version of Vedas. Due to space constrains, a very brief idea of the paradigm on (2n+1)-ary discrete logics and their switching functions is presented in this seed paper.
- 17 Quantifiable Measures Of Constructive Extended Filters In Terms Of Normal Algorithmic Operators (Lecture Series – 10)  
Erlandson introduces three different measures of the filtering capabilities of extended filters: (i) the ambiguity of a filter, (ii) the discrimination of a filter and (iii) the resolution of a filter [27]. In addition, he introduces a metric over a space of filters, a measure of how close or far apart two different filters are. Significantly, Erlandson's measures can be given a constructive interpretation as well. In fact, we could interpret these measures as normal algorithmic operators mapping a metric lattice of extended filters over a constructive set, into the metric space of constructive real numbers. But to describe our interpretation, we need to go into the details of constructive mathematical analysis, starting from the formulation of various constructive numbers, functions and function spaces. This would cause a diversion from the main flow of this book. So, we describe in what follows, the quantifiable measures for CEF's on similar lines of Erlandson, without loosing the constructive aspects in them.
- 18 Inverse Set Theoretic Rajan Transform (ISTRT)  
Sathya's version of STRT is applicable to all kinds of sequences of sets of length which is a power of two. The logical steps involved in computing ISTRT are given below in the form of a pseudo code.