Preface

The 11th International Conference on Image Processing, Wavelet and Applications (IWW2021) is online from 23 rd to 24 th . June, 2021 in Istanbul Aydın University; Turkey, in collaboratoin with University of Trieste; Italy, Eurasian Universities Union (EURAS), Indian Society Industrial & Applied Mathematics (ISIAM) and Sharda University; India and University of Massachusetts Medical School, USA.

Wavelet analysis provides a unique decomposition of time series into signal and noise components. From the overall spectrum, independent spectra can be extracted allowing the separate detection and monitoring of the world problems. The participants of the conference will have the opportunity to discuss major issues of importance for integrated wavelet implementation, including development experiences worldwide wavelet applications. The wavelet methods provide avenues for proper understanding of real world problems. These scientific meetings are aimed at providing opportunity for interaction of scientists, engineers, space scientists, agricultural and environmental scientists, social scientists, medical scientists who are applying wavelets in their research areas in broad range of fields. Mathematical studies are often aimed to analyze and visualize real world problems. Discussion on this theme during ICIAM2003 in Sydney by Prof. Dr. Abul Hasan Siddiqi and his group, mooted the idea of holding symposium on wavelets.

Considering the importance of wavelet tools, Istanbul Commerce University (Istanbul, Turkey) organized the First International Workshop on Applications of Wavelets to Real World Problems during 17-18 July, 2005. The “International Workshops II and III: Mini Symposium on Applications of Wavelets to Real World Problems: IWW07 and IWW08” were organized by İstanbul Aydın University with the co-operation of The Abdus Salam International Centre for Theoretical Physics-Office of External Activities (ICTP-OEA, Trieste, Italy). “The Fourth International Workshop on Applications of Wavelets to Real World Problems (IWW2009)” was organized by Kocaeli University with the co-operation of ICTP-OEA in June 2009. A fairly good number of active researchers of the field participated in its deliberations, and the papers presented were published in the Proceeding of the Workshop. Encouraged by the success of the series of Workshops, The Fifth International Symposium on Wavelet Applications to World Problems (IWW2010) was held in Istanbul Aydın University with the co-operation of ICTP-OEA, between June 7-8, 2010. The sixth International Image processing & Wavelet on real World applications conference (IWW 2012) was organized by Boğaziçi University with the co-operation of Istanbul Aydın University in Istanbul. Universitat Politècnica de València in Valencia, Spain organized the seventh IWW2013. The 8th International

conference on Image Processing, Wavelet and Applications (IWW2016) was held in Istanbul, Turkey on September 22 – 24, 2016. IWW 2016 was organized by Marmara University with the co-operations of Istanbul Aydın University and Sharda University. The ninth IWW2017 has been organized by Kafkas University, Kars between 5 – 8 November 2017. The previous conference was held in Kocaeli, Turkey (October 5-8, 2019). In the international symposium/conference, scientists from different countries gathered and shared their specialist research in their respective fields. Joint study subjects were also developed and young scientist reunited with internationally famous scientists which provided the opportunity to get in contact with scientists from different countries for embarking on new projects in the conference.

The 11th IWW (IWW2021) will be in light of the esteemed memory of honoree chair Professor Abul Hasan Siddiqi, who passed away on January 20, 2020. The conference will be held in his physical absence but his eternal presence will be with us through his contributions and propagation of science and scientific thinking. Accordingly, our aim is to bring together researchers in mathematics, science, engineering, industry, technology, social science, sciences and amongst others to discuss the development of new models, theories, and applications that contribute to the advancement of scientific knowledge and practice. Besides the advances, applications and contributions which offer new opportunities and methods. We hope the conference will be fruitful and enjoyable for all the participants and contributors, who will benefit from the thought-provoking presentations, focused debates and exchange of information to occur during the IWW2021 Conference.

ABSTRACT ORDERED ACCORDING TO PROGRAM

The unreasonable effectiveness of Haar frames

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Abstract: Despite its lack of regularity, the Haar basis has been of constant use in signal and image processing, and Haar decompositions have recently been used for Convolutional Neural Networks in Deep Learning. Computationally efficient Graph-based algorithms u using Haar decompositions have also been performed at a very low computational cost. However, a main drawback of Haar decompositions is the irregularity of the basis elements, thus their inability to account for the smoothness of the data.

Wavelet frames were introduced by I. Daubechies, A. Grossmann and Y. Meyer in 1985 as a compromise between the continuous wavelet transform, which is a very flexible analysis tool (the restrictions on the shape of the wavelet are easy to meet), and orthonormal wavelet bases (the use of which being much less greedy in terms of computational costs).

In this talk, we will show that Haar tight frames, obtained by using a finite union of shifted Haar bases, capture the advantages of both decompositions: they keep the algorithmic simplicity of Haar bases, and they also allow to characterize pointwise and global regularity by the standard smooth wavelet conditions, despite the fact that the elements composing the frame are discontinuous.

This is a joint work with Hamid Krim (North Carolina State University).

Evaluation of Turkish in terms of Informatics

EŞREF ADALI

Turkish in Terms of Informatics Eşref ADALI (15.06.2021) Summary We can examine and compare languages, which are extremely important for societies, from different perspectives. To evaluate a language, it is necessary to examine and evaluate all the features of the language. Within the scope of this paper, it will be explained from which aspects a language can be examined and evaluated. Reviews will not be limited to grammar but will also be technical aspects. As it is known, classical grammar topics are phonology, prosody, morphology, syntax, semantics, discourse and pragmatics. Our review will be on the features listed below: • Clarity • Ease of pronunciation and good-sounding • Vocabulary • Productivity • Prominence • Regularity When clarity tests are carried out on Turkish and other languages, it is seen that the clarity of Turkish is high. We can associate the reasons for this with the following features of Turkish: • Turkish is an agglutinative language • Vowel and consonant harmony in Turkish • Syllable structure of Turkish The vowel and consonant harmony of Turkish facilitates pronunciation and makes it sound pleasant. In other words, vowel harmony is a result of the nature of the human vocal organ. • Turkish is Easy to Say • Turkish speaking gets tired less • Turkish sounds good The effectiveness of a language can also be measured by the richness of its vocabulary. The size of the vocabulary of a language is directly proportional to the thinking ability of the person speaking that language. When investigating the richness of a language's vocabulary, only looking at the number of words in the dictionary does not give accurate results. In fusional languages, it is necessary to give a new name to each concrete and abstract object. This necessity causes the vocabulary to be wide in such languages. In agglutinative and Hami-Sami languages, it is possible to derive new words with affixes added to the root word. Even if some of the derived words are not included in dictionaries, their meanings are understood by those who use that language. An indicator of the productivity of a language is the meanings attributed to words. For example, the most basic use of the verb to break is to "break up hard things by hitting or crushing". It is possible to come across too many meanings of the word break in developed languages such as Turkish. Turkish is as if a language convention was held 5000 years ago and the rules of Turkish were determined. These rules have not changed until today. This feature of Turkish amazes linguists. It is expected that there should be a certain order in the order of the words in the sentence. In each language, certain rules are followed in ordering the words in the sentence. In some languages, if this order is changed, the meaning of the sentence is distorted or lost. In Turkish sentences, the words are arranged in a certain order. However, there is no loss of meaning when the order is changed.

A novel epidemiological model of tuberculosis epidemic allowing transfers of population and a wider use of treatment.

René Lozi (with M. Abdelouahab and A. Arama)

Abstract

A novel epidemiological model describing the evolution of tuberculosis in a human population is proposed. This model is of the form SEIR where S stand for Susceptible people, E for Exposed (infected but not yet infectious), I for Infectious and R for Recovered. The main characteristic of this model inspired from the disease biology and some realistic hypothesis is that the treatment is administrated non only to infectious but also to exposed. Moreover, this model has a geographic component, as it considers the transfer of infected or infectious people to other regions more conducive to their care and accepts for treatment exposed or infectious patients coming from other regions without care facilities. Stability and bifurcation of the solutions of this model are investigated. It is found that saddle-focus bifurcation occurs when the contact parameter passes through some critical values. The model undergoes a Hopf bifurcation when the treatment rate *r* is considered as a bifurcation parameter. It is shown also that the system exhibits saddle-node bifurcation which is a transcritical bifurcation between equilibrium points. Numerical simulations are done to illustrate these theoretical results. They highlight the critical role of the contact rate and the treatment rate in the eradication of the disease.

Analysis of Fractals on Square and Some Square Carpet Designs

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ABSTRACT: Fractal geometry has many applications in designing of floors, making home beautiful, designing of doors etc. so here in this paper we present some designs on square. Some self-similar fractals are presented here with analysis of area and perimeter. With the help of iteration process, properties of recurrence relation and numerical methods some newly discovered fractals are presented here.

Keywords: Fractal Dimension, Iterations, Self-Similarity, recursive relation, Sierpinski carpet.

INVESTIGATION OF KURA RIVER DELTA AND SURROUNDING AREA ON THE BASIS OF IMAGE PROCESSING

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Our investigation area includes Kura river delta and surrounding area (Figure 1). We researched area based on satellite images within Geographic Information Systems.

Nowdays variable satellite images provide a wide range of possibilities of monitoring the environment on coastal regions in a fast way. We can use lots of earth observation satellites with different spatial and spectral resolution in our research materials. Since Landsat images, with high resolution, are available for free, this type of land cover mapping is more effective.

PDE-based nonlinear anisotropic diffusion model for removing additive noise

Santosh Kumar, Khursheed Alam, Alka Chauhan

In the image processing area, deblurring and denoising are the most challenging hurdles. The deblurring image by a spatially invariant kernel is a frequent problem in the field of image processing. In this paper, we propose a nonlinear anisotropic diffusion model for removing additive noise. The model is developed by multiplying the magnitude of the gradient in the diffusion model, and then applies priori smoothness on the solution image. We present proof of the existence, uniqueness and stability of the viscosity solution of our model. The finite explicit scheme is used to discretize the diffusion model. The numerical results are given in terms of the improvement signal-to-noise ratio.

Clustering time series data: A case study on the diffusion of COVID19 in 12 Italian cities

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Abstract

This paper presents an application of clustering time series data for bringing into light the spread of Covid19 in Italian cities. We used a method comparing *n* curves, corresponding to different *n* entities described by time series that we could interpret as functions of a set *k* of environmental variables.

The method consisted of four steps. In the first step we calculated the correlation coefficient between the *n* curves and the environmental variables. Then, we described the entities corresponding to the curves by the set of correlation coefficients each of which has with the *k* environmental variables. For the comparison, we used the Goodall's probabilistic index that gives the probability that two elements are more similar than they could be if the variables by which they are described would have a random distribution in the set of the *n* elements. The matrix of probabilistic similarity is subjected to cluster analysis and the clusters are compared by the test of the evenness of the eigenvalues. In the third step the curves corresponding to the entities in the same clusters were averaged and then compared in the same graph after the double normalization of their values. In this way only the shape of the curves were taken into consideration for the comparison between the clusters. Finally, in the fourth step, we applied wavelet analysis to the normalized *n* curves and we used the correlation coefficients between the actual data and the values obtained by the wavelets at three decomposition levels (large, meso and small scale) to compare and cluster the *n* curves. Here, we again used the probabilistic index of Goodall. The results of clustering the *n* curves based on their correlation with *k* environmental variables, and those obtained by clustering the curves on the basis of the wavelet analysis were compared. Thereby, we observed whether the interpretation of the *n* curves was improved, keeping into consideration the information regarding the environmental variables.

We applied this method on the time series data of the COVID19 spread in 12 Italian cities in order to identify the pattern of spread in relation to 4 environmental variables namely: Temperature, Humidity, PM2,5 and NO2. The curves of the time series were given by the daily new cases (DC) and the total cases (TC) of 433 days starting from March 3rd, 2020 until May 9th, 2021. The application of cluster analysis to the matrix describing each city by the correlations of the DC values and the TC values with temperature, humidity and PM2,5 and NO2 identified two main groups of cities. The first group included the cities that were more significantly correlated with PM2,5, while the second group included the ones that were correlated more significantly with temperature and NO2. Interestingly, the first group consists of the cities that are nearby and have more contact with the agricultural lands where intensive breeding activities are implemented (source of PM2,5) and the second group consists of the cities that are more industrial, commercial and residential. By plotting the average curves of TC of the two groups, we observed that the COVID19 outbreaks started in the cities that are correlated with PM2,5 and then spread to the cities in the second group. At the beginning of May 2021 (the end of the time study) the spread started to converge in the two groups of cities. The application of the wavelets to the curves of DC leads to the conclusion that to concentrate the study only to the shape of the curves of the Daily New Cases (DC) is not sufficient for explaining the pattern of the diffusion of COVID. The differences within the same cluster of cities adds more information to understanding the pattern of spread.

Keywords: similarity, wavelet transform, pattern, COVID

Monitoring Air pollution impacts on COVID-19 in India

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Abstract

SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) is the agent of COVID-19 disease, which attacks the respiratory system. Air quality is an important issue that is affecting human health, flora, fauna and ecosystems. Vehicular pollution, demolition and construction activities, burning of fossils and plastics, and population burst are the main reasons for degrading air quality. The data collected is from CPCB (Central Pollution Control Board) of India from 2015-2020 for the pollutants such as PM2.5 and PM10. Pre-Processing techniques such as removal of null values using MICE imputer on multivariate data, merging the columns, and Minmax feature scaling is applied. The cities are classified and further subdivided based on Terrain (coastal, mountainous and plains) and based on Population (highly populated and less populated). The study analyses and hence, predicts the values for Particulate matter by using the SARIMA model. SARIMA stands for Seasonal Autoregressive Integrated Moving Average model. It uses optimal hyperparameters for better prediction. The performance evaluation of the forecasting model by calculating root mean square error which may help control the degraded air quality.

Keywords: COVID-19, Atmospheric pollution, PM2.5, SARIMA, SARS-CoV-2, AQI.

Impact of Wind and Temperature on Covid-19 outbreak: Investigatory analysis in India

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Abstract

The number of infected cases of Covid-19 has risen to over 100 million. With a recovery rate of 72.9% and a mortality rate of 2.2%. Although the safety measures, such as the protective face masks (PFMs) and social distancing, have been implemented, there was an explosion of infected cases in India over the span of 6 months in 2020, that is, May to October; under accordance with the arrival of monsoon. The virus spread shows preference to low temperatures and wind speed, as seen throughout India. Here, the study will shed light on the link between the spread of the pandemic in India and the meteorological factors of air temperature and wind speed. The study will develop a comparison between the fluctuations in meteorological factors and the virus spread in India. Weather data across state capitals and major cities is studied along with nation-wide data on Covid-19 infection cases. The study depicts the behavior of a variant of coronavirus in India, as less stable and low transmission rates at high temperatures and wind speed. On the other hand, its stability, transmission and infection severity is considerably higher at lower temperatures and wind speed. The study traces the importance of self-isolation and social distancing, especially during cold weather conditions.

Keywords : SARS-Cov-2, MERS-Cov, Coronavirus, Covid-19, Meteorological factors

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The mathematical model to Study the influence of different kind of clothing material on counter current heat and water distribution in human organs

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ABSTRACT

The Mathematical model to study the influence of different kind of clothing material on counter current heat and water distribution in human organs is presented here. A Mathematical model is developed for the calculations of detailed temperature distribution throughout the clothed human body. The Modelled limb consists of a counter current bones and different types of clothes. It is divided five concentric layers from the bone, muscle, fat, skin and cloth from the centre to the outside. In this model the bone is consider the core. The model included the effects of the local metabolic rate, local blood flow rate, heart rate, respiratory parameters, heat loss of conduction, convention and evaporation, geometry of the body, and the physical properties of the clothes like a natural or a synthetic one.

Asymptotic behavior of solutions and stability properties for a linear neutral delay differential equation with constant impulsive jumps

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ABSTRACT

We investigate the asymptotic behavior of solutions and stability properties to the linear neutral delay differential equation with constant impulsive jumps and constant coefficients. In this paper, an asymptotic result, a useful exponential estimate of the solutions and a stability criterion are established.

Keywords: Neutral delay differential equation, Characteristic equation, Asymptotic behavior, Stability, Zero solution

ESTIMATION OF MATH SUCCESS SCORES ACCORDING TO THE READING AND WRITING SCORES OF PRIMARY SCHOOL STUDENTS

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ABSTRACT

There are many important factors affecting students' success in mathematics lesson. The determination of these factors has been the subject of many academic studies. These factors are generally the communication of the students starting in preschool period with physical, social, emotional, language and cognitive skills, which are the areas of development.

In this study, students 'reading and writing scores in their primary school years were linked with their mathematics achievement scores, which will affect their academic success in the following years, and an analysis was made to estimate the mathematics score according to the students' reading and writing scores.

For this, before starting the study, the literature was scanned and then the analysis was made by choosing the Multiple Linear Regression method, one of the Data Mining methods. Python was preferred as the software language in the study. When the math prediction results are analyzed according to reading and writing scores, students with low reading and writing scores also have low math scores, and students with high reading and writing scores generally have high math scores.

Keywords: *Data analysis, Mathematics, Success Score, Multiple Linear Regression, Correlation analysis*

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100 Days Confirmed Covid 19 Cases Prediction Model In Turkey

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ABSTRACT

In this article, we present a 100-day prediction model of Covid-19 cases in Turkey from February 04, 2021 to May 14, 2021 using R Programming. The goal of the study was to create a Covid new infection rate prediction model using The World Covid-19 analytics dataset which starts from Jan 22, 2020, and Facebook's prophet model. We used the data about Turkey`s Covid cases in that dataset. The confirmed cases are generally uploaded to the dataset after the daily Covid-19 cases declaration by Ministry of Health. We used only the official data.

For creating the algorithm, we used "dplyr", "prophet", "lubridate", "ggplot2", "tidyr", "gganimate", "givski", and "av" libraries. So, we had different and independent plots. Our plots show the Number of confirmed Covid-19 cases in Turkey, Forecast Model of Covid-19 Cases in Turkey, Prediction Interactive Plot of Covid-19 Cases in Turkey, Animation of Covid-19 Cases in Turkey, Trend Plot and Day of the Weeks Plot of Covid-19 Cases in Turkey, Predict and Actual Plots of Covid-19 Cases in Turkey, Linear Trend Plots of Covid-19 Cases in Turkey.

In the February 04, 2021, actual case trend had a downward trend. April 13, 2021 the actual cases passed the prediction trend, and, in the May 03, 2021, the actual cases graphic had a downward trend again. In our study we investigate the results and comparison between predicted and real confirmed case day by day. The research study is still in progress.

In the study, we analyzed all plots and evaluate statistics and performance of the model. We found that prediction model was not very compatible with real infection rates due to the government's changing practices, such as imposing semi or complete lockdown for 20 days, overnight curfews during weekdays or semi-lockdown on weekends etc., to lower the new infection rates.

Keywords: COVID-19, prediction model, artificial intelligence, machine learning

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An Innovative Model SegChaNet for segmentation of lung cancer in CT Images

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Abstract
A key step towards the computer-aided diagnosis of the lung cancer is the automatic lung segmentation feature. Several anomalies impede the effective use of current procedures, which utilize segmentation of the lungs. The Channel Attention Module (CAM) proposed in this study will help with the segmentation of the lungs more effectively. A novel method SegChaNet was proposed to segment the lung area from the surrounding chest region and is hence called after the U-Net and Channel Attention Module. SegChaNet is proposed in which CT slices of the input lung are encoded into feature maps using the trail of encoders. Finally, a multi-scale dense-feature extraction module is specifically developed to extract multi-scale features from the collection of encoded feature maps. The segmentation map of the lungs is finally discovered by employing the decoders. Dense feature extraction in lung abnormalities being learned, while iterative down-sampling followed by an iterative up-sampling cause the network to remain invariant to the size of the dense abnormality. For the experimental study, the publicly accessible Cancer Archive Center dataset is employed. The performance of the proposed network has been compared to the current state-of-the-art approaches (3D U-Net and V-Net) for lung segmentation using SegChaNet analysis. The results of the experimental study reveal that SegChaNet outperforms the conventional methods in finding abnormalities in the CT scan of the lungs.

Keywords: Segmentation, Lung CT, V-Net, 3D U-Net

Automated Detection of Alzheimer's Disease Using Wavelet Transform with Convolutional Neural Networks

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Abstract

Alzheimer's disease (AD) is a chronic disease that causes the death of nerve cells and tissue loss in the brain. It usually starts slowly and worsens over time. Individual computer aided systems are needed for early and accurate diagnosis of Alzheimer's. Magnetic resonance imaging (MRI) offers the opportunity to examine the pathological brain changes associated with AD. In recent years, neuroimaging data has been increasingly used to characterize AD with machine learning methods, offering promising tools for personalized diagnosis. Very recently, a number of studies have proposed to aid the diagnosis of AD through convolutional neural networks (CNNs). CNN is machine learning algorithm which is used in a variety of fields, including image and pattern recognition, speech recognition, natural language processing, and video analysis. In this study Discrete wavelet transform (DWT) was used for feature extraction. DWT has attractive properties and has better image representation than other transforms like Fourier. Medical images are vulnerable to noise. Medical images are preprocessed to remove unwanted data and improve quality. Feature extraction and classification are two essential components for the recognition system that have a significant impact on the efficiency of the system. DWT is an implementation of wavelet transform that uses a separate set of wavelet scales and translations that follow some defined rules. The aim of this study is to detect Alzheimer's disease by using convolutional neural networks and to reduce noise by preprocessing by applying DWT on the entered images. With combining DWT feature extraction with CNN algorithm for detecting Alzheimer's disease, the performance and learning rate are significantly increased and while accuracy in CNN learning without using DWT feature extraction was about %75 it increased up to %85 which means using wavelet transform techniques with machine learning algorithm will make the learning rate better.

Keywords: Alzheimer's disease, DWT (Discrete wavelet transform), CNN (Convolutional Neural Networks)

Wavelet Hybridized Neuronal Modelling of COVID-19

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ABSTRACT

Most widely and uncontrollably spreading unknown viral genome infecting people worldwide was announced to be 2019-2020 *nCoV* by WHO on January 30, 2020. Based on the seriousness of its spread and unavailability of vaccination or any form of treatment, it was an immediate health-emergency of concern of international-level. The specific virus-gene is believed to be evolved through 7-month- old infant having infected with bronchiolitis and conjunctivitis. Viral gene consists of distinctive features consisting of a distinctive N-terminal sliver within spike-protein. Corona-genomic viruses - the genus of Coronaviridae species encased viruses along with large plus-strand RNA-gene. Genomic RNA has size 27-32kb wrapped polyadenylated. Three serologically distinctive assemblies for coronaviruses description. This study analyses long-term effects of this virus. It is important to capture the essence of this pandemic affecting millions of the population daily ever since its spread began from January 22, 2020 - August 3, 2020 (approximately 195 days) in this case of India. From sample of each case taken distinctly, initial 4 data-points are input values. Rest of the 191 are to train and test designed forecast model. Further, values that are trained and validated into prototype as inputs. Wavelet Neuronal Network Fuzzified Inferences' Layered (WNNFIL); Wavelet Neuronal Network Fuzzified Inferences' Layered Least-Squares Support Vector Regression (WNNFIL-LSSVR); Wavelet Neuronal Network Fuzzified Inferences' Layered Multivariate Adaptive Regression Spline **(**WNNFIL-MARS**)** techniques used to forecast the long term behaviour. WNNFIL-MARS perform better compared to WNNFIL & WNNFIL-LSSVR which is observed through Root Mean Square Error (RMSE), Mean Square Error (MSE), Mean Absolute Error (MAE) and Coefficient of Determination (R^2) values.

A Simplified Theory of Distributions for Engineering Applications and Time-Frequency Analysis

Abstract:

Invited by A. Siddiqi to a talk at Sharda University in February 2018, I have presented the ``{I}ngredients for {A}pplied {F}ourier {A}nalysis,'' i.e.\ an outline of a new way of teaching the Fourier transform not only to mathematicians, but also to engineers and physicists, avoiding Lebesgue integration and topological vector spaces.
Meanwhile
I have given such courses at TU Muenich and in autumn 2020 at ETH Z\"urich, entitled ``Mathematical Methods for Signal Processing''. The difficulty was to develop the principles of the generalized Fourier transform for a space of objects called {\it ``mild distributions''} from scratch.
This space (of tempered
distributions) is invariant under the (distributional) Fourier transform, and allows a unified approach to the classical methods involving Fourier transforms (given as an integral transform on L^1), or the Fourier series expansion of periodic functions. \newline Even the FFT (the fast Fourier transform for discrete and periodic signals) can be viewed as a special case of the general Fourier transform.

After a quick introduction to the material of the recent course (which was based on methods from linear algebra, Riemann integration and \newline basic functional analysis) I will discuss how {\it heuristic arguments} can be understood in a precise mathematical sense using this simple theory of generalized functions and the calculus, which is based on the triple of Banach space, using the space of test functions $S_0(R^d)$ (Feichtinger's algebra), the Hilbert space $L^2(R^d)$, and the dual space $S_0^*(R^d)$ (the space of mild distributions), which form together THE Banach Gelfand Triple $(S_0,L^2,S_0^*)(R^d)$.

In particular we will point out, how the use of the most natural form of convergence (related to the so-called w^*-convergence) can be used to describe the mutual approximation of the different settings, e.g.\ how to compute the integral transform approximately with the help of the FFT.

The published material can be downloaded from the author's % \newline

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AUTOMATIC TRAFFIC SIGN CLASSIFICATION

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The aim of this study is to design and implement an Automatic Traffic Sign Classification (ATSC) system. According to the National Highway Traffic Safety Administration, the main cause of vehicle crashes is human error and an ATSC aims to increase safety of car driving. Moreover, ATSC is one of today's important research topic due to the recent introduction of self-driving cars. The subject is particularly challenging due to the presence of disturbance elements such as damaged traffic signs, inconsistent lighting conditions, blurring and fading effects, motion artifacts, poor visibility.

This paper challenges the German Traffic-sign database, which is one of the most studied collection of images in this field. The use of Convolutional Neural Networks reached an initial performance of 85%. After that, the initial model has been improved using the Italian Traffic Sign (ITS) database enriched with some of the images from the Belgium Traffic Sign (BTS) dataset. The signs taken from BTS dataset are those which are very similar to the signs in the Italian database. Finally, the use of transfer learning and data augmentation techniques, such as shifting vertically and horizontal translation, allowed to reach the top performance of 94%. The proposed model is currently used by a logistic company to enhance safety during driving.

Bandgap alignment of buffer CdS toward ZnO Window layer for thin-film application.

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Abstract.

Binary cadmium sulfide (CdS) is an n-type semiconductor which conventionally used as a buffer layer for CZTS and CIGS devices. The CdS has a tunable bandgap around 2.40 eV where the window layer of the complete device ZnO has a wide bandgap in the range of 3.20 to 3.50 eV. In this work, the Zn contents were electrochemically incorporated into the CdS thin film to decrease the energy losses between the mismatching of the bandgap. The obtained thin films were characterized by different techniques such as X-ray diffraction XRD, Surface electron microscopy SEM, Energy dispersive spectroscopy EDS, Optical and photocurrent response PC analysis. The crystallography of the film was confirmed by XRD with polycrystalline nature. The morphology and the elemental composition of the film investigated by SEM, it observed that the film is stichometry with a small variation of the grain size by increasing the Zn content. The optical analysis was studied in the visible range with a direct bandgap of 2.40 eV for CdS and 3.1 eV for Zn contents. The photocurrent response of the film confirmed that the incorporation of Zn content high energy photons was captured to enhance the photocurrent of the film and decrease the bandgap mismatching between the CdS buffer and ZnO window layer. The obtained results could be the better choice to improve the device performance.

Keywords; Buffer layer; CdS, characterization, optical and electrochemical analysis.

Controllability of fractional-order dynamical systems with control delay

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This paper deals with the problem of fractional-order dynamical systems with control delay. First, the controllability of linear fractional-order system with control delay is studied by applying the controllability Grammian matrix. Then, on the basis of controllability of linear system and the Schauder fixed point theorem, some sufficient conditions are presented to analyze the controllability results for nonlinear fractional-order system with control delay. Finally, the effectiveness of theoretical analysis is verified by an example.

Impact of Wind and Temperature on Covid-19 outbreak: Investigatory analysis in India

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Abstract

The number of infected cases of Covid-19 has risen to over 100 million. With a recovery rate of 72.9% and a mortality rate of 2.2%. Although the safety measures, such as the protective face masks (PFMs) and social distancing, have been implemented, there was an explosion of infected cases in India over the span of 6 months in 2020, that is, May to October; under accordance with the arrival of monsoon. The virus spread shows preference to low temperatures and wind speed, as seen throughout India. Here, the study will shed light on the link between the spread of the pandemic in India and the meteorological factors of air temperature and wind speed. The study will develop a comparison between the fluctuations in meteorological factors and the virus spread in India. Weather data across state capitals and major cities is studied along with nation-wide data on Covid-19 infection cases. The study depicts the behavior of a variant of coronavirus in India, as less stable and low transmission rates at high temperatures and wind speed. On the other hand, its stability, transmission and infection severity is considerably higher at lower temperatures and wind speed. The study traces the importance of self-isolation and social distancing, especially during cold weather conditions.

Keywords : SARS-Cov-2, MERS-Cov, Coronavirus, Covid-19, Meteorological factors

Modulation of the Crystallization in $MaPbI_3$ Perovskite Films: Studying the impact of Different Antisolvents

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Abstract

Enhancing the grain size and achieving uniform coverage for thin film perovskite are the most major challenges facing the perovskite solar cell device. Herein we study the impact of different antisolvent as additive for MAPbI3 precursor solution, on the surface coverage and grain size of MAPbI3 films. The addition of different antisolvents impacts the crystallization procedure and film coverage. The films prepared using Toluene had fewer pinholes and large grains compared to other films prepared with other antisolvents chlorobenzene and diethyl ether. MAPbI3 grains, with about 400nm, are highly oriented along the (112) direction. Photoluminescence analyses highlight the impact of antisolvent type on surface passivation of deposited MaPbI3 films.

Keywords

Crystallization, Perovskite, thin film, Antisolvent

Monitoring Air pollution and it's Impacts on COVID-19 in India

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Abstract

SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) is the agent of COVID-19 disease, which attacks the respiratory system. Air quality is an important issue that is affecting human health, flora, fauna and ecosystems. Vehicular pollution, demolition and construction activities, burning of fossils and plastics, and population burst are the main reasons for degrading air quality. The data collected is from CPCB (Central Pollution Control Board) of India from 2015-2020 for the pollutants such as PM2.5 and PM10. Pre-Processing techniques such as removal of null values using MICE imputer on multivariate data, merging the columns, and Minmax feature scaling is applied. The cities are classified and further subdivided based on Terrain (coastal, mountainous and plains) and based on Population (highly populated and less populated). The study analyses and hence, predicts the values for Particulate matter by using the SARIMA model. SARIMA stands for Seasonal Autoregressive Integrated Moving Average model. It uses optimal hyperparameters for better prediction. The performance evaluation of the forecasting model by calculating root mean square error which may help control the degraded air quality.

Keywords: COVID-19, Atmospheric pollution, PM2.5, SARIMA, SARS-CoV-2, AQI.

On the spectrum of a new class of graphs

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Abstract

The pineapple graph K_n^t is a graph of the form K_n (complete graph of order n) with t pendant edge attached to any one vertex of K_n. In this paper we determined the adjacency Laplacian and signless Laplacian spectrum of pineapple graphs. Here we investigate some graph invariants like the number of spanning trees, Kirchhoff index and Laplacian-energy-like invarients of these graphs.

Keywords : pineapple graph, spectrum, spanning tree, Kirchhoff index, Laplacian-energy-like invariant.

AMS Subject Classification (2010) : 05C50

Revitalization of Cultural Heritage Through Extended Reality Technologies

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Abstract

The transfer of cultural heritage assets to the audience through different experiences are seen as a current requirement. Audience can have knowledge about the cultural heritage assets and reach to an immersive experience without the need to be physically there by using extended reality technologies (XR). The limitation of physical visits and activities during the pandemic has led to an increase in studies based on extended reality technologies and led to industrial development of the sector in this field. Within the scope of this study, the methods of extended reality technologies used to experience cultural heritage assets are examined. These studies are discussed through examples. Various techniques used among these methods, photogrammetry, 3D modeling studies, software tools and programs were examined, and studies were evaluated within the scope of augmented reality and virtual reality technologies under the umbrella of extended reality. With the ease of access to augmented reality applications and the widespread use of devices using this technology (phones, tablets etc.) and the other hand the decrease in the costs of virtual reality devices, the increasing availability of virtual reality applications and with diversified virtual reality applications (museum, games, education etc.) the effect of the growing market share it is seen that the usage area has increased.

Keywords: Cultural Heritage, Pandemic, Extended reality technologies, Augmented reality, Virtual Reality, Immersive experience.

Sementic Analysis Of A Book using R Programming

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Abstract

The importance and use of the R programming language, which is used for text analysis, graphic drawings, graphics and also for vital computing, is increasing day by day. Because of development of social media and internet technologies, Big data analysis is needed to make this big unstructured data meaningful. The data for the study was taken from the address https://www.gutenberg.org/ebooks/1513 published by free books. The title of the is Romeo and Juliet, owned by William Shakespeare. R programming was used and R Studio was used as the interface was used to analyze the text and emotion of this book. Libraries in R studio have been used for our study. These libraries are library (gutenbergr), library (dplyr), library (ggplot2). "BING" dictionary was used for sentiment analysis of the downloaded book. Bing dictionary allows to separate words as positive and negative according to the meanings they contain. As a result, after the necessary chapters were loaded, the analysis of the book was listed visually by listing the most frequently used words in the book from high to low, and the general sentiment analysis of the book was based on the Bing dictionary for the emotion analysis of these words.

Keywords: R Programming Language, Text and Sentiment Analysis, Big Data

Brain Tumor Detection Using Convolutional Neural Networks (CNN)

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SUMMARY

Brain tumor diagnosis was made using brain tumor MR (Magnetic Resonance) images dataset and Convolutional Neural Networks (CNN). Brain tumor is a mass that grows uncontrolled in the brain. Since detection of brain tumor is quite difficult, it is very important to do this work using software.

In this study, Python programming language was used and the Sequential model of this software was preferred. In this way, the data was examined in the finest detail in order to provide high accuracy rate from the data. Two thousand eight hundered seventy training data and 394 testing data were used in the model.

Experimental results showed that the proposed approach performs well and gives 92% overall accuracy. In this context, it is evaluated that the model can be compiled and used in the field of health in practice with more data and wider technical equipment.

Keywords: Brain Tumor, Deep Learning, CNN, MR

Forecasting the EUR/TL exchange rate with Artifical Neural Network

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Today, it is always possible to estimate the euro buying rate by including many different variables that affect the euro exchange rate. However, in this case, these variables should also be measurable. On the other hand, many qualitative factors that are not measurable can also affect exchange rates. Artificial Neural Networks (ANN) modeling technique is frequently used today in the analysis of economic data and features prediction problems

The aim of this project is to use Artificial Neural Networks to forecast the EUR/TL exchange rate. The data used in this study, was obtained from the website of the Turkish Central Bank. In this study, the euro rate has been estimated using ANN method. In the estimation phase of the established exchange rate model, the error caused by the back propagation algorithm among many artificial neural network architectures was ensured to be minimum.

Recognizing Musical Instruments Using Machine Learning

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Abstract

In this project, we tried to recognize the instruments in the same dataset using the sound recordings of 11 different instruments given in the Nsynth dataset.

When we searched for projects on similar subjects, we came across many similar studies. One of them was Music Instrument Detection Using Lstms And The Nsynth Dataset . In this study, Nsynth suggested processing the dataset using Long Short Term Memory Networks algorithms, but did not perform the transactions and left them to future periods.

We chose the KNN algorithm as an algorithm. We used Python 3.8.5 language with Pandas, Numpy and Scikit-learn libraries to run the algorithm. Before starting the project, we used Jupyter Notebook to examine the dataset and looked at what is in the dataset and what features I can use in the project.

In the part called Dataset Train, there are 289205 audio files consisting of 4 seconds single note and also contains 1 JSON file belonging to these files. In the test part, there are 4096 files in the same order. These files can contain acoustic, electronic and synthetic versions of 11 different instruments.

While we achieved success at 20 percent in my first attempts, we were able to increase this rate up to 34.87 percent in the experiments we made in the following different arguments. Lastly, we caught this rate in our 3-neighbor trial.

Study of numerical model for thermoregulation in women body before and after menstruation cycle

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Abstract

The aim of this paper is to determine a mathematical model to study the heat transfer from female part of human body at different time of menstruation cycle i.e.before and after a menstruation cycle.
To begin, a model of thermoregulation will be presented, followed by a brief description of reproductive physiology of women. The major focus of the review will be thermoregulation in women who have normal menstrual function. Imbedded in the discussion will be the impact of the menstrual cycle on fluid volume regulation during exercise, heat stress, or cold stress. Special aspects of thermoregulation in women will also be considered that may help us understand the factors that affect the integrative function of thermoregulation.

The effect of the temperature in the structural and optoelectronics properties of $MAPbI_3$ / TiO_2 heterojunction for Photovoltaic application.

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Abstract:

In this work we investigate the effect of the temperature on the properties of two type of materials, MaPbI3 thin films perovskites and the TiO2 nano-rodes for photovoltaic applications.

In the first part, we deposited the nano-rodes of TiO2 on FTO substrates by the hydrothermal method. The second part was devoted to the preparation of MAPbI3 by spin coating technique on the FTO glass in the third part we synthesized the heterojunctions MAPbI3 / TiO2 / FTO.

The morphological study of Ti02 was obtained by scanning electron microscopy (SEM) and shows the nano-rodes of smooth and rectangular surface. The influence of the annealing temperature on the structural and optical properties was studied, by preparing MAPbI3 films in air from stoichiometric solutions of MAI / PbI2. Structural characterizations have demonstrated that the crystal structure is practically unchanged by the annealing conditions,Also we have found that the films prepared have a higher absorbance. It has also been found that the gap energy slightly decreases with increasing the temperature, reaching the maximum for T = 100 ° C. MaPbI3 was analyzed by X-ray diffraction analyses and indicated the formation a cubic perovskite phase with space groupe Pm-3m and homogeneous and uniform surface.

The heterojunction MAPbI3 / TiO2 / FTO showed a higher absorbance in the infrared region 750-800 and decreasing of the band gap with the increase of temperature.

Keywords : MaPbI3, TiO2, heterojunction, thin film, morphology, bad gap

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The impact of Different Antisolvents in the Growth and stability of Formamidinium lead iodide ($FaPbI_3$) Perovskite Films

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Abstract

Formamidinium lead iodide ($FAPbI_3$) with different antisolvent were successfully elaborated by a spin coating technique. The influence of the different antisolvents; Toluene, Diethyl Ether and Chlorobenzene, in the $FAPbI_3$ films was investigated. The crystal structures, surface morphology and optical properties have been characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Atomic force microscopy (AFM), Transmission electron microscopy (TEM), photoluminescence and UV–Visible spectrometer, respectively. The crystalline structure of was found in the orientation of (110) plane. It is observed from the XRD results that the type of antisolvent content plays an important role in in growth and stabilization of the $FAPbI_3$. Here, the Chlorobenzene leads to smooth and homogenous surface, large grain size and pinhole-free perovskite film. The optical analysis revealed that the band gape is in the range from 1.4 to 1.8 eV. Furthermore, in an approximately 60% humid environment and after two weeks, the stability of $FaPbi_3$ was still good .

Keywords

$FaPbI_3$, Perovskite, thin film, Antisolvent.

THE SOLUTION OF NIELS BOHR'S PROBLEM ON INTERACTIVE COMMUNICATION

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Abstract

One of the most urgent problems of our time is the security of information transfer. This can be seen even from the fact how much spam we receive every day by email. It is known that "Advanced Encryption Standard" [1], which is the basis of western information encryption, is based on such chaotic actions as permutation of cells, columns and matrix rows, which are the conversion of plaintext to ciphertext. These actions are random in nature and therefore do not provide complete confidentiality of information. Complete confidentiality of information can be provided if each information cell is closed using its own transformation. Such a complete set of transformations can be obtained by solving the equations for a function of N variables, where N is the number of cells. As known, there are very few exactly solvable equations for functions of N variables. One of the most reliable is the Lieb-Liniger model [2] for describing the system of bosons interacting by means of delta-function potentials. This problem was first solved by Lieb and Liniger and is known in the scientific literature as the Lieb-Liniger model.

Another vulnerable point leading to the loss of information security is the process of the encryption key transmitting after sending encrypted information from the sender (Alice) to the recipient (Bob). This vulnerability can be eliminated if Alice and Bob have their own encryption keys. Researchers drew attention to the problem of having their own encryption keys long before the development of modern information technologies. Back in the early 30s of the twentieth century, an attempt to play poker at a distance between Professor Niels Bohr with his son, Heisenberg and other colleagues was unsuccessful, and a problem arose for the players to have their own encryption keys. Only in the 80s of the 20th century, Adi Shamir [3] indicated a way to solve this problem. His method of solving the problem is often called a three-step protocol. It consists of the following steps. Alice encrypts the information with her encryption key and sends it to Bob. Bob encrypts the received information with his own encryption key and returns the information now under the two encryption keys back to Alice. Alice, having received this information, decrypts it with her decryption key and sends the information now under one encryption key back to Bob. Information is now under one encryption key with Bob. Bob, having received this information from Alice, decrypts it with his decryption key. Now the information is without an encryption key and Bob can get acquainted with the information that Alice wanted him to transfer.

In the paper, we show the possibility of using expressions defined based on the Lieb–Liniger work as commutative Alice and Bob encryption keys for
transmitting information based on a three-step protocol. It is shown that to determine the amount of time-dependent information, one can use the solution of the Bogolyubov–Born–Green–Kirkwood–Yvon hierarchy of quantum kinetic equations, when the equilibrium density matrix is determined through the Bethe ansatz.

The proposed method ensures complete confidentiality of information transfer

REFERENCES

1. J. Daemen and V. Rijmen, The Design of Rijndael AES—The Advanced Encryption Standard (Springer, Berlin, 2002).

2. E. H. Lieb and W. Liniger, "Exact analysis of an interacting Bose gas. I: The general solution and the ground state," Phys. Rev. 130, 1605–1616 (1963).

3. A. Shamir, R. L. Rivest, and L. M. Adleman, in Mental Poker, Ed. by D. A. Klarner (The mathematical Gardner, Wadsworth, 1981), p. 37–43.

INVESTIGATION OF THERMODYNAMIC PROCESSES IN THE OIL LAYER WITH REGARD OF DEFORMATION

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ABSTRACT

Experience in the development of oil fields shows that the complexity of the physical processes that occur during the operation of the fields highlights the need for a comprehensive scientific approach in the creation of technological schemes. The most important direction of these studies is the study of the mechanisms of mass transfer of hydrocarbons and the transition between phases, taking into account changes in pressure and temperature during the filtration of fluid in the formation. It is important to take into account the impact of pressure and temperature changes in the development of hydrocarbon fields on the performance.

Under these conditions and some physical assumptions, the determination of the pressure and temperature distribution functions in the layer is described by the following system of equations by corresponding initial and boundary conditions

$$\beta^* \frac{\partial p}{\partial t} = \frac{1}{r}\frac{\partial}{\partial r}\left(\frac{k(p)}{\mu} r \frac{\partial p}{\partial r}\right), \quad r_c \le r \le r_k, \quad t > 0 \tag{1}$$

$$C_{pl}\frac{\partial T}{\partial t} = \rho_f C_f \frac{k(p)}{\mu}\frac{\partial p}{\partial r}\left(\frac{\partial T}{\partial r} + \varepsilon \frac{\partial p}{\partial r}\right) + \eta \rho_f C_f \frac{\partial p}{\partial t}, \quad r_c \le r \le r_k, \quad t > 0 \tag{2}$$

$$p(r,0) = p_c, \qquad r_c \le r \le r_k \tag{3}$$

$$\frac{2\pi k(p) H}{\mu}\left(r\frac{\partial p}{\partial r}\right)\Big|_{r=r_c} = Q + C\frac{\partial p}{\partial t}\Big|_{r=r_c}, \quad t > 0 \tag{4}$$

$$p(r_k,t) = p_k, \qquad t > 0 \tag{5}$$

$$T(r,0) = T_c, \qquad r_c \le r \le r_k \tag{6}$$

$$T(r_k,t) = T_k, \qquad r_c \le r \le r_k\,. \tag{7}$$

Three difference shema for problem (1)-(7) was suggested. Obtained results accurately describes all physical nature of the investigated problem.

Keywords: Boundary layer problem, temperature and pressure distributions.

Vector-valued Nonuniform Wavelet Packets

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Abstract

Wavelet packets are a class of generalized wavelets having applications in many fields including signal processing, image compression and solving integral equations. The multiresolution analysis is the heart of the wavelet theory. The concept of multiresolution analysis provides a very elegant tool for the construction of wavelets i.e. the functions $\psi \in L^2(R)$ having the property that the collection of functions $\left\{2^{j/2}\psi\left(2^j x - n\right)\right\}_{j,n\in Z}$ forms a complete orthonormal system for $L^2(R)$ where Z denote the set of all integers [1]. We have considered a generalization of the notion of nonuniform multiresolution analysis (NUMRA) which is called vector-valued nonuniform multiresolution analysis (VNUMRA) [4]. The concept of NUMRA was introduced by Gabardo and Nashed [2, 3] based on the theory of spectral pairs. Xia and Suter [5] introduced vector-valued multiresolution analysis (VMRA) and orthogonal vector-valued wavelets. We have introduced vector-valued nonuniform multiresolution analysis(VNUMRA) in [4] where the associated subspace V_0 of $L^2(R;C^s)$ has, an orthonormal basis, a collection of translates of a vector valued function over the set $\Lambda = \{0, r/N\} + 2Z$, where r and N are relatively prime and $1 \le r \le 2N-1$ and the corresponding dilation factor is 2N. The notion of vector-valued nonuniform wavelet packets is introduced in this paper and their various properties are investigated. The orthonormal basis of $L^2(R;C^s)$ is constructed from these wavelet packets and the orthonormal decomposition relation is also given.

References

[1] A.Cohen and R.D.Ryan, Wavelets and Multiscale Signal Processing (R.J.Knops and K.W.Morton eds.), Appl. Math. Math. Comp. (11), Chapman & Hall, London/ New York, 1995.

[2] J.P.Gabardo and M.Z.Nashed, Nonuniform multiresolution analysis and spectral pairs, Journal of Functional Analysis 158 : 209 -241, 1998.

[3] J.P.Gabardo and M.Z.Nashed, An anlogue of Cohen's condition for nonuniform multiresolution analyses, Contemporary Mathematics 216 : 41-61, 1998.

[4] Meenakshi, P.Manchanda and A.H.Siddiqi, Wavelets associated with vector-valued nonuniform mltiresoltion analysis, Applicable Analysis. 93(1): 84-104.

Solution of Partially Singularly Perturbed System of Initial and Boundary Value Problems Using Non-Uniform Haar Wavelet

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Abstract

An efficient non-uniform Haar wavelet method is proposed for the numerical solution of system of first order linear partially singularly perturbed initial value problem on piecewise uniform Shishkin mesh and ρ−mesh. Further, we apply same technique for solving system of sec-ond order linear partially singularly perturbed boundary value problem on piecewise uniform Shishkin mesh and q−mesh. We demonstrated two test problems to support the theory, accu-racy and efficiency of the non-uniform Haar wavelet method.

Keywords: Non-Uniform Haar wavelet; Shishkin Mesh; Singular perturbation; Initial and Boundary Value Problems.

Space time fractional Ito system: Exact solution and conservation laws

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Abstract

The main aim of this paper is to examine the space-time fractional Ito system with time-dependent variable coefficients for explicit solution using the power series method, which correlates to Lie symmetry reduction. Further, the convergence of the explicit solution obtained in power series form is analyzed. The new conservation theorem and the generalised fractional Noether's operator are used to construct conservation laws for the Ito system.

Keywords: Fractional differential equations with time dependent variable coefficients, power series solution, conservation laws.

Inverse Problems Across the Curriculum

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ABSTRACT

This expository lecture is devoted to examples and topics in inverse problems throughout the undergraduate and postgraduate curriculum: trigonometry, calculus, differential equations, control theory, linear algebra, partial differential equations, complex analysis, calculus of variations, and signal processing. We also discuss and provide examples of recovery problems of a signal from partial or indirect information about the signal. The interactions of inverse problems and signal processing is an exciting field of study which shows the magic of techniques for recovery problems.

This talk is accessible to upper undergraduate students.

Automated Detection of Alzheimer's Disease Using Wavelet Transform with Convolutional Neural Networks

The Climate Changes and The Foreigner's House Purchases in Turkey

Aslan, Zafer[1] and Altinkaya Zelha[2]

Abstract

The liberalization movements started in the late 18th century argued for the free movement of commodities via free trade of goods. In the late 20th century, in addition to commodities, services were subject to free movement along the borders of countries. In addition to the changes in economic thought, technological developments, political changes in many countries facilitated not only the liberalization of goods and services, but also the liberalization of capital movements. As a phase of the liberalization processes started after January 24, 1980 in Turkish economy, foreigners were legally allowed to acquire real estate in Turkey. People and legal persons from Iraq, Iran, Russia, Ukraine, U.K, Germany preferred to purchase houses from different parts of Turkey. In this study, the effect of houses demanded by foreigners who come from different weather conditions will be under review. The effect of house sales to foreigners on house demand in the Turkish economy in the 2015-2020 period will be evaluated by wavelet analysis.

Keywords: *foreign direct investment, foreign demand, house demand, climate change, liberalization , Turkish Economy.*

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Riesz Multiresolution Analysis on Locally Compact Abelian Groups

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Abstract. We have explored the concept of Riesz multiresolution analysis (Riesz MRA) on a locally compact Abelian group G, and have studied in detail, the conditions under which a scaling function ϕ generates a Riesz MRA on the space $L^2(G)$. An example, supporting our theory and illustrating the methods developed, has also been discussed in detail at the end of this paper.

Keywords: LCA Groups, Riesz Basis, Multiresolution Analysis, Approximation Subspaces, Refinement equation.

AMS Subject Classification: 42C40, 22B05

Examining the Ease of Use of Hybrid Systems in Mobile Applications

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ÖZET:

Akıllı telefon uygulamaları, insanları sağlıklı yaşam tarzlarını benimsemelerine destek olmaktadır. Dolayısıyla davranış değişikliklerini kolaylaştıran hibrit mobil uygulamalara dâhil olan ikna edici tasarım stratejilerini anlamakta fayda vardır. Araştırmamızın amacı, Hibrit mobil uygulamaların Web ile Native uygulamalara göre kullanım kolaylıklarını göstermek için yapılmıştır. Hibrit mobil uygulamalar, Web uygulamalarının özelliklerini ve Native mobil uygulamalarını birleştirir. Web uygulamaları gibi HTML ve JavaScript gibi taşınabilir, platformdan bağımsız dillerde de uygulanırlar. Native uygulamalar gibi yerel cihaz kaynaklarına doğrudan erişirler. Hibrit uygulamalara geçiş teknolojinin hızlı ilerleyişiyle birlikte son dönemde büyük bir artış göstermektedir. Native uygulamalara göre performans eksileri olmasına rağmen yazılım geliştiriciler tarafından kullanım kolaylıkları sebebiyle daha çok tercih edilmektedir. Sonuçlardan, hibrit uygulamalar için kullanıcı arayüzünün dinamik yapısıyla geliştirilmesinin daha basit olduğunu ve hibrit uygulamalarda kullanıldığında mobil cihaz özelliklerini performans bakımından daha iyi kullandığı belirlenmiştir.

Anahtar Kelimeler: Mobil uygulamalar, Hibrit sistemler, e-Business

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The impact of Different Antisolvents in the Growth and stability of Formamidinium lead iodide ($FaPbI_3$) Perovskite Films

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Abstract

Formamidinium lead iodide (FAPbI3) with different antisolvent were successfully elaborated by a spin coating technique. The influence of the different antisolvents toluene, diethyl ether and chlorobenzene in the $FAPbI_3$ films was investigated. The crystal structures, surface morphology and optical properties have been characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM), Atomic force microscopy (AFM), Transmission electron microscopy (TEM), photoluminescence and UV–Visible spectrometer, respectively. The crystalline structure of was found in the orientation of (110) plane. It is observed from the XRD results that the type of antisolvent content plays an important role in in growth and stabilization of the $FAPbI_3$. Here, the chlorobenzene leads to smooth and homogenous surface and large grain size and pinhole-free perovskite film. The optical analysis revealed that the band gape is in the range from 1.4 to 1.8 eV. Furthermore, in a ~60% humid environment and after two weeks the stability of $FaPbi_3$ was found that continuous excellent.

Keywords

$FaPbI_3$, Perovskite, thin film, Antisolvent.