A Compendium of Research Publications 2015

The National Institute of Engineering
(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)
PREFACE

NIE has already brought out two issues of “Compendium of Research Publications” during 2013 and 2014. The response that we got by publishing two issues of such a compendium both from academia and outside experts have motivated our faculty members to publish research papers every year. This year we are bringing out the third issue of compendium.

As in the previous years this year also the compendium gives the abstracts of the research publications and papers presented by the faculty members of various departments. The detailed paper is available in the concerned journal/conference volumes.

I would like to congratulate our distinguished faculty for publishing nearly 200 research papers including a few books in the year 2015 alone. It is indeed highly commendable that the faculty members are very keen in engaging themselves in more research activities apart from their regular teaching.

I thank NIE Management for supporting us in bringing out this volume.

I thank the members of the Editorial Board for their tremendous effort in collecting, consolidating, editing data and bringing out this compendium which, I am sure, is going to be a resource material for researchers and students in future. I congratulate our distinguished faculty members as well. My special thanks to Prof. M.K. Sachidanandan, Special Officer and Mr. Y.S. Harish, Librarian for their extra mile effort in bringing out this volume.

June 20, 2016

Dr. G. L. Shekar
Principal & Chief Editor
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Fire Loads in Heritage Buildings

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ABSTRACT

The results of a fire load survey carried out on Daria Daulath Bagh and Mahadwara Gopuram Ranganatha Swamy temple at Srirangapatna Taluk, Mandya District, Karnataka (India) are presented. Two heritage buildings with a floor area of 1068.64.m² were surveyed. The inventory method was used in the present survey. Analysis has been made to determine the influence of nun 11.; level on fire loads. It is found that room use and room floor area are major parameters affecting the fire loads in a room. An attempt is made to calculate the composition of fire load in the buildings surveyed. In these buildings wood contributes to a substantial portion of the total fire load and the immovable contents contributes to about 90% of the total fire loads.

Analysis of Support Settlement of Telecommunication Tower Subjected to a Lateral Loads

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ABSTRACT

This paper discusses the criteria of support settlement in steel towers which are used for the transmission of microwaves for mobile communication, television signals and radio signals etc. The settlement of supports in telecommunication is mainly due to the type of underlying soil in which the foundation is rest and it is depends on the type of soil such Hard soil, medium soil, soft soil and the level of ground water table, climatic condition etc. In this present paper, a 60m height of telecommunication tower resting on ground has been analyzed, for the support settlement of 5mm, 10mm and 15mm for one leg, two adjacent leg, three leg and for the diagonal legs using SAP2000 and joint displacement, Axial force on the chords are noted for various values of settlement.

Influence of Support Systems on the Structural Behaviour of Cylindrical Shells

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ABSTRACT

The present study is intended to assess the influence of support system on the structural behaviour of cylindrical shells. Single and Multiple cylindrical shells supported on end diaphragms with free longitudinal edges, rigid support such as walls and flexible support with edge beams resting on columns are considered. Structural behaviour under gravity loads is assessed through linear static FE analysis. Develop automation tools using Excel for the Design of Circular Cylindrical Shell Roof with Rigid and Flexible Supports using ASCE procedure. The results obtained from this method are used to validate the FE results. FE analysis is done using NISA Design Studio. Stress resultants are compared with the values as per ASCE manual. Semi-Circular Roof on Rigid Support and a circular cylindrical shell roof for the following cases is examined.

Experimental Study on the Ductile Characteristics of Light Weight Ferrocement Beams under Monotonic and Repeated Loading

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ABSTRACT

Light weight ferrocement elements are generally more ductile when compared to conventional reinforced Earthquake-resistance is dependent on good construction technique and additional reinforcement of the cement. The present work is concentrated on two major aspects, (i) Effect of blast furnace slag on crack & ultimate strength and (ii) Behavior of light weight ferrocement element under Monotonic & Repeated flexural loading. The first part of the present study has been focused on the effect of blast furnace slag (BFS) on First crack & Ultimate Strength with replacement of slag by 0%, 10%, 20% & 30% and second part of the work focusing the behavior of Light weight ferrocement beam under monotonic & Repeated loads with increased load for ductility performance. The results obtained from this work is expected to be useful in determining the strength and ductility of light weight ferrocement beam subjected to similar types of forces and thus will help toward designing ferrocement elements to withstand monotonic and Repeated flexural loading for ductility performance.

State of Art on the Research of Light Weight Ferrocement

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ABSTRACT

Light weight ferrocement is a composite material consisting of cement-sand mortar (matrix) along with light weight fine aggregate as a replacement of sand in some quantity reinforced with layers of small diameter wire meshes and closely spaced small-diameter steel rods rebar. It has been regarded as a highly versatile construction material having unique properties of strength and serviceability. Its advantageous properties such as strength, toughness, water tightness, lightness, durability, fire resistance and environmental stability cannot be matched by any other thin construction material. Ferrocement is a promising composite material for prefabrication and industrialization of the building industry. The three major problem areas in light ferrocement construction are mortar mixing, mortar application, and curing. The mortar must be dense and compact. A trained supervisor can teach the mixer operator to judge mortar quality from the way it tumbles or rolls off the mixer blades. The desired shape may be built from a multi-layered construction of mesh, supported by an armature or grid, built with rebar and tied with wire. For optimum performance, steel should be rust-treated, (galvanized) or stainless steel. Over this finished framework, an appropriate mixture (grout or mortar) of Portland cement, sand and water and/or admixtures is applied to penetrate the mesh. The economic advantage of light ferrocement structures is that they are stronger and more durable than some traditional building methods. Depending on the quality of construction and the climate of its location, houses may pay for themselves with almost zero maintenance and lower insurance requirements. Key word: Light weight ferrocement, fabricated and construction technology.

Parametric Studies on Differential Shortening of Vertical Members in High-Rise R.C Building

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ABSTRACT

At present, there is a growing demand for residential units and office suites in India, resulting in the construction of large number of high rise buildings. By far, reinforced concrete is the most widely accepted and used material in high rise structures. In addition to the gravity loads, lateral loads due to earthquake and wind are other loads that should be considered in such high-rise buildings. These lateral loads cause horizontal displacement (lateral drift) of these buildings. To control this lateral drift, it is necessary to provide very large column sizes. However, providing such large column sizes leads to uneconomical sections. Therefore, the trend followed these days is to provide a central core, with shear wall. These shear walls, in addition to lateral loads also resist larger axial loads. Due to the fact that shear walls are of larger size in comparison to the column, they undergo less compression in comparison to column under axial loads. This leads to differential shortening between the two adjacent vertical members. The conventional analysis method for tall buildings consider all loads being applied in a single step (one step), but in practice self-weight and part of live load are released on the building gradually as the construction progresses and therefore construction stage analysis using software E-TABS needs to be carried out. In the present work, a parametric study is done on differential shortening of vertical members in tall R.C buildings. The parameters considered are varying the columns sizes, increasing storey height and grade of concrete. Comparison of various parameters such as beam moments and differential shortening and effect of spans using one step analysis and construction stage analysis is studied.

Studies on the Load Carrying Capacity of Plain Cement Concrete Arches

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ABSTRACT

This paper presents the results of experimental investigations conducted to determine the load carrying capacity and deformation characteristics of Plain Cement Concrete arches. Uniformly distributed load has been tried. Effects of thickness of arch and also length of arch on load carrying capacity have been studied.

Structural Characteristics of Alternative Masonry Units

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²Department of Civil Engineering, the National Institute of Engineering, Mysuru
³Principal, Maharaja Institute of Technology, Mysuru

ABSTRACT

Now a day’s stabilized mud blocks & solid concrete blocks are widely used as an alternative to the conventional clay bricks for masonry construction. These blocks are a type of masonry unit manufactured by precast technique. The demand of natural sand in the construction industry has increased a lot resulting in the reduction of sources and an increase in price. Thus, an increased need to identify a suitable substitute that is eco-friendly and inexpensive quarry dust being extensively used as an alternative to the sand in the production of concrete blocks. The paper deals with an experimental study on the influence of soil type and replacing sand by quarry dust for Stabilized mud block and solid concrete blocks respectively. The Stabilized mud block where red soil has been used have been prepared by using 5% cement except in SMB 10 and SMB 11. In these SMB 10 and SMB 11, 7% and 10% of Cement has been used respectively. Both Lime and combination of Lime and Cement has been used as the stabilizer for preparing the Stabilized mud block of black cotton soil. Four different percentages of lime has been tried (5%, 7.5%, 10% and 12.5%). Further 5% Lime and 2.5% cement has also been used. The present investigation has taken up to know the characteristics of hand moulded solid concrete blocks produced, both hand mixing and machine mixing has been tried. These types of blocks can be produced in remote areas. Two proportions of concrete have been tried without admixtures and both partial (i.e.50%) and complete replacement of sand has been tried.

On the Selection of a Suitable Fuzzy Operator for Information Combination

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ABSTRACT

The purpose of aggregation of information is to meaningfully summarize and simplify voluminous data from multiple sources. Some of the familiar examples of data aggregation techniques are arithmetic averages, geometric averages, majority voting. For aggregation of data from multiple sources, special techniques such as combination rules are used in fuzzy set theory, the operators used are Context Independent Constant Behavior (CICB) and are grouped into three families: Triangular norms (T-norms), Triangular behavior (T-conorms) and mean operators. The aim of this paper is to discuss on the selection of a suitable aggregation operator to combine data from different sources in the interval [0, 1].

Representing Uncertainty in Fuzzy Land Cover Classification: A Comparative Assessment

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ABSTRACT

In recent years, uncertainty has become an important subject in assessing the quality of remote sensing image classifications. Fuzzy classification approaches aim to estimate the proportions of specific classes that occur within each pixel. Partial class membership values derived from fuzzy classifications serve as baseline information to assess classification uncertainties and allow the depiction of spatial variation of uncertainty. Many metrics have been developed to estimate pixel-wise classification uncertainties. The main objective of this paper was to discuss and examine the applicability of uncertainty metrics, such as exaggeration uncertainty, a measure of classification uncertainty, and two forms of confusion index, and to make a comparative assessment. A comparison of these measures was made based on hypothetical examples and the relationships between them were discussed. A multispectral image from Landsat-7 ETM+ sensor was subjected to fuzzy c-means classification. The derived class membership values for each pixel were used in assessing uncertainty in the classification. A comparative analysis of classification uncertainty provided by the metrics was carried out. The results indicated that measure of classification uncertainty and the exaggeration uncertainty discussed in this paper were similar in conveying uncertain information, but on different scales. The scale factor in this case was always greater than 1 and was given by n/(n-1), where n was the number of classes. This is the reason measure of classification uncertainty estimates values higher than exaggeration uncertainty. Another observation was that if the ratio form of confusion index and exaggeration uncertainty were combined using fuzzy algebraic sum operator, the result was the difference form of confusion index. The results from this study demonstrate the usefulness of class membership values derived from fuzzy c-means classifiers in estimating uncertainties in final thematic maps. The outcome of this research and the observations made in this paper would help the remote sensing community avoid the use of similar metrics of uncertainty under different nomenclature.

Behaviour of Concrete Subjected to Elevated Temperature by Replacing of Fine Aggregate with Gbfs and Quarry Dust

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²Department of Civil Engineering, the National Institution of Engineering, Mysuru

ABSTRACT

Concrete structure are occasionally subjected to elevated temperature to know it's mechanical property. In most of the cases tests at elevated temperature results in considerable damage to concrete structure in present case industrial by product have been adopted as fine aggregate. This investigation aims to come up with a new mix proportion M30 concrete by the use of quarry dust and Granulated Blast Furnace Slag instead of normal river sand for concrete mix. And also focuses the Behavior of concrete at elevated temperature Fine aggregate is replaced by Quarry dust and GBFS in varying proportion like 0%, 25%, 50%, 75% and 100%.test and compared with regular concrete for mechanical properties like compression and split tensile strength at elevated temperature (100°C, 200°C and 300°C)

Study on Behaviour of Self Compacting Concrete by Replacing Sand with GBFS at Sustained Elevated Temperature

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²Department of Civil Engineering, the National Institution of Engineering, Mysuru

ABSTRACT

Nowadays major scarcity in construction field is sand. The overuse of river sand for construction has various undesirable social and ecological consequences. Many researches are carried out to find alternative material for sand in concrete, one among such alternatives is GBFS. This study aims at investigating the possibility of replacing Granulated Blast Furnace Slag as a sand substitute in self-compacting concrete. In this investigation, natural sand is replaced by GBFS in various percentages (25%, 50%, 75% and 100%), with a constant water/cement ratio of 0.48. Mechanical properties such as compressive and split tensile strength were found by testing cubes and cylinders of 150x150mm and 150x300mm. The specimens were also tested at sustained elevated temperature (100°C, 200°C, 300°C) for the duration of 2hrs.

Structural Behavior of Industrial Structure Subjected to Lateral Loads

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ABSTRACT

Industrial structures are low rise steel structures housing workshops or industries and characterized by their comparatively low height and absence of interior walls and partition with or without gantry girders, since gantry girders contribute to heavy loads a typical hangar building is considered for the analysis. In the current paper, the structural behavior of hangar subjected to lateral loads Le, both static load and seismic loads is analyzed by equivalent static analysis using standard FEM software package ETABS. The study encloses behavior of different truss configuration and different frame sections. The member forces are considered as the main parameter.

Structural Behavior of Multistoried Structure with Shear Wall Subjected to Seismic Excitation

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²Department of Civil Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Shear walls are the main vertical structural elements that can effectively resist lateral loads originating from earthquakes or wind. In the current paper, the seismic performance of a regular multi-storey reinforced concrete building is presented where different cross sections of shear wall namely U, L and C are considered. Shear walls equip large strength and high in-plane stiffness in the direction of their orientation which assist in preventing the failure of structure and its components by reducing drift. The paper deals with the dynamic analysis of RCC shear wall in building frames using response spectrum method by standard FEM software package ETABS to study the behavior of different models subjected to seismic excitation. An attempt has been made to study the effect of shear wall at various alternative locations in multi-storey building based on its elastic behavior. Also, the study has been done considering shear wall with 40imidmy elements with increased thickness for determining the parameters like base shear, storey shear, storey drift and displacement. The results indicate that the shear wall with bound elements is less vulnerable to lateral buckling in comparison to plane rectangular walls.

Multi-Spectral Synthetic Image Generation Using Linear Mixture Model

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ABSTRACT

The use of multi-spectral remote sensing images to extract thematic information via digital image classification techniques is now quite common. During past two decades, the spatial and spectral resolutions of remote sensing data have substantially improved. In remote sensing image processing domain, to understand the factors contributing to classification errors and isolating them for further analysis through empirical studies, the use of real image data is needed. However, availability of real data with desired characteristics and other difficulties may limit the scope of these studies. In such cases, it may be advantageous to use synthetic image data with desired and controlled spectral characteristics. This paper discusses a simple method to generate synthetic multi-spectral image which represents a real remote sensing image in spectral characteristics using linear mixture model and spectral statistics.

Assessing the Quality of Fuzzy Land Cover Classification by Similarity and Certainty Measures

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²PEC University of Technology, Chandigarh, India

ABSTRACT

Fuzzy approaches are being adopted for supervised digital classification of remote sensing images. However, the use of fuzzy classification methods is restricted when compared to hard classification methods in producing land use/land cover maps from remote sensing images. The major barrier for the wider adoption of fuzzy classifications is the difficulty in evaluating the classification accuracy, as the conventional measures of accuracy are not appropriate for such classifications. To overcome this barrier, many measures of soft classification accuracy have been developed. In this paper, two measures viz., fuzzy similarity measure and fuzzy certainty measure have been used for assessing the quality of a fuzzy classification. Fuzzy c-means classification was applied to a synthetic data set to derive fuzzy membership values. The derived fuzzy membership values and the corresponding fuzzy reference data were used to compute the values of fuzzy similarity measure and fuzzy certainty measure for each of the classes considered in the classification. The results indicated that the two measures estimate the values differently and fuzzy certainty measure resembles measure of goodness of fit used in statistical models.

Urban Tanks for Facilitating Reuse of Municipal Sewage — A Case Study in Mysuru, Karnataka.

V K Vidya\textsuperscript{1}, M R Yadupathi Putty\textsuperscript{2}, K C Manjunath\textsuperscript{3}

\textsuperscript{1,2 & 3}Department of Civil Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Urbanisation is a very important factor leading to the deterioration of small tanks, which are a popular and means of runoff harvesting in the South Indian plateau. The study reported in this paper was taken up in order to develop a strategy that could effectively help conservation of urban tanks and facilitate also these precious water bodies of the previous generations as a means of recycling and reusing the domestic sewage. The strategy developed is illustrated considering Lingambudi Tank of Mysuru city, as an example. A small wetland is suggested as a pre-treatment option for reducing the pollutant load in the sewage let in to the tank. Area required to reduce the BOD5 content of the domestic sewage by 30% is estimated and has been found to be generally available in the vicinity of tank. A trial and error approach is adopted to determine the sewage inflow that can be managed, by considering the tank as a Stabilization pond. It has been found that the Lingambudi Tank can be easily maintained as a freshwater body catering to various needs, including recreation with water quality at bathing standards, with a sewage inflow of 5000 m$^3$/day. This turns out to be about 60% of the annual freshwater inflow.
Subsurface Drainage and Storage Properties in the Western Ghats – A Study in the Basin of Netravati

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² & ³ Department of Civil Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

One of the reasons for the highly subdued response of the catchments, even to rainfalls of very high daily intensity, in the wet tropical areas of the Western Ghats in Karnataka is their soil mantle, which is very thick, well drained and very stable. An attempt is made in this work to understand the factors leading to such features, through a field study of the hydrological properties of the soils in the region. Cores extracted at road cuttings, from three different depths, at ten sampling sites scattered over the upland areas of the Kumaradhara basin, selected with due regard for the type of land covers commonly associated with hydrology, have been subjected to laboratory experiments to determine the soil texture, the porosity and the hydraulic conductivities. Ring infiltration tests have also been conducted on the field to cross verify the laboratory results. Storage capacity of the soils is estimated and compared with the rainfall magnitude in two small catchments in the area. The results indicate that the surface soils are sandy, while even at great depths, soils are Silty sands or Sandy silts, with high porosities and low drainage rates. The results are interpreted to mean that preferential pathways of macro-pores and soil piping would be an important feature in these areas. It is behavior that more elaborate studies need to be taken up in order to understand the subsurface runoff processes in this hydrologically unique tropical region.
Seismic Performance Evaluation and Retrofitting of RC Members and Joints

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ABSTRACT

In the present work, structure designed and constructed for only gravity an loads is considered for evaluation and retrofitting work. Finite element software ETABS is used to determine the seismic In demand of each element. Retrofitting to the increase the capacity of elements is suggested for the elements having ratio of Demand to WE Capacity more than 1. Pushover analysis is used to determine the performance of the structure before and after retrofitting. In the present work, deficient columns are retrofitted and re-analyzed to check performance of the structure in non-linear analysis. Performance of this retrofitted bu structure is then compared with the existing reinforcement structure and it is found that or structure after retrofit have more base shear lif capacity and displacement capacity, storey on drift of the retrofitted structure has decreased thereby ensuring a maximum safety of the or structure even to the zone3 level of seismic intensity. From the present study it is brought out that structural elements designed only for gravity loads have less vulnerability to collapse in zone 2 level of seismic intensity, and for zone 3 level of seismic intensity itself structural elements fails to perform both ne serviceability limit state as well as ultimate-strength limit state.
Contamination of Water Sources in Mysore City by Pesticide Residues and Plasticizer — A Cause of Health Concern

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ABSTRACT

Water pollution due to organophosphorus and carbamate pesticides is an important environmental issue. Pesticide analysis in water samples has received great attention for many years due to the wide use of pesticides in agricultural and household applications. The World Health Organization estimates that as many as three million people per year are poisoned by pesticides; many are due to organophosphorus pesticides, resulting in two hundred thousand deaths. In the present study an attempt is made to determine the presence of organophosphorus and carbamate pesticides and dibutylphthalate in water samples from different sources (surface and ground water) in Mysore city, Southern India, in order to understand the extent of water contamination due to pesticides and phthalates usage. Sampling points included drinking water sources, industrial areas and surface water sources closer to agricultural field. Water samples were collected from twelve sampling points and analysed using GC-MS. Organophosphorus and carbamate pesticides were not present in detectable concentration by the method adopted in any of the samples. Analysis indicated the presence of Methylisocynate (MIC) in five samples; an intermittent compound of carbarnate pesticides and is harmful to health. MIC is used in the manufacturing of pesticides such as methomyl, carbofuran, aldicarb, methiocarb and carbaryl. There is evidence in literature that MIC, when comes in contact with water will hydrolyze into methylamine and N-N’dimethylurea. Literature states that carbamate pesticides often lose methylisocynate in the voltage range of 90-130V during GC analysis. On this basis it can be concluded that the MIC identified in the water samples is a derivative of carbamate pesticides. GC-MS analysis showed the presence of Dibutylphthalate (DBP) in eight samples, a plasticizer used to impart flexibility to plastics. The results show the presence of DBP in the range of 46.79 pg/L to 212.524L in the samples analysed. USEPA specifies upper limit of 0.6 ttg/L for phthalates in water.
Flow Regionalization under Limited Data Availability – Application of IHACRES in the Western Ghats

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ABSTRACT

Long-term measurements of river stream flow are essential for numerous applications in water resources. In many parts of the world, rivers remain ungauged; stream flow prediction for such ungauged catchment requires information transfer from gauged catchments that are perceived to be hydrologically similar to them. Prediction of stream flows at ungauged catchments is typically performed through the transfer of hydrologic information (e.g., model parameters, hydrologic indices, stream flow values) from gauged to ungauged catchments. This procedure is commonly referred to as regionalization. Hydrologic models have been used extensively for the purpose of transfer of hydrologic model parameters from gauged to ungauged catchments and these models include HBV, IHACRES and PDM. In the present study, for the purpose of 21ehavior21ize21on, a lumped conceptual model namely, IHACRES has been used. IHACRES is a parsimonious model having six numbers of parameters and requires small data input. The model parameters are used to 21ehavior21ize the daily stream flow of the catchment and are related to the landscape attributes of the catchments. Further, as an offshoot, IHACRES provides for base-flow separation and development of unit hydrograph, which becomes an input in other hydrological works. In the current paper, the model IHACRES is applied at daily time step to six catchments (Malathi, Hemavathi, Lakshmanthirtha, Yetthinahole, Kadumanehalla and Kumaradhara) in the region of Western Ghats, Karnataka. IHACRES, being parsimonious, requires precipitation and temperature as the only data-input. Information is compiled for physical catchment descriptors using the elevation map of the area (DEM) and relationships are developed between the parameters and the descriptors. These relationships are validated by 21ehavior daily stream flow of a gauged catchment (Nethravathi). This work proves that as an alternative model, IHACRES does well in the domain of flow regionalization with least data inputs.
Estimation of Nitrate Leaching in Groundwater in an Agriculturally Used Area in the State Karnataka, India, Using Existing Model and GIS

P N Vinod¹, P N Chandramouli², Manfred Koch³

¹Dayananda Sagar College of Engineering, Bengaluru
²Department of Civil Engineering, the National Institute of Engineering, Mysuru
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ABSTRACT

Water pollution is one of the biggest environmental problems and nitrate is among the most common and widespread pollutants in groundwater. There has been an increasing demand for fresh water in the last two decades due to a progressive increase in population. In addition, people face serious water shortages, because groundwater has been used faster than it is naturally replenished. At the same time an increasing amount of wastes and chemicals causes contamination of water resources, especially of groundwater. Although the movement of groundwater through the aquifer has often the effect of removing a lot of impurities from the water by filtering it through the porous rocks, so that groundwater is generally much cleaner than surface water, there are many contaminants which are not easily degraded in the subsurface. Such is the case for nitrate which is impounded into the groundwater by agricultural activities, namely fertilizers and livestock manure. Since nitrate is soluble and negatively charged, it has high mobility and is thus easily leached from the unsaturated zone. In this research work, an attempt has been made to estimate nitrate leaching to groundwater at six different places around the village of Srirangapattanataluk where organic manure and inorganic fertilizers, together with irrigation water and cesspools are the major sources of nitrate in the area. Existing models and Arc-GIS have been used for the analysis. The results indicate that, except for Belagola village, the groundwater nitrate concentrations underneath the irrigated lands are still within the permissible limit, which means that the water of these villages can be used for both drinking and irrigation purposes. The average leached nitrate amounts in the sampled areas supplied from irrigated land have been estimated to range between 51.23 and 74.93 kg/ha/year. For the groundwater nitrate concentrations underneath the cesspools, the results of the analysis show that they are all within the permissible limit.
Adequacy of Seepage Analysis in Core Section of The Earthen Dam with Different Mix Proportions

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ABSTRACT

Earthen dams are built since early days of civilization. These dams constitute to be the most common type, because it is generally built of locally available materials which derive strength from their position, friction and cohesion. Many earth fill dams are vulnerable to failures due to seepage problems that take place in the core since all soils are pervious to a smaller or larger extent. One of the ways to control seepage problem in earthen dam is by using proper materials for core section since the core section of earthen dam provides impermeable barrier within the body of the dam. Thus, this paper analyses the usage of various materials with different combinations to zone type earthen dams with central impervious vertical core and to study the behavior of phreatic line at downstream phase by varying effective length of horizontal drainage filter. The results obtained from laboratory, proposed geometry of dam and corresponding stability analysis made for various materials showed that materials with impervious nature only provides safety to core part of the earthen dam.
Reliability Analysis of Brick Masonry

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ABSTRACT

Brick masonry typically is built by laying masonry units using cement mortar. The strength of brick masonry depends on the strength of these masonry units and mortar. The masonry is a highly durable form of construction. However, the strength and durability of overall masonry construction is significantly influenced by the materials used, that is units of masonry, mortar strength the quality of the mortar, workmanship, and the pattern in which the units are assembled. Generally masonry units used in practice are in the form of burnt clay bricks and either solid or hollow concrete blocks. Masonry is normally provided and expected to resist only the compressive forces. It is well established that the variation in compression strength of masonry is very significant.

In this paper, some results of the detailed study undertaken to determine the relationships amongst the strength of masonry prism, strength of burnt brick and strength of mortar have been presented. Further a reliability analysis of brick masonry by using these relationships is also carried out. The experimental data and data collected from literature are grouped into two parts based on a regional basis of origin of brick samples. Bricks from two regions namely Bangalore and Mysore, have been considered in the present study. Multiple linear regression technique is adopted to obtain strength relationships of brick masonry with brick units and mortar used. Based on these results, reliability analysis of brick masonry is performed using Monte Carlo simulation method for arriving at probability of failure. It is observed that the mean compressive strength of bricks from Bangalore region is high and coefficient of variation is also high when-compared with Mysore region bricks. Considering the strength characteristics, simulation analysis for a typical residential building is carried out. It is observed that the values of reliability index, $f_3$, of brick masonry for Bangalore region is less than that of Mysore Region.
Correlation of Index Properties with the CBR Values of Soils with and Without Admixtures

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ABSTRACT

Compaction is a process by which the soil particles are artificially re-arranged and packed together into a closer state of contact by mechanical means in order to decrease the porosity the soil and thus increase its density. Compacted soil is required for constructing airways, embankments, multi-storey buildings, highway, etc. For effective functioning and stability of these soils, which is found as artificially, prepared sub-grade is essential. To increase the strength and stability of the compacted soil, soil stabilizers like fly ash, lime, cement, cow dung, RBI grade 81, etc. are being used in order to implement it in the field conditions. The main objective of addition of soil stabilizer is to increase the strength and stability and to economize construction. Determining the strength of sub-grade by CBR tests can ensure this.

It is observed that cow dung requires high percentage of water to act effectively as a stabilizer. Fly ash, which is a by-product of the industrial wastes, solves disposal problems but the ash content poses a serious threat to the environment and living conditions. Cement is expensive to be used as soil stabilizer. Considering all the above facts, use of RBI grade 81 as a soil stabilizer is proved to be economical for the construction of pavements as provided in the literature.

Limited studies have been reported in the field of geo-technical engineering literature regarding the relationship between the index properties of soils with different clay mineralogy with the CBR values of soil with and without admixtures.

For the present experimental study, six soils having different clay mineralogical compositions were selected. The various index properties, Free swell ratio, specific gravity, Grain size analysis, Atterberg limits were conducted on the soils as per BIS specifications. Liquid limit test by cone penetrometer method using distilled water and kerosene as pore fluids are done on the soils in order to know the dominant clay mineralogy. The compaction characteristics of the soils at different energy levels i.e. SP, MP, RSP, RMP were determined in the laboratory as per BIS specification. Keeping the fly ash content as 20% by weight of soil, the amount of RBI Grade 81 is varied from 2% to 6% by weight of the soil having different clay mineralogy altogether. The CBR test were conducted on compacted plain soils and soils having 20% fly ash and varied percentage of RBI Grade 81(2, 4 and 6%) with soaked conditions . It was observed from the experimental results that, WL, Wp, PI of the plain soil could be better related with CBR values in comparison with soils with admixtures and without admixtures. It was also found that the optimum value of CBR was obtained for the mix proportion of 4%RBI and 20% fly ash. It is also evident that CBR values are having better correlation with index properties and compaction characteristics of the soil with 2% RBI and 20% fly ash.
*Full paper: 50\textsuperscript{th} Indian Geotechnical Conference 17-19\textsuperscript{th} Dec 2015, Pune, Maharastra, India.
Compaction Characteristics of Fine-Grained Soils with Varying Energy Levels

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ABSTRACT

Soil compaction is one of the most important and routine engineering techniques performed to assure the safety and stability of soils. Compacted soil is required for constructing highways, airways, earth retaining structures, etc. The study of compacted soils become very important in the present day scenario wherein the lack of good construction sites is forcing people to go for sites which have been considered unsuitable for construction works.

Compaction is a kind of densification done by mechanical rearrangement of soil particles without outflow of water. Here, soil particles are rearranged and packed together in a closer state of contact thus decreasing the porosity of soil and increasing its dry density.

While the compaction of coarse-grained soils do not pose problem to a field engineer, the same is not true about the compaction of fine-grained soils. While the compaction of coarse-grained soil is purely a physical problem, the behavior of compacted fine-grained soils is expected to be physio-chemical in nature by virtue of the clay mineralogical composition of such soils. Thus, compaction of fine-grained soils is gaining importance because of its contradictory behavior with respect to clay mineralogy.

It is also understood that many man made structures necessitates impounding of higher compactive energy levels owing to its service requirements like road, railway embankments subjected to heavy axle loads, and rolling loads, runways and taxiways in major airports, docks and harbours etc. Hence, it is necessary to understand the role of compactive energy levels (Standard Proctor, Modified Proctor) involved in the process and the clay mineralogical behavior of the said soils. Also, the importance of

*Full paper: 50th Indian Geotechnical Conference, 17th – 19th December 2015, Pune, Maharashtra, India*
Variation of Degree of Saturation along the Compaction Curve

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ABSTRACT

During the ground modification through compaction, water content plays a vital role in achieving the desired modifications in the soil properties in addition to compaction energy imparted to the soil. As the water content varies along the compaction curve, the degree of saturation of compacted soils also varies. In view of the importance of degree of saturation during field compaction, an attempt has been made in the present experimental work to study the variation of degree saturation along the compaction curve for soils with widely varying clay mineralogical composition subjected to both Indian Standard light and heavy compactive efforts. It is observed that the variation of degree of saturation with moulding water content adopted for both light and heavy compaction tests is linear up to OMC. The degree of saturation of kaolinitic soils has been observed to be less than that of montmorillonitic soils on the dry side of optimum; whereas on the wet side of the optimum, the degree of saturation of kaolinitic soils at any moulding water content can be more than that of montmorillonitic soils. In addition, the degree of saturation of compacted soils at optimum condition has been observed to be a function of the soil clay mineralogy.
Soil Structure Interaction for RCC framed Structure – A Case Study

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ABSTRACT

This paper describes some aspects and applications of Soil-Structure Interaction (SSI) approach in geotechnical engineering. Soil-structure interaction is an interdisciplinary field which involves structural and geotechnical engineering. The focus of this study is on potential effects of SSI on framed structure with shallow foundation resting on clayey soils. The main advantage of SSI approach is to combine the principles of soil mechanics and structural analysis to arrive at acceptable and viable solution.

In defining characteristics parameters which control SSI, the effect of gravity loads action on structure is often neglected. In fact SSI is more important in tall but relatively rigid structures founded on soft soils, where as gravity effect becomes more pronounced in flexible structures. The seismic effects are signified by huge amount of energy release which affects the structure. Hence the behavior of the structure is surely affected by seismic activity. Two aspects of foundation response are considered. Firstly the effect of SSI on shallow foundation is investigated for gravity loads only and then the effect of SSI considering seismic effect on the same soil profile is investigated and compared with non SSI models. Hence, an effort is made to evaluate and compare SSI effect in both cases.

For this purpose an RCC framed structure is considered for further study. The frame is modeled and analysed, employing Finite Element Method using ETABS software under two different boundary conditions: (i) considering fixed base (rigid condition) and (ii) considering SSI (flexible condition). The analysis is carried out changing the ratio of area of footing size. Foundation soil behavior is assumed to be nonlinear while structures are assumed to behave in elastic range.

The study shows the effect of SSI with regard to structural behavior for gravity loads as well as seismic loads. The inclusion of soil in the analysis provides result’s in the form of stresses and displacement values, deformations, story drift which are realistic values than those provided by analysis of a fixed-base structure. Therefore, considering SSI effects in seismic design of tall concrete building frames resting on soft soil deposit is vital to have realistic analysis,
Assessment of Residual Strength in Steel Fiber Reinforced Concrete at Various Elevated Temperature

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ABSTRACT

The Experimental investigation was focused on the study of compressive behavior of steel fiber reinbred concrete (SFRC) subjected to different sustained elevated temperature ranging from 100\(^{0}\)C to 400\(^{0}\)C. In order to evaluate the effect of elevated temperature on M40 grade SFRC steel fibers of length 30 mm were used. Specimens were casted by using 0\%, 1\% and 2\% volume fractions. Data obtained from laboratory test results showed that residual strength varied inversely with the quantity of fibers at all levels of sustained elevated temperatures. The Compressive toughness of SFRC was also evaluated to investigate the mechanical properties of SFRC at sustained elevated temperatures of 100\(^{0}\)C, 200\(^{0}\)C 300\(^{0}\) and 400\(^{0}\)C. Test results showed that increase in the volume of steel fibers does not have significant variation in compressive strength at room temperature whereas served that there is a decreasing trend in the residual compressive strength of SFRC up to sustained elevated temperature of 400\(^{0}\)C.
Books Published

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P N Chandramouli is Professor, Civil Engineering Department, The National Institute of Engineering, Mysuru. A Ph D from IIT Roorkee, he has over 30 years of teaching experience at The National Institute of Engineering in the area of fluid mechanics. Professor Chandramouli is a member of the Indian Society for Technical Education (ISTE). He has to his credit several research papers published in national and international journals. He has authored book on Structural Analysis I Published by Yes Dee Publication, Chennai.
Department of Mechanical Engineering
Influence of Micro and Nanofillers on Mechanical Properties of Pultruded Unidirectional Glass Fiber Reinforced Epoxy Composite Systems

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ABSTRACT

This paper reports, fabrication and characterization of unidirectional glass fiber reinforced epoxy composite filled with nano-size alumina, silica and micron-size alumina trihydrate fillers using pultrusion technique. Tensile, flexural and impact strengths were determined to evaluate the effectiveness of fillers on the mechanical properties. Results show that the micro and nanofillers act as secondary reinforcement. The tensile, flexural and impact strengths of 10 wt% (combined alumina, silica and alumina trihydrate)-filled glass fiber reinforced epoxy composite improved by 9, 20 and 28%, respectively, as compared to the unfilled and alumina/silica-filled glass fiber reinforced epoxy composites. The enhanced performance of micro and nanofillers-filled glass fiber reinforced epoxy composites is due to better adhesion and good dispersion of particulates in the epoxy matrix providing increased surface area for strong interfacial interaction and better load transfer. The improved mechanical properties indicate that the unidirectional glass fiber reinforced epoxy with combined micro- and nanofillers-filled composite is a good candidate for structural application.

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Mechanical and Three-Body Abrasive Wear Behaviour of Cenosphere Filled Epoxy Composites

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ABSTRACT

Novel epoxy composites made from major industrial waste, fly ash cenosphere (FA-ceno) particles have been developed. The effect of FA-ceno loadings on mechanical and three-body abrasive wear behaviour has been investigated. The tribological behaviour of three-body abrasive wear tests with different loads/abrading distances were performed at room temperature by using a Rubber wheel abrasion apparatus. Experimental results showed that the tensile strength and Young’s modulus of FA-ceno filled epoxy are more than those of neat epoxy. The wear volume increased with increasing abrading distance and the specific wear rate decreased with increasing abrading distance/ load which depends on filler loading. Among the filled composites tested, 10 wt% silane treated with FA-ceno filled epoxy showed a promising trend. Finally, the scanning electron microscopic observation on the wear mechanisms of epoxy and their composites were discussed.

Influence of Fiber Reinforcement and Abrasive Particle Size on Three-Body Abrasive Wear of Hybrid Friction Composites

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ABSTRACT

In the present study, enhancement of abrasion resistance of phenol formaldehyde (PF) resin based hybrid friction composites with different ingredients viz. binder, micron sized fibers and fillers have been synergistically investigated. Hybrid friction composites based on basalt and recycled aramid fibers were prepared using compression moulding. Three-body abrasive wear tests were conducted according to ASTM G-65 standard by dry sand/rubber wheel abrasion tester using two different size of angular silica sand abrasives (212 and 425 μm) at a constant load of 40 N. The results indicated that the wear volume loss increases with increasing abrading distance and abrasive particle size. However, the specific wear rate decreased with increasing abrading distance and increases with increase in abrasive particle size. Addition of fiber content has a significant influence on the abrasive wear performance of these composites. Further, the worn surfaces were examined by scanning electron microscopy to identify the involved wear mechanisms.

A Compendium of Research Publications 2015

Abrasive Wear Behavior of Thermoplastic Copolyester Elastomer Composites

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ABSTRACT

Micron-sized polytetrafluoroethylene (PTFE) particles, short glass fibre (SGF), short carbon fibre (SCF), SiC and Al₂O₃ particles were used as fillers in thermoplastic copolyester elastomer (TCE), and the influence of these fibres and fillers on two-body abrasive wear (single-pass) behaviour of the TCE composites was investigated. The composite samples were prepared by extrusion followed by injection moulding. Their wear behaviour was investigated under ambient conditions in a reciprocating wear apparatus by running a waterproof SiC abrasive paper against the TCE composite sample. The morphology of the wear traces and wear debris was studied by scanning electron microscopy (SEM). The experiments were planned according to L₂₇ orthogonal array by considering four factors and three levels. The routine abrasive wear tests were also conducted, and the results indicated that TCE-filled PTFE composite demonstrated the best abrasion resistance. Lowest abrasion resistance was observed in case of hybrid TCE composite consisting of PTFE, SGF and SCF, SiC and Al₂O₃. From the Taguchi’s experimental findings, optimal combinations of control factors were obtained for minimum wear loss. Significant contributions of control factors for abrasive wear were identified by analysis of variance (ANOVA). SEM analysis indicated that severe abrasive wear occurred on the worn surfaces of hybrid TCE composites.

Dynamic Mechanical Analysis and Dry Sliding Wear Behaviour of Carbon Fabric Reinforced Epoxy Composite with Fly Ash Cenosphere

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ABSTRACT

The transform that can take place in fly ash cenosphere (FAC) filled and carbon–epoxy (C-E) composites with temperature change can affect its performance, application and life time. Although reinforcement and/filler type are known to control the properties, less is known about their dry sliding wear performance especially with FAC as filler. How these composites perform in sliding wear condition needs a proper understanding. This research article reports the dynamic mechanical analysis and dry sliding wear behavior of unfilled and silane treated FAC particulates filled C-E composites. Dynamic Mechanical Analysis (DMA) test of composite samples were conducted using DMA Q800 instrument while sliding wear tests were conducted using the pin on disc wear tester. From the results of DMA, it was found that the glass transition temperature (Tg) of 6 wt% FAC-filled C-E composite changed up to maximum 78°C as compared to that of unfilled C-E composite. This change in Tg is believed due to the variation in the interface in FAC filled C-E composite. Dry sliding wear test results show that the wear volume loss increases with increasing sliding distance and specific wear rate decreased with increasing sliding distance/load and depends on FAC content. However, the presence of silane-treated FAC in C-E showed a promising trend on wear resistance when compared with the unfilled C-E. The characteristics of the worn surface of the samples when examined by scanning electron microscopy showed different morphology for unfilled and FAC filled C-E composites.

ABSTRACT

Short fibers and particulate fillers are known to enhance the mechanical properties of the polymers. The type of fiber and filler morphology, size, loading, and dispersion homogeneity influence extensively the composite’s performance. In the present study, various amounts of short fiber (glass and carbon) and micro-scale particles (silicon carbide, alumina and molybdenum disulphide) were systematically introduced into thermoplastic copolyester elastomer/polytetrafluroethylene (TCE/PTFE) composite for reinforcement purpose. The influence of these fibers and fillers on the tensile, flexural, and impact properties was investigated. All composite samples were fabricated using twin-screw extruder followed by injection molding. The incorporation of short glass fiber (SGF) yielded an effective improvement in mechanical properties of TCE/PTFE composite at a fiber loading of 20 wt.%. Choosing the 20 wt.% SGF-reinforced TCE/PTFE composite, short carbon fiber and microparticles were further added in order to achieve additional improvement in the mechanical properties. In fact, synergistic effects were in the form of a further increase in hardness, tensile modulus, flexural and impact strength. Various reasons to explain these effects in terms of reinforcing mechanisms were discussed. Also, dispersion of the fiber and fillers were studied using scanning electron microscopy.

Effect of Type and Filler Loading on the Static Mechanical Properties of Glass-Basalt Hybrid Fabric Reinforced Epoxy Composites

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ABSTRACT

Fiber-reinforced polymer composites (FRPCs) are rapidly gaining market share in structural applications, but further growth is limited by their lack of toughness. Fiber hybridization is a promising strategy to toughen composite materials. By combining two or more fiber types, these hybrid composites offer a better balance in mechanical properties than single fiber reinforced composites. This work concerns the production of glass-basalt hybrid fiber reinforced composite with and without different micro fillers like graphite and polytetrafluoroethylene (PTFE). All the composites were fabricated by hand layup technique followed by compression molding. The mechanical properties such as tensile strength, tensile modulus, flexural strength, flexural modulus and inter laminar shear strength have been investigated in accordance with ASTM standards. From the experimental investigations, it has been found that loading of graphite filler to glass-basalt hybrid fiber reinforced composites shows superior mechanical performance compared to unfilled and PTFE filled composites. Scanning electron microscopy (SEM) photomicrographs of the fractured samples revealed various aspects of the fractured surfaces. The failure modes of the tensile and flexure fractured surfaces have also been reported.

Design and Development of Automation System for Polyurethane Foaming Machine

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ABSTRACT

PU foams are extensively used in the automotive sector, mainly for car seats, headrests, (air conditioning) filters and acoustic insulation. Depending on the application they are being used for; these foams have to comply with specific performance and emission standards for the automotive industry. The purpose of the project is to control and maintain the temperature, pressure, flow control and curing time of foaming process to maintain global performance requirements for polyurethane (PU) foams in terms of density, hardness, durability, support factor, touch etc. A manual and semi-automatic system lacks in quality and also requires lot of labor and energy. This project was undertaken to implement fully automatic process for manufacturing and testing. As a part of the automation sensory feedback operations, flow control calibrations and robot was implemented, the program selection was done using the feedback from the sensors which also included RFID (Radio frequency identification) and limit switches. So as to produce global standard PU foams with minimum labor and higher production rate and lower rejections. Keyword: Polyurethane, Isocynate, Polyol, Radio Frequency Identification.

Dry Sliding Wear Behaviour of Nickel Aluminide coated on Zinc Aluminium Alloy Metal Matrix Composite for Anti Friction Applications.

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¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

The present investigation aims to evaluate the wear behaviour of Nickel aluminide (Ni3Al) coated on zinc-aluminium (ZA-12) alloy composites by thermal evaporation process. A pin-on disc wear testing machine is used to evaluate the wear loss of alloy. In recent years Ni3Al has attracted considerable interest due to their inherent properties such as withstanding high temperature etc. Further coating on ZA-12 provides good physical strength and tribological properties to ensure less wear of the material. In this paper an attempt has been made to provide an extensive performance of Ni3Al coated on ZA-12 to analyze the performance of the material in bush bearing of automobiles to prevent friction and wear of bearing parts. Keywords: Ni3Al, ZA-12, Friction, and Wear.

Human Activity Recognition through Accelerometer Sensor Using Data Mining

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¹ to ⁴ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Balance is the key phenomenon to maintain human body in good health which requires correct human calorie intake and calorie burning. Humans performs various activity during the day, each activity performed burns different amount of calories depending on the weight of the person. Accelerometers are widely being used to detect human activity data measurement capability. Many android applications using accelerometer are available on smart phones which have wide visibility and potential market place for creation of new health care applications. An attempt is made in this paper to classify different human activities using data mining through six tri-axial accelerometer mounted over human body. The classification parameters used in this study are mean and standard deviation of each activity. Five different classification algorithms like J48, Naïve bayes, Random forest, random tree, multilayer perceptron were tested, and the best algorithm was determined.

Design and Automation of HSU Assembly Station by Poka Yoke

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¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Manufacturing companies are continuously facing the problem of operating their manufacturing and assembly process, in order to deliver the required production rates with high quality, it is required to makes the product customization and short time to market increases the competition among the global manufacturer. The module has analyzed in RANE Madras Company in Mysore. This paper describes the assembly automation of HSU (Hydrostatic steering unit) using poka yoke technique over manual assembly process by considering mistakes in the manual process and cost, quality, production, lead time under demand fluctuation. The methodology includes FMEA of manual assembly process. The selection of final concept by generating 4 concepts using Pugh matrix method and finally detailed design of selected concept has been well tested. As per the obtained results, it is possible to reduce the human mistakes up to zero percent and reducing the cycle time from 20 seconds to 10 seconds.

An Experimental Investigation on Specific Heat Capacity and Enthalpy of Al 6061-SiC-Gr Hybri Metal Matrix Composites Using Differential Scanning Calorimetry

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¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Metal matrix composites are regarded to be one of the most predominant classifications in composites. The thermal characterization of metal matrix composites using Differential Scanning Calorimetry is a resourceful technique for the determination of heat flow distribution, specific heat capacity and enthalpy. The measurement of the thermal properties of materials is fundamental for the better understanding of the thermal design. Differential Scanning Calorimeter (DSC) is a technique that measures the difference in the heat flow to a sample and to a reference sample as a direct function of time or temperature under heating, cooling or isothermal conditions. In the present research, evaluation of specific heat capacity and enthalpy are accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C based on heat flow response. Based on endothermic and exothermic processes, the heat flow can be shown clearly depending on heating rate and gradual variation in temperature. The heat flow and heating rate are beneficial in the estimation of specific heat capacity for different percentage compositions of the hybrid composites.

*Full paper: International Conference on Advanced Materials Research at Doha, Qatar, January 7th and 8th, 2015, pp 208-214
Research Significance, Applications and Fabrication of Hybrid Metal Matrix Composites

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¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Metal Matrix Composites are the ground-breaking materials that possess unrestrained opportunities for modern material science and development. These materials satisfy the desired conceptions, objectives and requisites of the designer. The reinforcement of metals can have many different objectives. Reinforcements for metal matrix composites have a diverse demand outline, which is determined by production and processing and by the matrix system of the composite material. The reinforcement of light metals will have profuse prospect of application areas where weight reduction has first priority. This material group becomes motivating for the utilization as constructional and functional materials, if the property contour of the conventional materials either does not arrive at the increased standards of explicit demands, or is the solution of the problem. However, the appreciative technology of MMCs is in competition with other modern material technologies. In the present scenario, researchers and scientists are fascinated and involved in exploring new developments pertaining to metal matrix composite materials. Numerous scientists and researchers have carried out an extensive research work on mechanical and tribological behaviours of composite materials because of appreciative and advantageous properties. In present circumstances, Metal Matrix Composites are primarily important for military, automotive and aerospace applications. In the research work, Aluminium based composites reinforced with Silicon Carbide and Graphite particles have been prepared by stir casting technique.

Computational Investigation on Thermal Expansivity Behaviour of Al 6061–Sic–Gr Hybrid Metal Matrix Composites

S A Mohan Krishna¹, T N Sridhar², L Krishnamurthy³

¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Metal matrix composites have been regarded as one of the most principal classifications in composite materials. The thermal characterization of hybrid metal matrix composites has been increasingly important in a wide range of applications. The coefficient of thermal expansion is one of the most important properties of Metal Matrix Composites (MMCs). Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of Coefficient of Thermal Expansion (CTE) and Thermal Conductivity as a function of temperature is necessary in order to know the behaviour of the material. In this research paper, the evaluation of thermal conductivity and thermal expansivity have been accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C. Aluminium based composites reinforced with Silicon Carbide and Graphite particles have been prepared by stir casting technique. The thermal conductivity and thermal expansivity behaviour of hybrid composites with different percentage compositions of reinforcements have been investigated. The results have indicated that, the thermal conductivity and thermal expansivity of the different compositions of hybrid MMCs decreases by the addition of Graphite with Silicon Carbide and Al 6061. Using the experimental values namely modulus of elasticity, Poisson ratio and thermal expansivity, computational investigation has been carried out to evaluate the thermal parameters namely thermal displacement, thermal strain and thermal stress. Similarly, using the experimental values namely density, thermal conductivity, specific heat capacity and enthalpy at varying temperature ranges, computational investigation has been carried out to evaluate thermal gradient and thermal flux.

Computational Investigation on Thermal Conductivity Behaviour of Al 6061-Sic-Gr Hybrid Metal Matrix Composites

S A Mohan Krishna¹, T N Sridhar², L Krishnamurthy³

¹ to ³ Department of Mechanical Engineering, the National Institute of Engineering, Mysuru

ABSTRACT

Metal matrix composites are regarded to be one of the most principal classifications in composite materials. The thermal characterization of hybrid metal matrix composites has been increasingly important in a wide range of applications. Thermal Conductivity is one of the most important properties of MMCs. Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of thermal conductivity as a function of temperature is necessary in order to know the behaviour of the material. In the present research, evaluation of thermal conductivity has been accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C. Aluminium based composites reinforced with Silicon Carbide and Graphite particles have been prepared by stir casting technique. The thermal conductivity behaviour of hybrid composites with different percentage compositions of reinforcements has been investigated using laser flash technique. The results have indicated that the thermal conductivity of the different compositions of hybrid metal matrix composites decreases by the addition of Graphite with Silicon Carbide and Al 6061. Few empirical models have been validated concerning with the evaluation of thermal conductivity of composites. Using the experimental values namely density, thermal conductivity, specific heat capacity and enthalpy at varying temperature ranges, computational investigation has been carried out to evaluate thermal gradient and thermal flux.

Theoretical Validation of Thermo-Elastic Models for the Evaluation of Thermal Expansivity and Thermal Conductivity Behaviour of Al 6061–Sic–Gr Hybrid Metal Matrix Composites

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ABSTRACT

Metal Matrix Composites (MMCs) are the proficient materials that possess excellent opportunities for modern material science and development. The thermal characterization of hybrid metal matrix composites has been increasingly important in a wide range of applications. The coefficient of thermal expansion and thermal conductivity are the most important properties of Metal Matrix Composites (MMCs). Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of Coefficient of Thermal Expansion (CTE) and Thermal Conductivity as a function of temperature is necessary in order to know the behaviour of the material. In the research, Al 6061 is the matrix alloy and Silicon Carbide and Graphite are the reinforcements considered, being fabricated using stir casting technique. Microstructural analysis has been carried out using Scanning Electron Microscope to examine the dispersoid concentration of the reinforcements. Few empirical models have been validated for the evaluation of thermal expansivity and thermal conductivity behaviours of hybrid metal matrix composites. Some of the important theoretical models for the evaluation of thermal expansivity considered are rule of mixtures, Turner’s model, Kerner’s model and Schapery’s model, whereas for the evaluation for thermal conductivity behaviour are series, parallel, geometric, Maxwell, Russell and Lewis Neilsen models. A comparative study has been carried out based on the experimental and theoretical values of thermal conductivity and thermal expansivity. Keywords- Metal Matrix Composites, material science, microstructural analysis, Coefficient of Thermal Expansion, Thermal Conductivity, theoretical models.

Evaluation and Examination of Volume Fraction, Porosity, Microstructure and Computational Modeling of Hybrid Metal Matrix Composites to Reveal The Heat Flow Distribution Characteristics

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ABSTRACT

Metal Matrix Composites (MMCs) are the competitive and proficient materials that possess natural opportunities for modern material science and development. The mechanical, tribological, thermal and machinability properties of composite materials are extensively pertinent for aerospace and automotive applications. In this paper, the determination of density, volume fraction and porosity has been carried out successfully. In the research, Al 6061 is the matrix alloy and Silicon Carbide and Graphite are the reinforcements considered, being fabricated using stir casting technique. Microstructural analysis has been carried out using Scanning Electron Microscope to examine the distribution of the reinforcements. Finite Element Analysis (FEA) has been used to simulate the thermal and mechanical behaviour of Metal Matrix Composites. Computational simulation for the investigation of thermal properties of hybrid metal matrix composites has been performed depending on the variation in volume fraction of hybrid MMCs. To carry out computational modelling, the experimental values have been used to show the temperature distribution and heat flow distribution characteristics, being considered as the salient thermal properties of composite materials.

Experimental Investigations on Thermal Analysis and Thermal Characterization of Al 6061-Sic-Gr Hybrid Metal Matrix Composites

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ABSTRACT

Metal matrix composites are regarded to be one of the most predominant classifications in composite materials. The thermal characterization of hybrid metal matrix composites has been increasingly important in a wide range of applications. The coefficient of thermal expansion, thermal conductivity, thermal diffusivity and specific heat capacity are the most important properties of Metal Matrix Composites (MMCs). Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of thermal properties of MMCs as a function of temperature is necessary in order to know the behaviour of the material. In this research paper, the evaluation of thermal conductivity, thermal diffusivity, thermal expansivity and thermal capacity has been accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C. Aluminium based composites reinforced with Silicon Carbide and Graphite particles have been prepared by stir casting technique. The thermal behaviour of hybrid composites with different percentage compositions of reinforcements has been investigated. The results have indicated that the thermal properties of the different compositions of hybrid MMCs varies by the addition of Graphite with Silicon Carbide and Al 6061. Few empirical models have been validated for the evaluation of thermal expansivity and thermal conductivity of hybrid composites.

Importance, Need and Scope of Thermal Analysis and Characterization of Composite Materials

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ABSTRACT

Metal Matrix Composites (MMCs) are the cutting edge materials that possess uninhibited opportunities for modern material science and development. Thermal studies of composite materials are gaining greater impetus in the present scenario. This will help to comprehend the properties of materials as they change with temperature. The thermal characterization of hybrid metal matrix composites has been progressively more important in a wide range of applications. The coefficient of thermal expansion, thermal conductivity, specific heat capacity, latent heat and thermal diffusivity are the most important properties of Metal Matrix Composites (MMCs). Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of Coefficient of Thermal Expansion and thermal conductivity (CTE) as a function of temperature is necessary in order to know the behaviour of the material. Thermal characterization and analysis of hybrid MMCs will depend on the factors that influence on the prominent thermo-physical properties presents a major challenge since they are sensitive to the type of reinforcement and method of manufacture. This research paper emphasizes the importance, need, applications and scope of thermal analysis of composite materials. Important thermal analyzers with their significance are discussed.

An Experimental Investigation on Specific Heat Capacity And Enthalpy of Al 6061-Sic-Gr Hybrid Metal Matrix Composites Using Differential Scanning Calorimetry.

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ABSTRACT

Metal matrix composites are regarded to be one of the most predominant classifications in composites. The thermal characterization of metal matrix composites using Differential Scanning Calorimetry is a resourceful technique for the determination of heat flow distribution, specific heat capacity and enthalpy. The measurement of the thermal properties of materials is fundamental for the better understanding of the thermal design. Differential Scanning Calorimeter (DSC) is a technique that measures the difference in the heat flow to a sample and to a reference sample as a direct function of time or temperature under heating, cooling or isothermal conditions. In the present research, evaluation of specific heat capacity and enthalpy are accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C based on heat flow response. Based on endothermic and exothermic processes, the heat flow can be shown clearly depending on heating rate and gradual variation in temperature. The heat flow and heating rate are beneficial in the estimation of specific heat capacity for different percentage compositions of the hybrid composites.

Computational Investigation on Thermal Conductivity Behaviour of Al 6061-Sic-Gr Hybrid Metal Matrix Composites

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ABSTRACT

Metal matrix composites are regarded to be one of the most principal classifications in composite materials. The thermal characterization of hybrid metal matrix composites has been increasingly important in a wide range of applications. Thermal Conductivity is one of the most important properties of MMCs. Since nearly all Metal Matrix Composites are used in various temperature ranges, measurement of thermal conductivity as a function of temperature is necessary in order to know the behaviour of the material. In the present research, evaluation of thermal conductivity has been accomplished for Al 6061, Silicon Carbide and Graphite hybrid metal matrix composites from room temperature to 300°C. Aluminium based composites reinforced with Silicon Carbide and Graphite particles have been prepared by stir casting technique. The thermal conductivity behaviour of hybrid composites with different percentage compositions of reinforcements has been investigated using laser flash technique. The results have indicated that the thermal conductivity of the different compositions of hybrid metal matrix composites decreases by the addition of Graphite with Silicon Carbide and Al 6061. Few empirical models have been validated concerning with the evaluation of thermal conductivity of composites. Using the experimental values namely density, thermal conductivity, specific heat capacity and enthalpy at varying temperature ranges, computational investigation has been carried out to evaluate thermal gradient and thermal flux. Keywords: Thermal characterization, thermal conductivity, reinforcements, computational, thermal gradient and thermal flux.

Synthetic Aerial Image Generation for Miniature Aerial System

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ABSTRACT

This paper presents a computer vision based method which generates a synthetic image of the earth as would be viewed by an aerial camera. The method takes geo-referenced, ortho-rectified aerial image database as the source and using a pinhole perspective camera model generates the synthetic image. The method requires the position and attitude of the camera, which act as the extrinsic parameters for the camera model. The intrinsic parameters are chosen to emulate a real camera. Finally, the results of synthetic aerial image generation implemented on MATLAB are presented. Keywords— Image Processing, Computer Vision, Synthetic Aerial Image Generation, Perspective Camera Model, Miniature Aerial System

Effect of Fibre Reinforcement on Tribological Performances of Hybrid Friction Composites

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ABSTRACT

Fibre plays an important role in determining the friction, wear and thermal stability of friction materials. In the present study, basalt and aramid (recycled) fibre reinforced hybrid friction composites were developed using hot compression moulding process and named as C1, C2 and C3, respectively. Aramid fibre (recycled) was kept constant at 5 wt.% and basalt fibre content was varied from 15 to 25 wt.%. Physical, chemical and mechanical properties of the composites were evaluated according to ASTM and IS 2742 of 1994 standards. Thermogravimetric analyses (TGA) were conducted to understand the thermal stability of the friction composites. From TGA studies, it was confirmed that composite having higher amount of basalt fibre content (composite C1) shows better thermal stability and minimum weight loss than lower fibre content composites (C2 and C3). The fade and recovery behaviour was characterised on a chase friction tester according to SAE J661 standard. From the results, it was found that the frictional behaviour of the friction composites significantly influenced by the amount of fibre (basalt + aramid) reinforcement. The increased amount of basalt fibre imparts better fade and wear resistance and friction stability to friction composites. The wear loss was found to be decreases with increase in basalt fibre for all composites. Scanning electron microscope (SEM) helped to study the surface wear morphology of the composites. Keywords: hybrid friction composites, thermogravimetric analysis, fade and recovery, wear loss, scanning electron microscopy.

Green economy via Decentralised Energy generation and Waste Management by a 60kg/day Kitchen Waste Biogas Plant at Postal Training Centre, Mysore, India

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ABSTRACT

The 60kg/day Kitchen waste biogas plant at Postal Training Centre [PTC], Mysore, India implemented by NIE-CREST has solved the problems of waste disposal and created a value chain of waste to energy. The plant at present is partially fulfilling thermal energy demand, has achieved zero waste and low carbon footprint. Analysis of 60days data shows generation of 251.65m³ of biogas (100.66kg LPG Eq.) from 2600kg of waste amounting to INR.9831.97 averaging to biogas generation of 0.097m³/kg of waste and an average feed of 43.33kg/day. The plant in a year saves 611.74kg of LPG, reduces 1.85tonnes of CO₂ emission, converts15.82tonnes of waste to energy & organic manure thus contributing to green economy. Further COD reduction of 74.7%, BOD reduction of 80.9% was achieved in outlet slurry.


A Compendium of Research Publications 2015
Solid Waste Management at Chamundi Hill, Mysore India- A Case Study

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ABSTRACT

The 50kg/day Kitchen waste biogas plant at Dasoha bhavan, chamundi hill, Mysore, India implemented by NIE-CREST has solved the problems of waste disposal and created a value chain of waste to energy. The plant at present is partially fulfilling thermal energy demand, has achieved low carbon footprint. The plant has a capacity to produce 1080m$^3$ of biogas (432kg LPG Eq.) from 18,250kg of waste amounting to INR.42197 averaging to biogas generation of 0.06m$^3$/kg of waste and an average feed of 50kg/day. The plant in a year saves 23 cylinders of LPG, reduces 1.32 tonnes of CO$_2$ emission, and converts 18.25 tonnes of waste to energy & organic manure thus contributing to green economy.

*Full Paper: International Conference on Solid Waste Management IISc Bengaluru, November, 24$^{th}$ and 27$^{th}$, pp 591-595
Role of Renewable Energy and Sustainable Technologies in Building an ecofriendly and Sustainable Antipoaching Unit in a Forest

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ABSTRACT

Better late than never..but let’s not leave it too late till the train departs…! Natural calamities/Disasters can hit any part of the world and thereby damage the networks of water, energy, food and other amenities as well by and large. Although Disasters/Natural calamities are beyond the control of humans, the impact of the disaster can be localized and minimized by incorporation of Renewable Energy and Sustainable Technologies. The present article illustrates the effectiveness of Renewable Energy and Sustainable Technologies in building a sustainable habitat. The article is based on the case study of a implemented project by NIE-CREST. NIE-CREST (Centre for Renewable Energy and Sustainable Technologies) is a centre of excellence at the premises of NIE (National Institute of Engineering), Mysuru. The centre is promoting eco-friendly energy systems, Renewable energy and sustainable technologies. The centre itself has successfully implemented numerous projects on eco-friendly & renewable energy systems and sustainable technologies in and around Karnataka. Major technologies promoted by NIE-CREST include Waste to wealth Systems , Kitchen Waste Biogas Plants, Biodiesel from non edible seeds like Pongamia (Honge), Jatropha, Simarouba, Neem, Mahua (Hippe) and many others, Solar energy technologies - Design & implementation of Solar lighting systems, Parabolic concentrators, Solar cookers and many others, Sustainable building materials like Stabilised Mud Blocks, Alternative building; from the promotion and implementation of these technologies, the centre is actively involved in Research and Development (R&D) of the eco-friendly technologies. Exhibits of all the technologies promoted are arranged for visitors. The centre is continually involved in conducting Awareness and Training Programmes for all the technologies mentioned above.

Laser Assisted Brazing of Ceramic and Titanium Alloy Using Cu-Ag Filler Material

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ABSTRACT

The joining of ceramic to structural alloys has received much attention in recent years because of its potentially attractive properties. In the present investigation alumina which is a ceramic has been brazed with titanium alloy (Ti6Al4V) using KM72(Ag/Cu) filler material. The study has been carried out using CO2 laser gas in argon inert atmosphere. Uniformity of the brazed joints has been observed in scanning electron micrographs. The elements and phases present at the joint interface have been characterized by EDX and XRD spectra analysis. As per the experimental observation, the phases present in the Ti6Al4V/KM72/alumina joint are Cu₃TiO₄, Cu₃Ti₂, CuO, Ti₂Cu, CuTi, and Cu₄Ti₃. The effect of brazing process parameters on the shear strength of the brazed joint has been studied and maximum shear strength observed at brazing power of 330 watts and speed 300 mm/min is 4±0.5MPa. Micro-hardness values of the brazed interface indicate that the interface is softer than the substrate.

Simulation Studies on Ceramic Coatings on Aluminium thin films for Solar Reflector Application

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BSTRACT

Concentrating solar power technologies is one of most promising and competitive energy source for the future and it is necessary to develop aluminum reflector coating on polycarbonate substrate material that are low in weight and cost, maintain high reflectance under harsh condition in outdoor environments. Oxidation significantly reduces aluminum's reflectance in the ultraviolet and causes lightly scattering throughout the spectrum. For long-term performance, protective layer will be necessary and the addition of adhesion-promoting layer could improve durability. The front surface of the protected aluminum coating on polycarbonate substrate reflects an average of 0.90 over UV Vis NIR spectrum region. Aluminum coated with a ceramic film arrests oxidation, minor abrasion resistance and helps maintain a high reflectance. Overcoating metallic coatings with a hard, single, ceramic layer of half-wave optical thickness improves abrasion and tarnish resistance but marginally reduces optical reflectance from 0.92 to 0.90. Optimised thickness of aluminum thin film of 200nm and protective layer SiO₂ of 200nm gives a maximum reflectance of 0.90.

Studies on Nanostructured Nickel Thin Film Coatings Deposited using Pulsed DC Magnetron Sputtering Process

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ABSTRACT

The purpose of this research work is to investigate the mechanical properties of nickel thin film. The nickel thin films were coated on glass substrate using pulse PDC power supply magnetron sputtering process in argon atmosphere. The effect of substrate temperature, effect of duty cycle and mechanical properties of nickel thin films has been presented in this paper. Coating deposited with substrate temperature at 250°C, had lower surface roughness (Ra<3 nm) compared to the coating deposited with substrate temperatures at 25~45°C (RT). When the substrate was maintained at 250°C during sputter deposition of 4N purity nickel, as a result the coating had a hardness of 5 GPa using PDC power supply, while that of pure nickel deposited at RT had a hardness of 3.5 GPa. Hardness of the nickel thin films with variable duty cycle is 3-4Gpa.

Influence of Organo-Modified Montmorillonite Nanolayers on Static Mechanical and Dynamic Mechanical Behavior of Carbon/Epoxycomposites.

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ABSTRACT

The combination of carbon fiber and organo-modified montmorillonite nanolayers with epoxy matrix can produce a hybrid composite that is competitive to carbon/epoxy composites. In this work, carbon fabrics and organo-modified montmorillonite nanolayers (1.5, 3, and 5 wt%) were used to produce hybrid carbon/epoxy composites using hand lay-up technique followed by autoclave curing, aiming to evaluate their static mechanical and dynamic mechanical properties. Higher organo-modified montmorillonite content in carbon/epoxy yielded slight decrease in the weight and lower voids in carbon/epoxy composite. Transmission electron micrographs showed that the organo-modification improved the dispersion and interfacial bonding of organo-modified montmorillonite with an epoxy at loadings of 1.5 and 5 wt%. The flexural strength, interlaminar shear strength, and impact strength and modulus of the composites were improved with increasing organo-modified montmorillonite content. Carbon/epoxy composite with 5 wt% organo-modified montmorillonite had the greatest increase in mechanical properties, with the flexural modulus and strength increasing by about 33% and 27%, respectively. Although the flexural properties were improved for hybrid composites, the glass transition temperature decreased for lower organo-modified montmorillonite content up to 3 wt% and increased for 5 wt%. Dynamic mechanical analysis results revealed that the storage modulus of carbon/epoxy composite was increased significantly for 5 wt% organo-modified montmorillonite loading. However, the loss modulus was decreased for 1.5 and 3 wt% organo-modified montmorillonite loading. Also, tan δ has increased for 1.5 wt% and later decreased for 3 and 5 wt% organo-modified montmorillonite loading in carbon/epoxy hybrid composite.

Abrasive Wear Behavior of Thermoplastic Copolyester Elastomer Composites

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ABSTRACT

Micron-sized polytetrafluroethylene (PTFE) particles, short glass fibre (SGF), short carbon fibre (SCF), SiC and Al₂O₃ particles were used as fillers in thermoplastic copolyester elastomer (TCE), and the influence of these fibres and fillers on two-body abrasive wear (single-pass) behaviour of the TCE composites was investigated. The composite samples were prepared by extrusion followed by injection moulding. Their wear behaviour was investigated under ambient conditions in a reciprocating wear apparatus by running a waterproof SiC abrasive paper against the TCE composite sample. The morphology of the wear traces and wear debris was studied by scanning electron microscopy (SEM). The experiments were planned according to L₂⁷ orthogonal array by considering four factors and three levels. The routine abrasive wear tests were also conducted, and the results indicated that TCE-filled PTFE composite demonstrated the best abrasion resistance. Lowest abrasion resistance was observed in case of hybrid TCE composite consisting of PTFE, SGF and SCF, SiC and Al₂O₃. From the Taguchi’s experimental findings, optimal combinations of control factors were obtained for minimum wear loss. Significant contributions of control factors for abrasive wear were identified by analysis of variance (ANOVA). SEM analysis indicated that severe abrasive wear occurred on the worn surfaces of hybrid TCE composites.

*Full paper: International Conference on Advances in Materials and Materials Processing (AMMP), 22nd and 23rd Coimbatore, 2015, pp 1-15

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ABSTRACT

Mechanical properties and abrasive wear behaviour of carbon fabric reinforced epoxy (C-E) composites and nano-sized clay particles dispersed C-E hybrid composites were investigated. Mechanical properties were improved by incorporating 5 weight % nano-sized clay particles into the epoxy matrix. Hybridization effects on the mechanical properties of carbon fabric reinforced epoxy composites with nano-sized clay particles are discussed. Two-body abrasive wear tests were carried out using a pin-on-disc machine under multi-pass condition. Silicon carbide waterproof abrasive paper was used under dry sliding conditions. The influence of tribological parameters like, applied load, abrading distance, sliding velocity, loading of nano-sized clay and grit size of the abrasives on the specific wear rate were investigated. The wear volume depends on weight % of clay used. The specific wear rate decreases with increase of abrading distance and increases with increasing load for all the composites. Selected mechanical properties such as hardness, tensile strength, and elongation at fracture were analyzed for investigating wear property correlations. The SEM studies indicate the reasons for failure of composites and influencing parameters.

Role of Fillers on Mechanical Properties of Selected Thermoplastic Composites.

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ABSTRACT

In this study, different thermoplastics (TP) namely polyamide 66 (PA 66), polyoxymethylene (POM), thermoplastic copolyester elastomer (TCE) and polymethylmethacrylate (PMMA) are separately filled with polytetrafluoroethylene (PTFE) composite, reinforced with short glass fiber (SGF) and different shape microfillers such as short carbon fiber (SCF), silicon carbide (SiC) and alumina (Al₂O₃) were prepared by compounding using twin screw extruder followed by injection moulding. The prepared samples were subjected to mechanical characterisation, and the results reveal that inclusion of SGF improves the strength of TP+PTFE composites and different shaped ceramic microfillers decreases the tensile properties and flexural strength of TP+PTFE composite. Further, they demonstrated a synergistic effect on flexural modulus of TP+PTFE filled with ceramic fillers. Also, the fractography of the selected failed TP composites have been studied by using scanning electron micrograph.

*Full paper: International Conference on Advancement of Polymeric Materials Feb 20-22, 2015 (APM2015) at IISc, Bengaluru
Fabrication and Mechanical Characterization of Carbon Fabric Reinforced Epoxy with Alumina and Molybdenum Disulfide Fillers.

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ABSTRACT

In this research article, a systematic study has been carried out to investigate the mechanical properties of carbon fabric reinforced epoxy (C-E) composites, having alumina (Al₂O₃) in one instance and molybdenum disulfide (MoS₂) of two different loadings in the epoxy matrix resin. The study has revealed that with 60 wt.% carbon fabric loading brings superior mechanical properties to the epoxy matrix. The microphased (Al₂O₃/MoS₂ in epoxy resin) matrix is then utilized with T300 carbon fabric preforms to fabricate hybrid laminated composites. The resulting structural hybrid composites have been tested under tensile and flexural loads to evaluate mechanical properties. The fillers were micron-sized Al₂O₃/MoS₂ particles which were mixed with epoxy resin using high shear mixer. Amount of particle loading varied in two steps viz. 5 % and 10 % by weight. It has been observed that microparticle inclusion increases the thermal stability of the system by enhancing cross-linking in the epoxy matrix. Microparticles also tend to reduce air void content of the as-fabricated hybrid composites and thus translate into increased mechanical properties. With 10 wt. % loading of MoS₂ in C-E enhanced the flexural strength and modulus by 20 and 40% respectively.

ABSTRACT

Short glass fiber (SGF), micron-sized polytetrafluoroethylene (PTFE), silicon carbide (SiC) and alumina (Al2O3) particles were used as reinforcements in polyoxymethylene (POM), and the influence of these reinforcements on physical and mechanical properties of POM/PTFE composites was investigated. The composite specimens were processed by screw extrusion followed by injection moulding. Their mechanical behaviour was investigated under ambient conditions as per ASTM standards. The nature of fiber/matrix interface is examined using scanning electron microscope of the fractured samples. Physico-mechanical properties viz., mass density, surface hardness, tensile, flexural and impact properties improved significantly for SGF reinforced POM/PTFE composite. However, inclusion of SiC and Al2O3 fillers deteriorated the tensile and impact strength of SGF reinforced POM/PTFE composite. The enhanced mechanical properties such as surface hardness, tensile, flexure properties and impact strength of SGF reinforced POM/PTFE composite composites is due to better adhesion and good dispersion of SGFs in the POM/PTFE blend providing increased surface area for strong interfacial interaction and better load transfer. The improved mechanical properties indicate that the POM/PTFE with SGF reinforced composite is a good candidate for structural application.
Effect of Type and Filler Loading on the Static Mechanical Properties of Glass-Basalt Hybrid Fabric Reinforced Epoxy Composites

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ABSTRACT

Fiber-reinforced polymer composites (FRPCs) are rapidly gaining market share in structural applications, but further growth is limited by their lack of toughness. Fiber hybridization is a promising strategy to toughen composite materials. By combining two or more fiber types, these hybrid composites offer a better balance in mechanical properties than single fiber reinforced composites. This work concerns the production of glass-basalt hybrid fiber reinforced composite with and without different micro fillers like graphite and polytetrafluoroethylene (PTFE). All the composites were fabricated by hand layup technique followed by compression molding. The mechanical properties such as tensile strength, tensile modulus, flexural strength, flexural modulus and inter laminar shear strength have been investigated in accordance with ASTM standards. From the experimental investigations, it has been found that loading of graphite filler to glass-basalt hybrid fiber reinforced composites shows superior mechanical performance compared to unfilled and PTFE filled composites. Scanning electron microscopy (SEM) photomicrographs of the fractured samples revealed various aspects of the fractured surfaces. The failure modes of the tensile and flexure fractured surfaces have also been reported.

*Full paper: 11th International conference on Production, Mechanical and Automobile Engineering (ICPMAE 2015)*
Thermal Barrier Coatings for High Temperature Applications on Nickel Super Alloy Substrate.

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ABSTRACT

TBCs provide thermal insulation against high temperatures in engines and turbines and thus reduce the surface temperature of the underlying alloy components. The coated parts are cooled inside and the heat transfers through TBC to the component are kept low. Conventionally with approximately 300 μm thick YSZ top coat, it is possible to achieve a temperature drop of up to 1700 °C between the top coat surface and substrate. Here we try to reduce the thickness of the coating by means of Atmospheric plasma spray technique (APS) and enhance the thermal insulation thereby allowing higher heat intake. The deposited films were characterized by XRD for phase determination, SEM for surface morphological studies and SPIP software was used to analyze hardness of the coatings.

Aerospace Cluster of Bangalore: Can the SMEs Take Up the Challenges?

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ABSTRACT

As per estimates made by leading experts global civil aerospace industry is expected to touch revenue of US $45 billion. The industry is witnessing emergence of developing countries such as India, Brazil and China as players pivoted to play major role in future. Small and Medium Scale Enterprises (SME) in India have the potential to garner a major share in Tier-3 and Tier-4 sectors of aerospace value chain. Overseas aircraft manufacturers such as Airbus and Boeing have recognized the competencies and skills India has in areas such as engineering, production, maintenance & service, etc. In this backdrop, this paper explores the global scenario of SMEs in some of the successful clusters. Some of the prominent clusters discussed in this paper include the clusters at California & Seattle, Toulouse, Hamburg and Chengdu. This would help us in drawing useful lessons for the Bangalore cluster, which is highlighted in the paper. An analysis is done to identify major challenges that influence the future growth prospects of aerospace industry in Bangalore namely Infrastructure, Finance, Technology and Manpower. A summary and discussion of the opportunities and challenges faced by the Bangalore aerospace cluster and draws conclusions, which have a bearing on policy measures.

Finite Element Analysis of Connecting Rod of IC Engine

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ABSTRACT

A connecting rod of IC engine is subjected to complex dynamic loading conditions. Therefore it is a critical machine element which attracts researchers’ attention. This paper aims at development of simple 3D model, finite element analyses and the optimization by intuition of the connecting rod for robust design. In this study the detailed load analysis under in-service loading conditions was performed for a typical connecting rod. The CAD model was prepared taking the detailed dimensions from a standard machine drawing text book. Based on the gas pressure variation in the cylinder of an IC engine, the piston forces were calculated for critical positions. MATLAB codes were written for this calculation. Altair Hypermesh and Hyperview were used for pre-processing and post-processing of the model respectively. The finite element analyses were performed using Altair Radioss. The results obtained were compared to a case study for the field failure of the connecting rod. By comparing the induced stress result with the yield strength of the material, the component was redesigned. This was done to save some mass keeping in mind that the induced stress value should be well below the yield strength of the material. The optimized connecting rod is 11.3% lighter than the original design.

*Full paper: Conference International Conference on Mechatronics & Mechanical Engineering (ICMME – 2015)
Department of Industrial & Production Engineering
Ergonomic Analysis of an Assembly workstation to Identify Time Consuming and Fatigue Causing Factors to Improve the Productivity

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ABSTRACT

The industrial success greatly depends on the quality and delivery time. In order to achieve this industry should implement new techniques which will increase the quality, productivity and decrease worker fatigue. One such technique is ergonomics. This paper addresses the application of ergonomics in improving the quality of work life, reducing musculoskeletal disorders and increasing productivity. The existing workstation was studied and suggestion was given to improve the method for productivity by reducing shoulder and wrist injury and fatigue. A good ergonomic work station design showed a better interaction between man–machine systems. The new approach of studying the operations by Ergonomics assessment Work sheet includes Rula assessment, Work-place assessment and Composite Scoring system, by considering these factors, problems regarding the MSDs is reduced. It is observed that the newly designed workstation improved working posture and resulted in reduced postural stress on operator’s bodies and consequently reduced prevalence of MSDs symptoms.

An Ergonomics Intervention in A Steering Gear Manufacturing Industry to Improve the Productivity

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ABSTRACT

The industrial success greatly depends on the quality and delivery time. In order to achieve this industry should implement new techniques which will increase the quality, productivity and decrease worker fatigue. One such technique is ergonomics. This paper is a case study on application of ergonomics in improving the quality of work life, reducing musculoskeletal disorders and increasing productivity. The existing workstation was studied and suggestion was given to improve the method for productivity by reducing shoulder and wrist injury and fatigue. A good ergonomic work station design showed a better interaction between man–machine systems. The new approach of studying the operations by Ergonomics assessment Work sheet includes Rula assessment, Workplace assessment and Composite Scoring system, by considering these factors, problems regarding the MSDs is reduced. It is observed that the newly designed workstation improved working posture and resulted in reduced postural stress on operator’s bodies and consequently reduced prevalence of MSDs symptoms.

*Full paper: International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE), Vol. 2, Issue No. 6, 2015, pp 043-047
Reduction Hub Diameter Variation in High Pressure Pump Cylinder Head by Using Shainin Problem Solving Technique

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ABSTRACT

In this study, the control parameters for grinding process are improved for reduction in diameter variation while keeping up quality standards in a cp 1h high pressure pump’s cylinder head hub diameter manufacturing company. The shainin problem solving technique which is a powerful tool to design optimization for quality is used to find the optimal control parameters. The present paper deals with one of the quality issues resolved by using shainin methodology in diesel systems plant, bosch ltd., bengaluru.

*Full paper: International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE) Vol. 2, Issue No. 6, 2015, pp 057-063
Preventive Maintenance and Cost Benefit Analysis of Splicing Machine

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ABSTRACT

Maintenance is undoubtedly the most important shop floor support function for production. It is necessary to ensure that available machines are utilized to maximum capacity and breakdowns kept to a minimum. Preventive maintenance believes in the principle “a stitch in time saves nine”. It seeks to eliminate possible breakdowns through planned maintenance checks, production schedules were continually upset due to frequent breakdowns of machines keeping the above problem in mind; we have tried to formulate a feasible preventive maintenance schedule for 14 splicing machines to eliminate breakdowns. We have attempted to predict future breakdowns and devised a preventive maintenance programme to avoid these breakdowns. The prediction of future breakdowns has been done on the basis of statistical of past available breakdown data the actual preventive maintenance schedule has been formulated with mean time between failures and maintenance personnel availability as constraints.

Improvement in Material Handling Equipment – An Ergonomic Case Study

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ABSTRACT

Ergonomics is the foremost concern in almost all the fields. In industrial cases, ergonomics has become important that tworks on reduction of human efforts. Material Handling Equipments (MHE) is designed to eliminate human efforts for storage and transportation in logistics. The major components of steering company (Rane Madras Limited, Mysore Plant) are ball pins, sockets, bars, tubes and outer columns. In the present work, MHE’s are devised for all these components so as to reduce human effort, elimination of unloading charges and optimizing the counting time that are incorporated during in-warding of materials.

Optimization of Transportation Cost in Supply Chain Management (SCM)

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ABSTRACT

Transportation is movement of materials from origin to destination. In industrial means, expenses involved in moving materials/products from Supplier to Customer. Transport system is the most important economic activity among the components of business logistics systems. The data shows transportation is the highest cost, which occupies (one-third) of logistics costs, which includes order by inventory, warehousing cost, packing cost, management cost, movement cost and ordering cost. This paper deals with the reduction in transportation cost by adopting new technique. The analysis worked out in reduction of transportation cost to greater extent.

Optimization of Fuel Delivery Variation in PF Conventional Pump

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ABSTRACT

Pump is the principle segment in the engine. The major problem identified is the required fuel delivery is not optimized at the different speeds and the fuel delivery variation was more at the constant speed. The experimentation is conducted in a leading automobile industry to optimize this parameter. Utilizing critical thinking methodology, the major fuel delivery variation at 1800 RPM was observed. The fundamental goal of this work to optimize the fuel delivery variation and reduce the spread. The root cause is carried out utilizing advanced Shainin Technique and Design of Experiments (DOE)

Ergonomics Study of Automobile Assembly Line

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ABSTRACT

The final assembly of an automobile involves tasks of complex nature. These processes are on the least priority for automation. Manual labor is best suited for assembly operations with the aid of minimal level of automation. All the processes have to be improved continuously in order to reduce the costs and increase productivity. The workers attain various postures, exerts force and works continuously in cycle time to accomplish the assembly task. Working along automobile assembly lines is characterized by repetitiveness. The objective of the work carried out is to identify the ergonomic burden and reduce the same by the application of ISO and CEN standards.

Ergonomic Assessment and Risk Reduction of Automobile Assembly Tasks Using Postural Assessment Tools

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ABSTRACT

Automotive is one of the fast growing industries which involve the design, development and manufacturing of motor vehicles. However, it has its own impediment as the interaction between man and machinery pose several health hazards. Work related musculoskeletal disorders (MSDs), low back injuries and poor body postures are the most common problems occurring in the automobile industries. The aim of this study was to identify the risks of work related MSDs and eliminates the same. The Rapid Upper Limb Assessment (RULA) & Rapid Entire Body assessment (REBA) methods were used to find out the scores of working postures for the existing process. Engineering control actions were implemented to those process with high risk. Processes were reassessed using the tools. Substantial risk reduction was achieved.

To Arrive At Solution for Sine Pattern Problem Occurring on Gear Involute during Shaving Operation of Gear Manufacturing Process Using Root Cause Analysis

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ABSTRACT

Modern gearboxes are characterized by high torque load demands, low running noise and compact design Gear assemblies, gear box and quality of its components (referring to gears) play an important role during transmission mechanism. Many issues have occurred and still do occur during the processing of gears especially in areas of Hobbing, Shaving, Heat Treatment processes, etc and best trials are carried out so as to attain definite solutions to the encountered problems. Oerlikon Fairfield- a gear manufacturing MNC successfully uses Root Cause Analysis Techniques (PDCA cycle, Cause and Effect Diagram with Shainin Technique combination), DMAIC quality improvement Methodology in order to solve the problems occurring during part’s processing. The present paper deals with Sine Pattern problem occurring during processing of new development part i.e. spur gear. Sine pattern occurrences have to be controlled stringently as per K sheet specifications. Current problem being one of major quality issues is resolved and controlled by using a combination of Cause and Effect Diagram with Shainin Technique and DMAIC-6 sigma break through methodology. Tool modifications being tried as final resort and hence implementation of modified shaving cutter during shaving stage helped in achieving the corrected sine pattern profile within the required K sheet specifications.

To Arrive At Solution for Profile Distortion Problem Encountered During Heat Treatment Process of Gear Manufacturing Using Root Cause Analysis

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ABSTRACT

Gear Box, assemblies and hence quality of its components (referring to gears) plays a vital role during transmission mechanism. Many issues have occurred and still do occur during the processing of gears especially in areas of Hobbing, Shaving, Heat Treatment processes, etc and best trials have been carried out so as to attain authentic solutions to the complexities occurred. Oerlikon Fairfield- a gear manufacturing MNC successfully uses Root Cause Analysis Techniques (PDCA cycle, Cause and Effect Diagram with Shainin Technique combination), DMAIC quality improvement Methodology in order to solve the problems encountered during part processing. The present paper deals with Profile fall/distortion problem occurring after heat treatment process during new development of helical gear. Modern gearboxes are characterized by high torque load demands, low running noise and compact design. In order to fulfill these requirements, profile specifications have to be tightly controlled. Current problem being one of major quality issues is resolved and controlled by using a combination of Cause and Effect Diagram with Shainin Technique and DMAIC-6 sigma break through methodology. Tool modifications being considered as final resort and hence implementation of modifications of shaving cutter during shaving stage (a pre heat treatment process) helped in achieving the required profile trace within the required post heat treatment process specifications

To Arrive At Solution for Root Step Problem Occurring During Shaving Operation of Gear Manufacturing Process Using Root Cause Analysis

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ABSTRACT

The automobile normally uses spur and helical gears in transmission with bevel gears in the rear end. Automatic transmission is now widely used. Gear Box, assemblies and quality of its components play a vital role during transmission mechanism. Modern gearboxes are characterized by high torque, load demands, low running noise and compact design. In order to fulfil these requirements, gear specifications have to be accurately controlled. Many issues have occurred and still do occur during the processing of gears, especially in the areas of Hobbing, Shaving, Heat Treatment processes, etc. and attempts have been made to address them. Fulfilling the customer’s requirements is one of the key performance indicators for any organization. Meeting the quality specifications, costs and delivery times are vital elements for organization when a project is undertaken. The major challenges faced by the companies in the areas of quality and productivity, can be addressed by using Quality control tools, Statistical approaches, Lean tools, etc. which help in achieving the desired targets. Oerlikon Fairfield- a gear manufacturing MNC successfully uses Root Cause Analysis Techniques (PDCA cycle, Cause and Effect Diagram with Shainin Technique combination), DMAIC quality improvement Methodology in order to solve the problems occurring during part’s processing. The present paper deals with Root Step problem occurring during shaving processing of new development part i.e. helical gear. Root Step occurrence has to be eliminated. Current problem being one of important quality issues is resolved and controlled by using a combination of Cause and Effect Diagram with Shainin Technique and DMAIC-6 sigma break through methodology. Hob modifications being tried as final resort and hence implementation of modified hob during hobbing stage helped in elimination of root step problem occurring during shaving stage.

Reduction of Nozzle Tip Breakage in Heavy Duty Diesel Vehicles using Problem Solving Approach

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ABSTRACT

On field sustainability of Engine components determines the efficiency and performance characteristics of the vehicles. Problem is injector nozzle tip breakage at lower load cycles in case of heavy duty diesel engines. Application of Injectors is being used for Trucks, Tractors, Trailers, Tippers, and Buses etc. Project is carried out at Bosch Ltd. Bangalore. Bosch Production System’s (BPS) Problem Solving Approach is used to find out the root cause of the problem. Moving parts of the injector mainly Influences the injection timing, and hence the combustion and emission characteristics.

*Full paper: International Journal on Recent Technologies in Mechanical and Automobile Engineering (IJRMAE) Vol. 2, Issue No. 6, 2015, pp 17-20
Does Energy Intensity Affect Labour Productivity in Indian Firms? Preliminary Estimates

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ABSTRACT

Micro, small and medium-sized enterprise (MSME) development is seen as a key to economic growth, innovations and market competition not only in countries in transition but also in advanced western economies (Acs and Audretsch 1990). In India, the sector made a significant contribution to manufacturing output, employment and exports. It produces more than 6000 products ranging from traditional to high-tech items. Small and medium enterprises (SMEs) have been established in almost all major sectors in the Indian industry such as food processing, agricultural inputs, chemicals and pharmaceuticals, engineering, electrical, electronics, electromedical equipment, textiles and garments, leather and leather goods, meat products, bioengineering, sports goods, plastics products, computer software etc. The sector accounts for about 45 % of the manufacturing output and 40 % of the total exports of India. MSME sector provides employment to about 42 million persons in over 13 million units throughout the country (Ministry of MSMEs 2006–2007).

Department of Electrical & Electronics Engineering
A Hybrid approach for State Estimation in Electrical Distribution System integrated with RESs

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ABSTRACT

The integration of Renewable Energy Sources (RESs) as Distributed Generators (DGs) in the electrical distribution systems (EDSs) has been increased rapidly due to the environmental concerns to reduce the green house gases. According to some studies carried out by the research institutes, about 25% of the new generation will be generated by Renewable Energy Sources (RESs) in the near future. Hence, it is necessary to study the impact of RESs on the power system, especially on the Electrical distribution System (EDS). This paper presents a Distribution System State Estimation (DSSE) model for electrical distribution system including RESs. The proposed DSSE model is based on the combination of Powell method and Artificial Bee Colony (ABC) algorithm. The proposed method can estimate load and RES output values by using Weighted Least-Square (WLS) technique. The performance of the proposed work is evaluated on IEEE 33 bus and 70 bus test systems using MATLAB working platform.

Line Outage Detection Using Phasor Measurement Units

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ABSTRACT

Transmission network is spread over a vast area subjected to harsh environment and monitored from remote control centers. To ensure uninterrupted transfer of electrical power, continuous monitoring and controlling of the transmission lines is essential. The use of RTUs at strategic locations in the transmission system for monitoring system parameters limits the complete observability of the system providing partial information about the system. This paper discusses an algorithm to detect line outages in the transmission system using the bus voltage phasor measurement available from PMUs in conjunction with change in the system topology arising due to line outage. The algorithm also suggests the minimum number of PMUs required for effective line outage detection for a given system. The system under consideration was simulated in MiPower™ software to obtain the bus voltage angle and the algorithm to detect effective line outage was programmed using MATLAB. Initially, PMUs were assumed to be placed at all buses in the system to detect line outage and the efficacy of the algorithm was checked and proved. The number of PMUs in the system was then reduced by removing them from the buses with least priority, based on their generation capacity and amount of real power consumed by connected load, to arrive at the minimum number of PMUs. The technique was successfully implemented on IEEE14-bus and IEEE 30-bus system. The minimum number of PMUs required for effective line outage detection was determined successfully in both the systems.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015, pp 88-95
Optimal Allocation of Combined DG and Capacitor Units for Voltage Stability Enhancement

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ABSTRACT

Due to high penetration of distributed generation (DG) in distribution networks, transmission networks are no longer responsible solely for security issues in low-voltage distribution networks. DG units may also participate in security as well as power generation depending on their locations. In this paper, stability of Distribution system is studied based on voltage stability analysis as a security measure. Basic load flow is carried out on the well known 33- bus radial distribution network using forward backward sweep algorithm in MATLAB and voltage stability indices have been calculated. A priority list of DG and capacitor unit allocation for minimization of losses and improvement in voltage magnitude will be evaluated by evolutionary search algorithm i.e. Genetic Algorithm.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015,
A Weighted Multi-objective Index Based Optimal Distributed Generation Planning in Distribution System

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ABSTRACT

Distributed Generation (DG) sources have been popular due to their potential solution for some issues, like the deregulation in power system and improving the performance of Distribution System. The optimal placement of DG is needed for maximizing the DG benefits in power system such as improving reliability and stability. There are several similar works have been done to find the optimal DG site by their imposed constraints and objectives. In this paper, the siting and sizing of Distributed Generators (DG) in distribution networks are determined using multi-objective indices. The objective is to minimize the real power loss and to improve the voltage profile of the system. To minimize power losses, it is important to find the location and size of local generators to be located in power distribution systems. Best location of the DG is determined by using multi-objective voltage index analysis and size of DG is computed by finding its optimal power factor using Fast Approach. This paper presents the results of simulations for standard Civanlar16-bus and 12 bus Practical Distribution systems.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
Priority Algorithm Based Coordinated Voltage Control for Distribution System with Distributed Wind Generators

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ABSTRACT

Different voltage control strategies have been found effective in managing voltage rise issues in the presence of DGs, power factor control (PFC), OLTC control, active power Generation curtailment, and also reactive power compensation. This paper investigates the coordination of control methods to mitigate the voltage rise problem in a distribution system connected with distributed Wind generators (WDGs). Priority algorithm for voltage control methods are proposed by considering the forecasted wind generation and typical time varying load profiles. The DigSilent power factory simulation software is used for the implementation and the results were found satisfactory to keep the system voltage within its allowable limits.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
A Literature Review on Distribution System State Estimation

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ABSTRACT

This paper provides a survey of techniques for distribution system state estimation (DSSE) for electric power distribution systems. State estimation has long roots in the monitoring and control of electricity transmission systems for several decades, it has not been widely implemented in distribution grids to date. However, with the recent drive towards low carbon technology, introduction of distributed generators, more actively-managed, intelligent power distribution networks and the improvements in monitoring and communications infrastructure, DSSE has been receiving significant research interest. DSSE presents a number of unique challenges due to the characteristics of distribution grids, and many of the well-established methods used in transmission systems cannot be applied directly. This paper provides a detailed survey of the available methods for DSSE, reviewing around 60 papers from the major journals.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
Genetic Algorithm Based Network Reconfiguration in Distribution Systems with Multiple DGs for Time Varying Loads

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ABSTRACT

This paper describes the implementation of an algorithm which predicts optimum reconfiguration plan for power distribution system with multiple PV generators. Since network reconfiguration is a multi objective and multi constrained problem, genetic algorithm is used for optimization. Forward backward load flow method with time varying load condition is considered. The objective function of the genetic algorithm incorporates all the objectives and constraints required for the reconfiguration plan. The algorithm developed predicts the switching pattern for reconfiguration which gives minimum loss and minimum voltage deviation. It also reduces the number of switching operations along with satisfying the defined limit constraints.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Visha Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
Loss Reduction and Voltage Profile Improvement in a Rural Distribution Feeder Using Solar Photovoltaic Generation and Rural Distribution Feeder Optimization Using HOMER

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ABSTRACT

Rural Electricity is lagging in terms of service as well as penetration of power. Most of the rural householders do not have power supply, if at all they have high in voltage fluctuations and system losses. Due to this, the performance of distribution system becomes inefficient. Optimal placement and sizing of Distribution Generator (DG) in the distribution system will improve the performance of the distribution system. This paper analysis a practical rural feeder of 3.06 MW peak load in Mysuru, Karnataka, India. A methodology used for finding optimal placement and sizing of DG in the rural feeder. The practical rural feeder is simulated in Power World Simulator (PWS) and analyzes the voltage magnitude and system losses. Simulation results show that optimal placement and sizing of DG will improve the voltage profile within the acceptable limits and reduce the system losses. Hybrid Optimization of Multiple Electric Renewables (HOMER) optimization analysis designs best system model by considering different constraints and with Renewable Energy sources (RES) for the rural distribution feeder.

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
A Modular Single-phase Multistring Multilevel Inverter Topology for Distributed Energy Resources

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ABSTRACT

This Paper presents simulation analysis of single phase multilevel inverter for distributed energy resources (DER) system are small power generation tools, in order to reduce conversion losses, complexity of the circuit and to improve the size and cost of the system. The system involves a high step up converter is used to set up the voltage coming from the various DER's such as Fuel cell module and Photovoltaic module, this high voltage acts as input to the inverter. This system requires less number of switches as compare to conventional cascade H-bridge (CCHB) inverter. There are some advantages of this multilevel inverter such as improved output waveform, and lower Electromagnetic interference, lower switching power loss and Total Harmonic Distortion (THD).

*Full paper: International Conference on Smart Grid Technologies held at Amrita Vishwa Vidyapeetham, Coimbatore from 6th to 8th of August, 2015.
A Simple Analytical Approach Based Optimal Distributed Generation Planning in Distribution System

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ABSTRACT

Distributed Generation (DG) sources have attracted serious attention due to their potential solution for some issues, like the deregulation in power system, increasing the power consumption and the shortage of transmission capacities. The optimal placement of DG is necessary for maximizing the DG potential benefits in power system such as maintaining and/or improving reliability and stability. There are several research studies have been done to determine the optimal DG location by their imposed constraints and objectives. In this paper, the placement and sizing of Distributed Generators (DG) in distribution networks are determined using performance indices. The objective is to minimize the real power loss and to improve the voltage profile of the system. To minimize power losses, it is important to determine the location and size of local generators to be placed in power distribution systems. Best location of the DG is determined by using voltage index analysis and size of DG is computed by finding its optimal power factor using Fast Approach. This paper presents the results of simulations for standard IEEE 6-bus and Civanlar 16 bus Distribution systems.

Comparative Analysis of Robust PSS and Robust Supplementary Modulation Controller for SSSC

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ABSTRACT

This paper discusses the influence of Accelerating power input Power System Stabilizer (PSS) and Supplementary Modulation Controller (SMC) for Static Synchronous Series Compensator (SSSC) on the system stability of a single-machine infinite bus system. The objective of the work presented in this paper is to design a robust PSS with accelerating power input and a robust Supplementary Modulation Controller for SSSC to damp low frequency oscillations arising out of small and large disturbances by placing all the eigen values within a specified contour in the s-plane. The selected input signal for the PSS is devoid of many disadvantages that the usually chosen speed input signal has. The control signal for SMC of SSSC used is Thevenin angle and is obtained by using the current through the line where the SSSC is installed. For tuning the controller parameters a nonlinear constrained optimization technique is used with the objective of damping oscillations to make the controller robust for a large range of operating conditions. The design of SMC is validated by performing nonlinear simulations for small and large disturbances.

Genetic Algorithm Based Design and Performance Evaluation of Accelerating Power input PSS

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ABSTRACT

Power system stabilizers (PSS) are extensively used as primary controllers to damp the low frequency oscillations for secure operation of power systems. Use of accelerating power input power system stabilizer to provide damping has been presented in this paper. PSS parameters are tuned to place all the eigenvalues within a specified contour in the s-plane. Genetic Algorithm (GA) is used to tune the PSS parameters with the objective of damping the oscillations arising out of small and large disturbances. A small signal and large signal stability analysis have been carried out to validate the effectiveness of the designed PSS for a Single Machine Infinite Bus (SMIB) system using nonlinear simulations.

\textsuperscript{*}Full paper: National Conference on Innovations and design Challenges in Electrical and Medical Electronics, 21\textsuperscript{st} & 22\textsuperscript{nd} August, 2015, (Gokaraju Rangaraju Institute of Engineering & Technology), Hydrabad, Telangana, 2015
Performance Evaluation of Multi Machine Power System with Fuzzy Based Power System Stabilizer

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ABSTRACT

Power system operates under secure state. Any disturbance in terms of faulty or major load change introduces oscillations in the power system. These oscillations cause stability problems. If not damped in short span of time. In a multi machine power system the rotor swing between generators makes the problem more complicated. In this paper Fuzzy logic based power system stabilizer (FLPSS) is designed to damp the low in multi machine system. FLPSS is designed with speed deviation and rotor acceleration as input signals. The novelty about the work reported in this paper is that nine linguistic variables are considered to design the FLPSS. A four machine, two-area system is considered to validate the design of the proposed FLPSS. The superiority of the FLPSS is demonstrated by comparing its performance with that of a Conventional PSS (CPSS) by carrying out nonlinear simulation on the multi machine.

*Full paper: IEEE Conference on Technological advancements in power and energy, Kollam, Kerala, 24th June to 26th June 2015.
Design and Performance Evaluation of Nine Linguistic Variable Fuzzy Logic Power System Stabilizer

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ABSTRACT

Synchronous machines are an important component in the power systems. It is desirable that synchronous machines operate under stable operating conditions. But when subject to small or large disturbances oscillations are noticed in power systems. There is a risk of the system losing stability if the adequate damping is not provided. Traditionally conventional power system stabilizers (CPSS) are employed to damp the low frequency oscillations. This paper highlights about the enhancement of power system stability by damping rotor oscillations using Fuzzy Logic Power System Stabilizer (FLPSS). The novelty of the work presented in this paper is that nine linguistic variables are employed to design FLPSS. A single machine connected to infinite bus (SMIB) is analyzed by subjecting it to small and large disturbances. The performance of FLPSS is compared with that of CPSS to highlight the superiority of FLPSS.

*Full paper: National Conference on Advances in Electric Engineering NCAEE-15, 2nd April 2015, NMAIT, Nitte, pp105-109
Design of Energy Meter with one Second Logic for Energy Calculation

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ABSTRACT

To improve the economic benefits of electric power enterprises, it is essential to reduce the production cost and energy loss. Further it is also required to improve the metering to provide reliable electric energy metering data, strengthen the effective management of power calculation and adopt an accurate, reliable and systematic electric energy metering mode. In the work presented in this paper, the metering engine is given with voltage and current input. Depending on sampling rate of ADC which is based on line frequency, voltage and current values are sampled and are converted to digital signals. The converted ADC values of voltage and current are read and energy is calculated, accumulated and averaged. So if energy is averaged for a longer duration, then percentage of error decreases.

Variable Speed Drive for Industrial Automation Using PLC

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ABSTRACT

In the development of automation controllers the trend has been to move towards soft controllers so as to provide better control, more flexibility and more reliability. So industries have gradually moved from conventional relay logic control to programmable logic control. Three phase induction motors are widely used motors in industry, because of their wider applications, mainly due to their low cost, reasonably small size, ruggedness, low maintenance, and operation with an easily available power supply. A variable frequency drive (VFD) (also termed adjustable frequency drive, variable-speed drive, AC drive, micro drive or inverter drive) is a type of adjustable speed drive used in electromechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage. Variable frequency drive uses power electronics to vary the frequency of input power to motor, thereby controlling motor speed. Method utilizing ladder logic diagram modelled Programmable Logic Controller and Pulse Width Modulation based variable frequency drive has been proposed for controlling the speed of the induction motor. As there is development in industrial area there is need for many motors to run simultaneously at different speeds, this can be done by employing PLC. This work deals with the control of a VFD which acts as an intermediary between a three-phase induction motor and the PLC. The VFD is simulated and modelled using power system blocks in MATLAB/SIMULINK to obtain the desired results. The PLC takes the inputs from the sensors and takes an appropriate action based on the logic developed for the motor control. Finally, the PLC output then becomes the VFD input, which after being reprocessed within the drive brings about the necessary control of the motor with respect to speed.

Vector Controlled Voltage Source PWM Rectifier

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ABSTRACT

The objective of this paper is to model and simulate a three-phase voltage source boost rectifier based on vector control method. The control system based on SVPWM (Space Vector PWM) includes three PI controllers which are used to regulate the AC currents and DC link voltage. The active and reactive current can be controlled independently for this system. The DC bus voltage and power factor are regulated with high quality factor in place. The paper presents MATLAB/SIMULINK model. The results validities of the model and its control method can be proved.

PLC Based Exposure Unit for PCB Fabrication

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ABSTRACT

The present exposure system is operated manually which suffers from exposure mismatches resulting in poor PCB quality. The proposed system overcomes this shortcoming and improves quality of PCB, enhances safety to radiations and made suitable for industrial environment. The process is semi-automated. The total solution comprises of controller implementation through hardware and software in PLC environment. This paper also describes photolithographic processes and compares the results for the quality of the PCB before and after automation.

Recent Trends of Solar Cell Manufacturing in India and Development Needed.

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ABSTRACT

This article describes the solar cell manufacturing technology in India. The design topology has numerous desirable features such as low cost, simple control, higher efficiency. India produces 156 mm pseudo square high efficiency Mono/Multi crystalline solar cells. The use of these cells has become necessity for solar PV module manufacturers. With the recent trends and technique of PV manufacturing it is unable to cross the efficiency line of 17% for PV modules. Thus there is a development need for next generation high efficiency PV cells which will be of thin silicon film wafers of 100μm or less with advanced methods of encapsulation. This paper describes the generic manufacturing process of solar cells and scope for future prospects.

Optimal Location and Sizing of Multiple Distributed Generators in Distribution System for Loss Reduction

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ABSTRACT

Distributed Generation (DG) is increasing in considerable amount in recent days and has changed the face of distribution system and has drawn attention of electrical engineers. The transmission networks are no longer responsible solely for security issue in low voltage distribution networks due to high penetration of distributed generation in distribution networks. Penetration of DG units in distribution network has increased rapidly, stimulated by reduced network power losses, improved bus voltage profile and better power quality. To maximize the availing benefit, optimal DG planning is necessary. Two critical issues of DG planning are (i) Optimal placement and (ii) Optimal sizing. This paper presents the optimal size and an effective methodology to identify the corresponding optimum location for multiple DG placements for minimizing the total power losses in primary distribution systems. These are based on the exact loss formula and loss sensitivity factor and voltage deviation index. The effectiveness of the present methodology is tested on a well-known IEEE 33-bus radial distribution system using MATLAB software for simulation.

A Simple Approach for Optimal DG Allocation for Voltage Profile Improvement and Network Loss Reduction

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ABSTRACT

Distribution system operators are often challenged by voltage regulation problems, energy losses and network capacity problems. Distributed generation at optimal locations on distribution feeders may enable energy loss reduction and voltage profile improvement. The transmission networks are no longer responsible solely for security issues in low voltage distribution networks due to high penetration of distributed generation in distribution networks. Penetration of DG units in distribution network has increased rapidly, stimulated by reduced network power losses, improved bus voltage profile and better power quality. To maximize the availing benefits, optimal DG planning is necessary. Two critical issues of DG planning: (1) Optimal placement (2) Optimal sizing. In this work a methodology is implemented to obtain the appropriate location and capacity of the distributed generations based on maximum voltage improvement and loss reduction. The effectiveness of the present methodology is tested on a 33-bus radial distribution network and MATLAB software is used for simulation.

Interfacing and Commissioning of Motor and Drive to the Tandem Test Jig

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ABSTRACT

The motors and drives have wide applications from servos to traction and it is mainly used in automation industry, CNC machines and robots. The application of interfacing and commissioning of motor and drive to the tandem test jig helps to achieve improved reliability and cost effectiveness. This paper mainly describes how motors and drive system is interfaced to tandem test jig. BG605 motor grader vehicle is used for grading operation and bank cutting operation of roads. Tandem is a part of BG605 Motor grader equipment and it is used for transmission of power in the equipment. Testing of the tandem before assembling on to the vehicle is very much essential.

Design and Simulation of FPGA Based Digital Controller for Single Phase Boost PFC Converter

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ABSTRACT

This paper presents a design of the digital controller for continuous conduction mode Boost converter with power factor correction (PFC) on Xilinx FPGA. It is designed to fulfil the international energy standards on input current harmonic distortion by reducing total harmonic distortion (THD) and improving the power factor of power supplies. In Proposed digital controller both outer loop, proportional-integral voltage compensator and inner loop, Average current compensator are implemented in Xilinx block sets in MATLAB/SIMULINK software integrated with Xilinx System Generator. A model of 650W FPGA-controlled boost PFC converter with 98~120 V in the ac input and 390V in the dc output has been simulated in MATLAB/SIMULINK using Xilinx System Generator(XSG) environment.

Genetic Algorithm Based Service Restoration in Distribution Systems with Multiple Dgs for Time Varying Load

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ABSTRACT

This work intends to foresee an optimum restoration plan for power distribution network with numerous DGs through system reconfiguration. The destinations, for example, minimizing the out of service area, diminishing the quantity of switching operations, lessening the aggregate system losses alongside imperatives, for example, radial system structure, voltage and current points of confinement are considered while taking care of the restoration issue. Rowlett wheel choice procedure and elitism is utilized as a part of GA which gave better enhancement results. An effective calculation is created which predicts appropriate restoration arrangement for conveyance framework arranged or spontaneous blackouts. Genetic algorithm is utilized to settle multi-goal and multi obliged enhancement issue.

*Full paper: International Conference, IEEE Biennial international conference on power and energy systems towards sustainable energy PESTSE2016, Bengaluru
Intelligent Satellite Tracking for Antenna Control System

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ABSTRACT

The growth in satellite communication technologies attracts a considerable amount of attention in digital broadcast communication system. The necessity to develop a GUI based "Intelligent satellite tracking for antenna control system for continuous satellite tracking in geo-stationary orbit. This paper presents a general description of the system, followed by descriptions of the network and discussion of system operations.

*Full paper: International Conference on Recent Innovations In Science Engineering And Technology 17 May, 2015 Goa India*
Department of Electronics & Communication Engineering
Morphology Based Surface Crack Detection

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**ABSTRACT**

Surface crack detection is useful in structural engineering. Early detection of surface crack can prevent damages and disasters. If the surface cracks are detected early, we can avoid costly repairs to the structures and damages to structures and human life. Regular curve tracing methods fail to detect cracks because cracks are non-continuous. We need to explore different technique to detect cracks in the surface. Cracks can be in concrete walls or in the asphalted roads. In this paper, we propose to use morphological techniques to detect surface cracks, along with regular edge detection techniques. Morphological operations can be used to enhance discontinuities in image and join the missing pixels. Combination of edge detection as pre-processing and filtering as post-processing seems to be an effective way to detect the surface cracks effectively.

*Full paper: Journal of Advanced Research and Science, Vol. 1, Issue No. 1, 2015, pp 15-20*
Accelerating Huffman Algorithm Using Multicore Platform

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ABSTRACT

Huffman coding is a lossless entropy coding method employed for data compression. More frequently appearing symbols are represented by shorter code than less frequent symbols. In this paper we modify Huffman coding and decoding algorithms using parallel computing constructs and improve the performance. We use OpenMP, a standard application program interface (API) for writing shared memory parallel applications. OpenMP provides constructs to create multiple threads of execution that execute concurrently divide work among an existing set of parallel threads. We analyze the existing Huffman coding program in C language and identify the blocks for parallelism and employ OpenMP constructs. All implementations and tests are carried out on 64-bit Intel core i5-3470 CPU at 3.20 GHz quad core in Linux operating environment.

OpenMP constructs are inserted both in encoding and decoding part of algorithm, and we compared the results with the existing program and find significant speed enhancement in execution time for both encoding and decoding.

Area Optimized High Speed Parallel Architecture with Internal Pipelined Structure for Fic on Fpga

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ABSTRACT

The goal of image compression is to remove redundancy present in a data giving sufficient room for proper image reconstruction. There are numerous lossless and lossy compression techniques. Lossless compression techniques allow the image to be compressed by reducing the redundancy in the data where decompressed data is an exact copy of the original with no loss of data. However, lossy compression sacrifices the exact reproduction of the original image. JPEG is an example of lossy compression. One such compression is fractal image compression (FIC). FIC is a lossy compression technique and is also used for medical image compression. In this paper, a novel architecture for FIC is proposed, modeled and implemented on FPGA platform. The input image is grouped into 8 × 8 blocks, and simultaneously eight blocks are processed using parallel architecture. The nine isometrics are realized using interleave technique and a search/comparison operation is carried out using parallel architecture. The two parallel architectures have internal pipelined structure for arithmetic operations. The FSM control unit designed synchronizes the data movement and ensures codebook generation for 256 × 256 × 8 input data. The design operates at maximum frequency of 139.9MHz consuming less than 30% of FPGA resources consuming 0.46W of power. The design is suitable for real time medical image compression.

*Full paper: Journal of Electronics and Communications, Allahabad, Vol. 16 Issue No. 1, 2015, pp 49-70
Simulation of Top-Contact Rubrene Organic Field Effect Transistor with SiO2 and Poly (Methyl Methacrylate) As Gate Dielectrics

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ABSTRACT

In this paper, the electrical performance evaluation of rubrene based top-contact bottom-gate (TCBG) OTFTs is done. The Organic Transistor modeling software and Matlab tools are used to evaluate the drain current, charge-carrier mobility and threshold voltage calculated. The effect of temperature, layer thickness for SiO2 and PMMA dielectric materials and W/L ratio are performed. In addition, change in contact resistance of source and drain has been reported. It is found that over the temperature range of 300-450K, the whole mobility increases to a peak value and then decreases to low values. Both the modeling and Matlab simulation demonstrated for model simulation results in terms of output and transfer characteristics, drain current, charge-carrier mobility, and threshold voltage, and agree approximately.

Smart Energy Saving an Application of Image Processing

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ABSTRACT

Forgetting to put off the electrical device while not in use, keeping the device on while not necessary, therefore resulting in wastage of electrical energy has become common in our day to day life. Not much attention is paid towards such silly mistakes, but these little wastages can form a formidable amount of overall energy wastage if we consider the same mistake happening in every work place, house, educational institute, public place etc. So the aim of this undertaking is to develop a system that monitors a place/ room or an area in a large room for the presence of human activity. If no human presence is detected, a pre-determined set of electrical devices, if ‘on’ are ‘put off’ thus saving electrical energy. The system consists of a camera that takes pictures of the space being monitored, periodically. The ‘Raspberry Pi’ forms the computational unit, comparing successive images. A particular algorithm is used for the purpose. Human presence in the room results in difference between successive images. Should there be no difference in the successive images, then the Raspberry Pi checks the states of the devices if they are on then it sends control signals to the relay circuits to put off the running devices.

Imaging for Concealed Weapon Detection

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ABSTRACT

In today’s world, security forms an integral part in every aspect of life. The detection of weapons concealed underneath a person’s clothing is very much important to the improvement of the security of the general public as well as the safety of public assets like airports, building and railway stations, etc. Manual screening procedures for detecting concealed weapons are common in controlled access settings like airports, entrance to sensitive buildings and public events. It is desirable sometimes to be able to detect concealed weapons from a standoff distance, especially when it is impossible to arrange the flow of people through a controlled procedure.

In this project we propose an automated weapon detection using millimeter wave imagining method. The millimeter wave scans the entire body, without causing any side-effects, for concealed weapon. We enhance the millimeter wave image and follow it up with segmentation. The system has built-in intelligence to detect the concealed weapon after segmentation. We also use wavelet based fusing techniques to pin-point the position of the concealed weapon.

Audio Processing In Car Infotainment Systems

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ABSTRACT

Present day in-car infotainment systems use audio DSP to incorporate many advanced features. The paper briefs about the car radio architecture which is used in high end infotainment systems and explains how the audio mixing takes place in the superposition block of the audio DSP. The paper also explains the audio processing operations like filtering and scaling, which a signal undergoes before it reaches the output of the speakers. It also contains how audio mixing takes place in the superposition block of audio DSP.

A Single-Phase Single-Stage High Step-Up AC–DC Cockcroft Walton Voltage Multiplier with PFC Using FPGA Controller

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ABSTRACT

The paper proposes a high-performance transformer less single-stage, high step-up ac–dc matrix converter based on Cockcroft–Walton (CW) voltage multiplier. Deploying a four bidirectional-switch matrix converter between the ac source and CW circuit, the proposed converter provides high quality of line conditions, adjustable output voltage, and low output ripple. The matrix converter is operated with two independent frequencies. One of which is associated with power factor correction (PFC) control, and the other is used to set the output frequency of the matrix converter. Moreover, the relationship among the latter frequency, line frequency, and output ripple will be discussed. The proposed paper adopts one-cycle control method to achieve PFC, and one of the most advanced methods of FPGA have been used for control.

*Full paper: National Conference on Developments in the Domain of Electrical Engineering, SSIT-Tumkur 2015,
Detection of Copy Move Forgery in Digital Images

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ABSTRACT

Digital images are easy to manipulate and edit due to availability of powerful image processing and editing software. Nowadays, it is possible to add or remove important features from an image without leaving any obvious traces of ampering. As digital cameras and video cameras replace their analog counterparts, the need for authenticating digital images, validating their content and detecting forgeries will only increase. Detection of malicious manipulation with digital images is the essence of this project. In particular, we focus on detection of a special type of digital forgery -“the copy-move” attack in which a part of the image is copied and pasted somewhere else in the image with intent to cover an important image feature. Here we investigate the problem of detecting the copy-move forgery technique. This technique successfully detects the forged part even when the copied area is enhanced or retouched to merge it with the background.

RFID Based Checkout System

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ABSTRACT

The Radio frequency identification (RFID) labels are set to replace the bar codes in the near future. The existing trolleys should be replaced by intelligent shopping trolleys with radiofrequency scanners. Our RFID checkout is organized around several central components. A microcontroller is used to initialize and communicate with RFID readers and detect the tags of purchased items. The RFID unit sits on the shopping cart and estimates the cost before reaching the counter, thereby saving customers' time at the counter.

Performance Comparison of Image Compression Algorithms

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ABSTRACT

This paper discusses the results of survey on various lossy and lossless image compression algorithms for gray scale images. We use the performance matrices viz, compression ratio, time for compression/decompression and picture quality measure PSNR for each algorithm. Furthermore we analyze advantages and disadvantages of each algorithm. We also discuss a new method using NTT (Number theoretic transform) and recommend to develop an algorithm using NTT in future. The recommendations on further implementation and enhancement of image compression algorithm are formulated in this paper.

Development of Mathematical Morphology Filter for Medical Image Impulse Noise Removal

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ABSTRACT

Post-acquisition denoising of medical images is of importance for clinical diagnosis and computerized analysis, such as tissue classification and segmentation. During the image generation, imaging devices are quite often interfered by various noise sources. Impulse noise which causes the medical images to remove important image details such as edges, contours and texture. In this paper, a new filtering method is proposed to remove impulse noise on degraded medical images. The proposed filter is integrated with noise detector and filtering approach. An impulse noise detector using mathematical residues is proposed to identify pixels that are corrupted by impulse noise, and the image is recovered using specialized open-close algorithm that is only applied to the noisy pixels. Black and white blocks that degrade the quality of the image will be recovered by a block smart erase method. The proposed method was tested on simulated medical images from a brain web database and clinical medical images with different levels of noise. The results show that the morphology filter produces better denoising results in terms of qualitative and quantitative measures compared with other denoising methods, compared with several existing noise-filtering models demonstrated that not only the proposed filter is effective for noise removal but also for image detail preservation and clinical practice.

*Full paper: International Conference on Emerging research in Electronics, Computer Science and technology ICERECT 2015, PESCE Mandya, 2015
Comparative Analysis of Efficient Impulse Noise Removal Techniques applied to Medical Images based on Mathematical Morphology

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ABSTRACT

Medical image processing is essential in many fields of medical research and clinical practice, because it greatly facilitates early and accurate detection and diagnosis of diseases. Noise is introduced to the medical images due to various factors in medical imaging. Noise corrupts the medical images and the quality of the images degrades. This degradation includes suppression of edges, structural details, blurring boundaries etc. To diagnose diseases edge and details preservation are very important. Medical image denoising can help the Radiologists to diagnose the diseases. Medical images include MRI, CT scan, x-ray images, ultrasound images etc. In this paper we implemented Morphological filtering for medical image denoising corrupted by salt and pepper noise with different values of variances. It is a nonlinear technique that preserves the edges of the image as well as structural details. It removes the salt and pepper noise effectively but its performance is poor in removing additive noise and speckle noise. This paper proposes a novel filter based on mathematical morphology for high probability impulse noise removal is presented. First, an impulse noise detector using mathematical residues is proposed to identify pixels that are contaminated by the salt and pepper noise. Then the image is restored using specialized open-close sequence algorithms that apply only to the noisy pixels. Finally, black and white blocks that degrade the quality of the image will be recovered by a block smart erase method. Experimental results demonstrate that the proposed filter outperforms a number of existing algorithms and is particularly effective for low and highly corrupted medical images. The objective of this paper is to remove the impulse noise in corrupted medical images by detecting the impulse noise present in an image and then effectively removing the low and high probability impulse noises present in the medical images using the mathematical morphology algorithm.

*Full paper: International Research and Journal Medical Science, Vol.3, Issue No. 9, 2015, pp 1-12
Markov Random Field Based Medical Image De-noising

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ABSTRACT

De-noising images, specifically MRI images, is the need of the hour. Due to various reasons and disturbances, the images might be degraded by noise. This project aims to remove the noise without blurring the image. Moreover, the proposed work retains (can be extended to enhance) edges, which are pivotal in medical images. The degraded MRI image is modeled as Markov Random Field (MRF) and the de-noising problem is treated as maximum a-posteriori problem. We use simulated annealing method to solve the MRF based a posteriori problem. We incorporate line-fields in the energy function minimization. Usage of line-fields results in sharper images. The sharpness can be varied by appropriate parameter selection. The given image is degraded by both Gaussian and salt-pepper noise. De-noising is performed using neighborhood average, medial filter and the MRF methods. Resulting improvements in the image quality are noted. Proposed MRF based de-noising works well for Gaussian and salt-pepper noise, without blurring the image. Limitation is the selection of optimal parameters and computational time. This may not be suitable for real-time applications.

Department of Computer Science & Engineering
Reviewing the Research Paradigm of Techniques Used in Data Fusion in WSN

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ABSTRACT

Wireless Sensor Network (WSN) has been constantly emerging in the area of wireless communication system. Although Wireless Sensor Network has explored its identity in various remote communication system right from environmental monitoring, health monitoring, to industrial monitoring applications, but still the area is shrouded with some of the significant open issues. In the past decade, numerous attempts have been made to address the frequently occurring issues, but still the applicability of the solution are yet to be seen. This paper presents a state-of-art review of existing techniques of data fusion, which has not found its proportional significance compared to data aggregation among the research community. The paper discusses majority of the significant studies, in-depth analysis of their outcomes along with discussion of research gap at the end of the paper.

*Full paper: International Conference on Computing And Communication Technologies, Sai Ram Engineering College, Sai Leo Nagar, Chennai, Tamilnadu,(ICCCT’15) on 26\textsuperscript{th} & 27\textsuperscript{th} 2015
EEDF: Energy Efficient Data Fusion Supportive of Virtual Multipath Propagation in WSN

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ABSTRACT

Achieving an efficient data fusion technique not only ensures enhancement in network lifetime but also ensures better communication performance. The existing literatures are found to be more focused on addressing routing, energy, optimization issues and quite less on data fusion technique. Therefore, the proposed manuscript introduces a simple technique called as EEDF i.e. Energy Efficient Data Fusion that intends to achieve enhanced communication in wireless sensor network. The proposed study jointly addresses the challenge of incorporating multipath propagation as well as energy efficient data dissemination technique. The study also introduces a virtual topology that assists in energy efficient data dissemination process using multipath propagation technique. The outcome of the study shows that EEDF outperforms existing energy efficient techniques like LEACH and PEGASIS with respect to energy and bit error rate.

*Full paper: International Conference on Data Engineering and Communication Systems at RNSIT, Bengaluru, Vol. 10, Issue No. 86, 2015*
Wireless Sensor Networks

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ABSTRACT

The design of wireless sensor networks for distributed applications is the most challenging task due to the factors such as limited storage on nodes, variable data arrival rate and high energy cost of communication. In most Wireless Sensor Networks (WSN), the battery is the sole energy source of the sensor node. The Sensor nodes are expected to work on batteries for several months to a few years without replenishing. Thus, energy efficiency becomes a major issue in WSNs. Nowadays, it is desired to use the WSN in heterogeneous platform for multiple monitoring. The Software development for the sensor node is a tedious task due to the change in network topology. The present state of art has come up with different solutions to overcome the performance issues such as Memory overhead, Heterogeneity, Portability, Scalability, Cost and Quality of Service. An adaptive framework should minimize the resource consumption and provide an optimal solution for run-time Reconfiguration. This paper presents a detailed review on current state-of-the-art in the Run-time Reconfigurations of Wireless Sensor Networks. An Analysis is made on the existing middleware approaches and an evaluation is done based on the parameters like Application Openness, Scalability, Heterogeneity, User Friendly Interface, Mobility and Power Efficiency. The paper identifies a few open research issues that must be addressed during the Run-Time Reconfigurations of Wireless Sensor Networks.

Infrastructure Establishment for a Reconfigurable Network in Wireless Sensor Networks

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ABSTRACT

Wireless sensor networks (WSN’s) have become the part and parcel of our life. The Wireless sensor networks are used to sense and process data in applications like Water Level Monitoring, Vehicle Tracking and Patient Health care Monitoring systems. The energy is supplied to the sensor node through the battery. As the battery storage cannot be retained for longer time, the sample of information may not be collected continuously and send to the Base Station with a regular interval of time. The collection of information and its processing will be difficult, as there would be dynamic change in topology due to failure of existing nodes, addition of new nodes, link failure, change in parameters and the amount of battery storage capacity left in nodes. The Sensor nodes must observe the context, identify the dynamic changes and adapt to the new operating conditions. The challenges to be addressed during the establishment of an infrastructure-based reconfigurable Wireless Sensor Networks are Localization, Software Development, Role Assignment, Design of Code Dissemination Algorithms, Routing, Reconfiguration Model, Configuration Management and Security. Many Frameworks have been proposed to establish an infrastructure-based Wireless Sensor networks. But, there exist a need for an adaptive infrastructure-based reconfigurable framework which has to reconfigure at the runtime.

*Full paper: International Conference on Computational Intelligence and Computing Research, (ICERECT – Dec 2015), pp 1-8
Game Theoretical and Generic Approaches for Selfish Node Avoidance in Ad Hoc Networks

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ABSTRACT

In this paper, we review the routing models that use both the Generic and Game theoretical methodologies. A very common assumption in the analysis and development of networking algorithms is the full co-operation of the participating nodes. However, the reality may differ considerably. The existence of multiple domains belonging to different authorities or even the selfishness of the nodes themselves could result in a performance that significantly deviates from the expected one. Even though Game theory is known to be extensively used in the field of economics and biology, it is used for the analysis and modeling of protocols in several layers, including routing. This review aims at providing an elucidation of the terminology and principles behind game theory and the most popular Generic and Game theoretic recent routing models.

*Full paper: Proceedings of IC3I, Published in IEEE explore, 2015, pp 1052-1059*
Implementation of Ranked Search over Encrypted Cloud Data with Supporting Synonyms

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ABSTRACT

the “pay-as-you use” cloud computing paradigm. The searchable schemes over encryption Implementation of ranked search over encrypted cloud data with supporting synonyms” has been developed to provide a stable and efficient search services in the cloud data storage. The cloud service provider will charge the cost for the services they provide to the user so consumers want to find the most relevant product, information or data, which is highly desirable in data support only exact or fuzzy keyword search. That is, there is no tolerance of synonym substitution and/or syntactic variation. And the searchable schemes support only single keyword search. To meet the challenge of effective search system over secured data, the new search schema is described which is efficient and flexible searchable scheme that supports both multi-keyword ranked search and synonym based search i.e Semantics-based multi-keyword ranked search technology over encrypted cloud data which supports synonym queries is proposed. The search results can be achieved when authorized cloud customers input the synonyms of the predefined keywords, not the exact or fuzzy matching keywords. Possible synonym substitution and/or her lack of exact knowledge about the data to the data user. Ranked search over encrypted cloud data with supporting synonym will protect the data in the cloud and retrieve the required document or page that contain search key efficiently and quickly which is very important in the pay-per-use type of cloud model, so it saves time and money. If the user doesn’t have knowledge of data in particular, he can also obtain the search result because search results can be obtained for synonym of input keywords.

A Secure Data Transmission for Cluster- Based Wireless Sensor Networks

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ABSTRACT

Data forwarding in Wireless Sensor Networks is insecure as wireless protocol provides least security measures. Clustering is an effective and practical way to enhance the system performance of WSN's. A study of secure data transmission for cluster-based WSN's is performed, where the clusters are formed dynamically. The two secure and efficient data transmission (SET) protocols for CWSNs, called SET-IBS and SET-IBOOS, by using the identity-based digital signature (IBS) scheme and the identity-based online/offline digital signature (IBOOS) scheme, respectively are proposed. The calculation results have been demonstrated to show the efficiency of proposed protocols in terms of minimization of energy consumption and security overhead.

LanLink Text and Voice communication over wired LAN

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ABSTRACT

This paper is influenced by the experiences and designing process involved in developing software for chat over wired LAN where python language has been used as the programming tool. The application can be used to communicate through text and voice methods. The discussion here mainly involves some of the key factors which took part effectively throughout the process such as ARP over NMAP Protocols, protocols and tools used for text and voice communication, dual socket methodology for two way communication and python programming language. Getting the list of computers stored in local ARP cache reduced the time required by the nmap tool. TCP looks after text as well as voice communication in LanLink. Two different port numbers have been used in receiving and sending data both I case of voice and text. Python version 2.7 is the coding language chosen for this network application.

Package Analyzer Automated Solution for Energy Inefficiency in Smartphone Application

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ABSTRACT

Smartphone applications’ energy efficiency is vital, but many Android applications suffer from serious energy inefficiency problems. Locating these problems is labour-intensive and automated diagnosis is highly desirable. This work aims to address this challenge. Two common causes of energy problems were observed: missing deactivation of sensors or wake locks, and cost ineffective use of sensory data [1]. With these findings an automated approach to solve energy problems in android applications is proposed. This method monitors sensor and wake lock operations to detect missing deactivation of sensors and wake locks by accessing the android’s operating system packages. In this work only the ideal threads are terminated instead of an entire application. This approach is built as an android application.

A Simulator for Designing Dependable Storage Solution for Shared Application Environment in Storage Area Network

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ABSTRACT

The cost of data loss and unavailability can be large, so businesses use many data protection techniques for storing the data in the network to make it possible for access in different locations. This also adds up the advantage of dynamic growth of storage capacity with the changing needs. However, this data on the network should be backed up to ensure the fault tolerance in the cases of storage device failure (like HDD, tape drives, etc.), system crash (server or application), etc. So how to depend on such storage or data stored in the network? Choosing an appropriate combination of techniques is difficult because there are numerous approaches for protecting data and allocating resources. Solution for this is by using many data protection techniques such as remote mirroring, instant copies, LUN masking and concurrent access in shared application environment.

Automated Water Meter Reading

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ABSTRACT

Automated Water Meter Reading deals with the collection of water units consumed by the customer. The objective of this project is to overcome the disadvantages of current meter technology and make the billing process faster. This advancement helps in eliminating the traditional billing system and eliminates the manual reading of meters where human resource is required to collect the meter reading periodically. Automated Water Meter Reading uses Radio Frequency to transmit the data collected at the consumer site to the administrator. Customer can make payment based on the invoice sent by administrator.

Applications of Fog Computing for Smart Environment

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ABSTRACT

Fog Computing is a paradigm which means it’s a standard perspective that extends cloud computing services to the edge of the network. Fog computing is also referred to as —Edge computing‖. Fog systems operate on network end rather than working from a centralized cloud. Fog provides data, compute, storage, and application services to end-users which is similar to cloud but the distinguishing characteristic is its proximity to end-users by allowing the services to be hosted at the network edge. This kind of distributed strategy helps to lower costs and improve efficiency. The important feature of Fog Computing is its support for emerging Internet of Everything (IoE) applications that demand real-time access with predictable latency. Fog computing gives an approach to deal with the demands of the ever-increasing number of Internet-connected devices referred to as the Internet of Things(IoT).Internet of Things (IoT) is the network of physical objects or things embedded with electronics which is able to interoperate within the existing Internet infrastructure. The things are usually geographically distributed over heterogeneous platform. Hence, with fog computing it is possible to place some processes and resources at the edge of the cloud, instead of establishing channels for cloud storage and utilization which leads to reduction in bandwidth. In fog computing every bit of information is not sent over cloud channels, instead aggregating it at certain access points. Fog reduces service latency, and improves Quality of Service (QoS) resulting in superior user-experience. Analysis of its applications in real scenarios such as Smart Grid, smart traffic lights in vehicular networks and software defined networks is done.
A Novel Way of ICON Based Authentication Methods

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ABSTRACT

Authentication is one of the important security aspects to secure the critical or sensitive information in a system. The authentication system must allow only the authorized users to access the critical information. So it must be strong enough to identify only the valid users and at the same time it should be user friendly. There are many authentication systems designed and used, but most commonly used authentication system is login-password. But this suffers with the attack called shoulder surfing, and brute force method of password guessing. The work carried out to explore the strengths of different graphical based password system to avoid the attack of shoulder surfing and enhance the security in terms of authentication. Also we have proposed a new graphical based authentication system.

*Full paper: Advance Computing Conference (IACC), 2015 IEEE International, 12\textsuperscript{th} & 13\textsuperscript{th} June 2015,
High Speed Face Detection and Tracking

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ABSTRACT

Real time face detection and tracking is one of the most important components used in many image processing applications. Gesture analysis of a driver driving a vehicle based on facial features like eyes, and mouth is one such application we are considering. The image frame rate needed in such applications is at least 15 frames/sec say for example on a smart phone where our algorithm resides on application layer. In this paper we focus on Joint Viola Jones face detection and tracking algorithm which considers some innovative techniques to speed up processing time. It should be noted that entire process of gesture analysis is automated with high degree of robustness with a view to alert the driver at appropriate time to avoid mishaps. The performance analysis of Joint Viola Jones face detection and tracking algorithm is analysed using functions available in Computer Vision Tool box and Image Processing tool box of MathWorks. The performance is platform dependent. In the end we show performance results, which is quite promising.

Real Time Detection and Tracking of Mouth Region of Single Human Face

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ABSTRACT

For any real-time application, detection and tracking of features becomes very important. The detection and tracking algorithms have to be very robust and efficient with least or zero false positives and false negatives. We use a novel combination for detection and tracking purpose. In this paper we propose a robust mouth region extraction and tracking algorithm that works in real-time. The region of interest for our application requires the face and mouth regions. We propose a novel technique for extracting the mouth region automatically. The proposed technique detects and tracks the mouth in either closed or opened state. We use the colour components for skin tone and lips extraction.

*Full paper: IEEE International Conference on Artificial Intelligence, Modelling and Simulation (AIMS2015), pg. 297-304, December 2015.*
Cloud Based Advanced Bestpeer for Data Sharing in Corporate Network

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ABSTRACT

Many computer networks and business organization of the same industry sector share some of the selective data and collaborate with other companies who share a common interest. This data sharing helps to achieve their business goals and to reduce the operational cost which in turn increases the revenue of the corporate network. There are many unique challenges faced by inter-company data sharing and data processing processes such as scalability, performance and security. In this paper we present a cloud based system, Advanced BestPeer which delivers elastic data sharing services with better performance for corporate network and business organization. Advanced BestPeer system is developed by combining cloud computing, peer to peer technology and database to provide economical, flexible, scalable platform and also based on pay-as-you-go business model. Advanced BestPeer is evaluated on Amazon EC2 cloud platform. The benchmarking result shows that Advanced BestPeer performs better than HadoopDB technology. It also demonstrates that Advanced BestPeer achieves near linear scalability for throughput with respect to the number of peer nodes.

Survivable Hybrid Wireless Optical Broadband Access Networks in a Single Segment Failure

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ABSTRACT

Hybrid wireless optical network is gaining popularity because of its wireless features. In WOBAN, the wired part of the access network is replaced with a wireless connectivity. Wired router is replaced with wireless router in the network. In a typical network setup, WOBAN consist of servers, optical network unit (ONU), optical line terminal (OLT), routers and node. Back end network of WOBAN is wired optical network and the front end is wireless. Survivability of WOBAN is an important issue. A single segment failure in WOBAN is a scenario where ONU are disconnected with OLT which will lead to large data loss and inconvenience to the users. We are proposing an optimized scheme called optimizing back up ONUs selection and back up fiber deployment (OBOF) to provide survivability of WOBAN in a segment failure. In OBOF scheme simulated annealing algorithm is used for optimizing the selection of back up ONU. Enhanced greedy algorithm is used for optimizing the fiber layout and channel capacity utilization. Implementation is done using JAVA.

Internet of Things for Smart Environment

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ABSTRACT

Internet of things is the proposed development of the internet, wherein objects used in day to day life have connectivity network, which allows them to share the information. It is abbreviated as IoT. It is the network of “things” or physical objects which is embedded with sensors, software, electronics and connectivity which helps us to achieve greater service by the exchange of information. Each object can be uniquely identified but has the capability to interoperate within the environment. The devices integrate with internet. Here there little or no human-human interaction or human-computer interaction. There is large number of application of this technology which even includes alerting the driver when the blow is less in the tire. Other applications range from Smartphone detection, traffic congestion, smart parking, smart lighting, and smart roads in the field to smart cities. Earthquake detection, forest fire detection, air pollution in the field of smart environment. Radiation level and liquid presence in the field of security and emergency. Energy and water use and remote control appliances in the field of home automation, Medical and health Care.

*Full paper: International Conference on Computer communications and Networks (I3CN), Coorg Institute of Technology, Kodagu, May 2015,

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ABSTRACT

The design of wireless sensor networks for distributed applications is the most challenging task due to the factors such as limited storage on nodes, variable data arrival rate and high energy cost of communication. In most Wireless Sensor Networks (WSN), the battery is the sole energy source of the sensor node. The Sensor nodes are expected to work on batteries for several months to a few years without replenishing. Thus, energy efficiency becomes a major issue in WSNs. Nowadays; it is desired to use the WSN in heterogeneous platform for multiple monitoring. The Software development for the sensor node is a tedious task due to the change in network topology. The present state of art has come up with different solutions to overcome the performance issues such as Memory overhead, Heterogeneity, Portability, Scalability, Cost and Quality of Service. An adaptive framework should minimize the resource consumption and provide an optimal solution for run-time Reconfiguration. This paper presents a detailed review on current state-of-the art in the Run-time Reconfigurations of Wireless Sensor Networks. An Analysis is made on the existing middleware approaches and an evaluation is done based on the parameters like Application Openness, Scalability, Heterogeneity, User Friendly Interface, Mobility and Power Efficiency. The paper identifies a few open research issues that must be addressed during the Run-Time Reconfigurations of Wireless Sensor Networks.

Department of Information Science & Engineering
A Secure Ranked Search Service over Encrypted Data in Cloud

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ABSTRACT

Cloud storage provides huge number of storage servers to store cloud users complex data. For Data owners and data users cloud storage system provides flexibility in usage and economic savings. But for protecting data from attackers, confidential important information and data should be encrypted before uploading or forwarding to the cloud, which violates usual data utilization on plaintext keyword search. So allowing search over encrypted data becomes so important without loosing privacy. By considering large number of documents and users in the cloud, there is a need to enter or apply multiple keywords in search query service. In multi-keyword search scheme we choose a measure of “coordinate matching,” i.e., as many number of matches as possible in order to capture the most related data documents in search query. We Propose another new scheme in which every document will be associated with multi-keywords which has been provided by the data owner at the time of uploading a document. Every documents rank will be increased based on number of queries or number of downloads occur on a file. In this paper we use One Time Password (OTP) as a security measure, data user has to enter OTP when he/she wish to download a file.

*Full paper: National Conference on Artificial Intelligence and Software Engineering (AISE - 2015), NHCE, Bengaluru
Automatic Single Payment Gateway Using ANPR Technique

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ABSTRACT

Computer and information technology has a major influence on the society and the society is becoming more and more dependent on technology. The main objective behind development of “Automatic single payment gateway using ANPR technique” is to make the vehicle payment methods complete automatic and simplified. The purpose of this project is making a single payment gateway for parking fee, fuel stations, toll collection according to vehicles and builds the real time application which recognizes vehicles license number plate at entry gate. Automatic fee collection is considered as one of the intelligent transport systems. It is aimed at making vehicle taxation more efficient, reliable, and safe and environment friendly. For the identification of the vehicles, the information of the vehicles is already stored on the central database. So captured number and information will be sent to the nearby police station for theft detection.

Web Application for Voice Operated e-mail Exchange

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ABSTRACT

E-mail, in this age, is the primary mode for passing on crucial information. Along with getting tech-savvy, we need to be the more user-friendly as well. This paper proposes an application that will compose the mails as you speak, send it to a valid e-mail address, read aloud the received emails; all of this voice enabled with minimal use of keystrokes. With the use of speech-to-text and text-to-speech synthesizers the voice input will be converted to text and vice-versa respectively. Javascript and PHP codes are used to facilitate the mailing module and integrate it with the speech synthesizer module. The user only needs to worry about speaking clearly and rest is taken care of, thus hugely advantageous for the disabled.

Hand Gesture Recognition System Using Histogram and Neural Network

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ABSTRACT

In this paper, consider the problem facing by distance between hand and the web cam and corresponding image noise in a Hand gesture recognition for human computer interaction (HCI) using a web cam. In this paper a survey of various recent hand gesture recognition systems background information is presented, along with key issues and major challenges of hand gesture recognition system are presented. In this paper consider histogram and neural network approaches for hand detection. At the end of this paper focuses on different hand gesture approaches, algorithm, prototype model, technologies and its applications. The present approaches can be mainly divided into Data-Glove Based, Computer Vision Based approach and Drawing gesture.

Securing MANETS using EAACK

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ABSTRACT

The voyage or the journey from wired association to wireless association has been a worldwide fashion in the past few decades. Mobile ad-hoc network does not have any predetermined infrastructure so they rely on their neighbours to transmit message. Mobile ad-hoc network here after known as MANET is competent enough for creating a self-provisioning/configuring and self-sustaining network without the help of a centralized infrastructure, which is often helpful in critical applications like military conflict or emergency rescue missions. However the open/loose medium and extensive distributions of these nodes are easy targets to various types of nasty attacks. In this case, it is very decisive to develop a competent intrusion finding mechanism to guard MANET from attacks. In this document, we put forward a new intrusion discovery system named Enhanced Adaptive Acknowledgment (EAACK) principally intended for MANET. EAACK certifies more eminent malicious-behaviour-detection rates in certain situation without greatly affecting the network performances.

ABSTRACT

LARS-location aware recommender system is a modern method of producing the recommendations for the users based on the location based ratings. Earlier recommender systems did not consider the spatial properties of the users nor items; In LARS we consider about the spatial properties of users and the items, and it supports taxonomy of three novel classes of location-based ratings, namely, on-spatial ratings for spatial items, non-spatial items by spatial ratings and spatial items by spatial rating.

User partitioning is a technique which is utilized by LARS and it exploits user rating locations with the help of the same. This enhances the system scalability while not compromising through recommendation quality. Items location is exploited by LARS with the help of technique called travel penalty exploits item locations using travel penalty. Travel penalty is a technique which is capable of producing the travel distance for the user who queries it. This eliminates the need to search exhaustively all the items in order to obtain access for spatial items.

The above mentioned techniques can be adopted by the LARS separately or by combining depending on the availability of the location based ratings. The Experimental evidence in large-scale real-world data from both the foursquare location-based social network and the Movie-Lens movie recommendation system reveals that LARS is very efficient, scalable, and capable of producing recommendation twice as accurate compared to existing recommendation approaches.
A Scheduling Policy With Low Complexity that can Performa Optimally in Terms of Delay and Can Achieve Throughput Optimally in 4G Wireless Networks

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ABSTRACT

A scheduling policy for downlink of a multichannel wireless networks (e.g. OFDM based networks). We focus on single-cell with the aim developing a scheduling policy that can perform optimally in terms of delay and throughput with low complexity. Before designing our scheduling policy we make some assumptions on arrival process and develop some sufficient conditions for delay optimal and throughput optimality.

Our sufficient conditions allow us to prove that Oldest Packet First (OPF) policies are delay optimal and Maximum Weight in Fluid Limit (MWF) policies are throughput optimal. By carefully combining the policies from the class of oldest packet first and maximum weight in fluid limit policies and by exploring special features of our sufficient conditions, we develop a new hybrid policy which can achieve optimal throughput and optimally perform in terms of delay with low complexity of O (n^{1/4} log n) where „n“ is number of users or channels in the system.

Head Detection and Tracking System

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ABSTRACT

HDTs (Head detection and Tracking System) detects and tracks multiple people in a real time video stream in an efficient way. HDTs detects heads and faces in an outdoor and indoor environment and keeps track of them.

HDTs uses Partial Head Contour method to detect head and Feature invariant methods to detect face. Head is located at an extreme position of the body and there is noticeable difference between the head and the shoulders in the input image. Face can be detected by finding the distance between eyes, colour intensity between eyes and other parts of the faces. HDTs is able to re-detect a person even if he/she is invisible for some time. People can become invisible if they wall behind pillars or walls. The principle in developing this system can be extended to solve other problems such as human gesture recognition and face recognition.

Implementation of Android Application-ROAR

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ABSTRACT

The status of women has been subjected to many great changes over the past few millennia. However, women in India continue to face atrocities such as rape, acid throwing, dowry killings, and the forced prostitution of young girls. According to a global poll conducted by Thomson Reuters, India is the fourth most dangerous country in the world for women. From the above description, we see that, India’s women need a solution to protect their dignity. It is important to provide protection to an individual’s life. In this paper, we propose ROAR, an android application. In this application, when the user feels helpless or detects danger he/she can vigorously shake the phone and the app will automatically open. This is facilitated through an accelerometer.

ROAR app contains two modules, the first module will enable the user to contact his/her friends when in danger by pressing a button on the app which will send an auto generated message to the user’s contacts. The user’s location along with a text message will be included in the auto generated message. The location will be tracked using a GPS tracker. In case, the button is accidentally pressed, a counter of 5 seconds is started to ensure that the button is genuinely pressed. The contacts will be stored on a server and on a local database. The second module provides options to use calling services, messaging services and access to WhatsApp.

In addition to the above feature, the application also provides safety precautions and guide to the user on how they should react to danger. This will help victims to avoid attack and it also helps their friends to reach that place as fast as possible to offer aid.

Color Code Based Authentication and Encryption

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ABSTRACT

In today’s high technology environment, organizations are becoming more and more dependent on their information systems. The public is increasingly concerned about the proper use of information, particularly personal data. The threats to information systems from criminals and terrorists are increasing. Today’s information system the security is largely supported by password for authentication process. The most of password contains alphanumeric and special characters it is highly vulnerable.

To overcome the drawbacks of traditional method we propose new authentication method to abolish well known Security threats like brute force, dictionary attacks phishing attacks and spyware attacks. Encryption is a process of changing the data into unreadable format, much of the data flows through information system is highly sensitive need to be protected, and the disadvantage of widely used public key encryption is time consuming. Public-key encryption may be vulnerable to impersonation, even if the intruder not able to get private key. A massive attack on a highly secured network will allow an intruder to imitate or mimic the adversary chooses to by using a public-key from the compromised security network to the key of the adversary’s choice in the name of another user.

To overcome the drawbacks of traditional encryption we introduce RGB color code oriented encryption method. The data consists of characters, symbols and digits. The data are converted in ASCII value, then these ASCII value are grouped into four digits and then the each part is assigned typical html RGB color codes, then these codes are converted into binary values and the binary values are compressed using simple XOR operations. Finally the data transmitted to receiver

Secure Data Retrieval for Decentralized Disruption Tolerant Networks

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ABSTRACT

Mobile nodes in military network scenarios carried by soldiers may be temporarily disconnected due to jamming and environmental factors. Disruption-tolerant network (DTN) technologies provide storage nodes to store the messages when there is no end-to-end connection.

Attribute-based-encryption (ABE) is an approach that enables an access control over encrypted data using access policies and attributes, but this introduces several security and privacy challenges. Here we propose a secure data retrieval scheme using Cipher-text-policy ABE for decentralized DTNs that provides a scalable way of encrypting data. The proposed scheme features immediate attribute revocation, provides fine-grained access policy and resolves key escrow problem.

Implementing of Trusted Platform Module throughout Bound Devices

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ABSTRACT

A Trusted Platform Module (TPM) is a secure crypto-processor that can generate and store secured information such as keys and passwords. TPM contains a unique identity and provides a range of security functions. This paper outlines a client-server system utilizing a TPM-enabled computer using out bound devices (Pendrive or memory card). The system allows for data confidentiality, plausible deniability, and hiding of traces that incriminating data was present on the client. The server will attest the client before allowing it to submit / receive incriminating data, and encrypted incriminating data can only be decrypted 1) by the encrypting client, and 2) if and only if the encrypting client’s platform configuration matches that during encryption. The client’s state can always be established via measurement results, and they cannot be tampered to fake attestation.

ABSTRACT

A Test Automation Framework provides an execution environment for the automated test scripts. In Test Automation Framework for Library Architecture we make use of a central Library where all methods written based on the workflow of applications, we make use of these methods further to write the test scripts.

A Novel Approach for Parallel Computation of non-deterministic parser applied to English Language

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ABSTRACT

This work aims at better usage of multi-core systems to achieve parallelism for Tomita’s Natural Language Algorithm. To accomplish this, we implement Implement Tomita’s algorithm with sequential processing assuming that only one core is available. The Development of multi-core architecture enables parallel processing, Hence exploit the power of parallelism we used the tool registered by Intel in open MP. This tool provides the directives that instruct the hardware to act according to the desired functionality. Thus, this work is all about introducing these directives at specific locations in the input, which shows the efficiency of parallel computation against the serial implementation counterpart.

Lightweight Classroom Surveillance System with MIS Integration

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ABSTRACT

The word “Classroom Surveillance” means monitoring the behavior, activities and changing information usually of people often in a surreptitious manner. It is done for the purpose of influencing, managing, and directing. It may be applied to observation from a distance by means of electronic equipment closed circuit (cc) cameras. The camera should be automatically on or off only when there is any activity going on inside the classroom. Object counter should be placed in tolerance to near point where all students enter in queue and not rushed together. The system is also integrated with options for class schedules and count of students attend in each session and same will be reported to the management as MIS as Email or as a report, which helps the management to identify subjects, where students are less or average or more.

Design and Implementation of SCADA Security System using Honeypot

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ABSTRACT

The need to urgently address the security issues related to SCADA system remains high. Contrary to regular IT systems, most successful SCADA attacks can have serious consequences on the nation's economy, stability and, worse affect people live directly. In this, we analyze the use of honeypot systems as a plausible solution to SCADA security problems. We start by analyzing the threat landscape of SCADA systems and discuss the comparative differences between standard IT security and the required security for SCADA systems. After analysis of, various honeypots features in relation to SCADA security; we setup an experimental but realistic honeypot SCADA environment. We then test the suitability of honeypots in protecting SCADA systems and the efficiency of 'anti-honeypot' techniques. Our results show, that when used properly, a high interaction honeypot can greatly enhance SCADA system security, and in some cases better than any other security system.

Department of P. G. Studies (MCA)
A Novel Identity Based Blind Signature Scheme using DLP for E-Commerce

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ABSTRACT

Blind signatures are used in the most of the application where confidentiality and authenticity are the main issue. Blind signature scheme deals with concept where requester sends the request that the signer should sign on a blind message without looking at the content. Many ID based blind signature are proposed using bilinear pairings and elliptic curve. But the relative computation cost of the pairing in bilinear pairings and ID map into an elliptic curve are huge. In order to save the running time and the size of the signature, this paper proposed a scheme having the property of both concepts identity based blind signature that is based on Discrete Logarithm Problem, so as we know that DLP is a computational hard problem and hence the proposed scheme achieves all essential and secondary security prematurity.

With the help of the proposed scheme, this paper implemented an E-commerce system in a secure way. E-commerce is one of the most concern applications of ID based blind signature scheme. E-commerce consisting of selling and buying of products or services over the internet and open network. ID based blind signature scheme basically has been used enormously as a part of today’s focussed business. Our proposed scheme can be also be used in E-business, E-voting and E-cashing anywhere without any restriction.

NUMA Aware Cache for iSCSI Storage Server’s Evaluation

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ABSTRACT

In an iSCSI based SAN, I/O requests are handled by target hosts in a parallel fashion to achieve the good performance. Here good performance in the terms of high throughput and low latency. Existing iSCSI take the advantage of the OS page cache to ensure the data sharing and reuse of the data. On the other hand another dimension of complexity is introduced on the introduction of non-uniform memory access (NUMA) architecture i.e., asymmetric memory access in many core and multi core platforms. In NUMA aware platforms iSCSI target repeatedly dispatches an access request on an I/O thread with a cache hit on remote to cached data hence multi core systems cannot utilize completely. This type of problem existed in the situation of ultra-high-speed of data transfer between two iSCSI storage systems. In the meantime deficient NUMA remote memory access logs behind the available high network bandwidth, hence bottleneck of the overall end-to-end data transfer path. We design a NUMA aware cache mechanism to arrange cache memory with local NUMA node and threads and then assign requests of I/O to the threads which are local to the data that can be accessed by. This NUMA aware solution results in lower latency in access and higher system throughput.

Survey on Identity Based Blind Signature

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ABSTRACT

In this paper, we survey the state of research on Identity Based Blind Signature. We start from reviewing the basic concepts of identity based encryption and blind signature schemes and subsequently review the framework of ID-based blind signature, and classification of ID-based blind signature. Lastly, we discuss the applications of ID-based blind signature.

An Enhancement of Cloud Data Access Security using Identity based Encryption

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ABSTRACT

Identity based Secure distributed data storage is a scheme that reduces the burden of maintaining excessive number of files from the owner to proxy servers. The Proxy servers are used to convert encrypted files for the owner to encrypted files for the receiver without the necessity of knowing the content of the original files. In practice, the owner removes the original files for the sake of space efficiency. Hence, the issues of confidentiality and integrity of the outsourced data must be addressed carefully since the cloud is managed by untrusted third party. In this paper, we propose an identity-based secure distributed data storage (IBSDDS) schemes.

Our schemes captures the following properties: (1) The owner of the file can decide the access permission independently without the help of the private key generator (PKG); (2) For one request, a receiver can access only one file, instead of all the files of the owner; (3) Our scheme is secure against the collusion attacks and untrusted users, namely even if the receiver can compromise the proxy servers, it’s not possible for him to obtain the owner’s secret key. Although this system is secure against different types of attack, by using the concept of re-encryption the data gets more secured and the access permission that who will access the data is decided by the owner himself. In existing system to provide better security data owner has to be online all the time so our propose system will be helpful for data owner by getting notification about the request of the user to their mail-ids.

An Approach of Attribute Based Cryptosystem in Cloud Storage

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ABSTRACT

In this world of the internet, people are increasingly opting for cloud storage for saving their data to off-site storage systems that are maintained by 3rdparties. Risks of losing important files and information are easily avoided by storing data on cloud storage. In this paper, we show how sensitive and confidential information can be shared securely, efficiently, and flexibly with others in cloud storage without unauthorized access. Here we show Cryptosystem scheme for data storage in cloud. One of the important techniques is ABE (Attribute Based Encryption). ABE is a public-key based one to many encryption techniques which allows users to encrypt and decrypt data based on user attributes. This technique effectively secures the data and also provides the correctness of the retrieved data along with the recovery mechanism for the transmitted data in case of malicious attack. The implementation of this scheme will show the correctness of the secure data storage and also advantages over other techniques supporting secure data storage in cloud.

Decentralized Access Control of Cloud Data

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ABSTRACT

The paper proposes a new decentralized access control scheme that supports anonymous authentication to provide secure data storage in clouds. In our proposed system, without knowing the user’s identity the cloud verifies the authenticity of the user before data is being stored. It consists of additional feature of access control through which only valid users are able to decrypt the stored information. This proposed scheme supports creation, reading and modification of the data stored in the cloud, it also avoids replay attacks. Existing systems authentication and access control schemes are centralized, where as our proposed system has decentralized access control scheme plus it is robust. The decentralized access control scheme addresses user revocation.

The Study of Methodologies for Identifying the Drowsiness in Smart Traffic System: A Survey

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ABSTRACT

Driver’s distraction has become an important safety concern, due to the use of in vehicle information systems such as mobile phones, GPRS and satellite radios. To overcome this problem we need to reduce such distractions and adapt in vehicle systems accordingly. The existing physiological signal monitoring systems have the ability to only record the signals without automatic analysis. However, biomedical signal monitoring systems are advanced with automatic analysis. In our proposed topic of brain computer interface (BCI) system that can acquire and analyze electroencephalogram (EEG) signals in real-time to monitor human physiological and cognitive states, which in turn provides warning signals to the user during danger. The BCI system has 5 units, bio signal acquisition/amplification unit, a wireless transmission unit, an embedded signal processing unit, a host system for data storage and real-time display, and a warning device are been implemented and integrated into the system to close the loop of BCI system.

A Hybrid Formulation of Reliable Routing Mechanism in WSN

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ABSTRACT

Providing reliable and efficient communication under fading channels is one of the major technical challenges in wireless sensor networks (WSNs), especially in industrial WSNs (IWSNs) with dynamic and harsh environments. In this work, we present the Reliable Reactive Routing Enhancement (R3E) to increase the resilience to link dynamics for WSNs/IWSNs. R3E is designed to enhance existing reactive routing protocols to provide reliable and energy-efficient packet delivery against the unreliable wireless links by utilizing the local path diversity. Specifically, we introduce a biased back off scheme during the route-discovery phase to find a robust guide path, which can provide more cooperative forwarding opportunities. Along this guide path, data packets are greedily progressed toward the destination through nodes’ cooperation without utilizing the location information. Through extensive simulations, we demonstrate that compared to other protocols, R3E remarkably improves the packet delivery ratio, while maintaining high energy efficiency and low delivery latency.
Analysis and Categorization of Brain MRI Images using Kernel Support Vector Machines

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ABSTRACT

This paper proposes an intelligent and automatic classification technique to recognize the Benign and the Malignant MRI brain images. Bio Medical image like ECG, MRI and CT-scan images are important ways to diagnose the diseases of human beings efficiently. The conventional methods of manual analysis of tumor based on visual inspection by radiologist/physician, may lead to wrong classification results when a large number of MRIs are to be analyzed. To avoid the errors by the human eye, an automated intelligent classification system is proposed which serves the needs for classification of image. One of the major causes of death amongst people is brain tumor. The chances of survival can be increased if the tumor and its type is detected correctly at its very early stages. Magnetic resonance imaging (MRI) technique is used for the study of the human brain. In this proposed work, classification techniques based on Kernel Support Vector Machines (SVM) are proposed and is applied to brain image classification. In this paper feature extraction from MRI Images is done by evaluating the Discrete Wavelet Transform (DWT). The main objective of this proposed work is to give an accurate outcome of MRI brain cancer classification using Kernel SVM.
Vulnerability Assessment for Networking Services

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ABSTRACT

As the number of vulnerabilities multiples in recent years, vulnerability assessment has emerged as a powerful security administration tool that can identify vulnerabilities in the system. The automatic network, network products and services are exposed to the large variety of security risks. The vulnerability management plays a very important role in detecting the security risks which may cause damage for the network servers or network products. We also focus on vulnerability assessment for automatic environments along with the web applications. We also point out the various threats which are detected during the vulnerability assessment for different networking products. In this paper we suggest solutions to fix those vulnerabilities.
Department of Basic Sciences
Surface Analysis and Optical Studies of CuSSe Thin Films for Solar Cell

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ABSTRACT

A simple process is adopted for the deposition of CuSSe thin film on ITO glass substrate. This absorbing layer was obtained by Chemical Bath Deposition (CBD) followed by electrochemical selenization at room temperature. The method adopted here is simple and economical. Surface morphology and optical parameters of the prepared thin film were studied. SEM analysis revealed that the nanoparticles are arranged uniformly and highly crystalline in nature. From the observed UV-Visible spectra shows that the prepared thin film is having good absorption with a suitable band gap for the fabrication of solar cells. The prepared thin film is ideal for solar control applications. Key words: CBD, Electrodeposition, CuSSe, thin films

Preparation and Characterization of Weaver Ants’ Silk - Polyaniline Composites

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ABSTRACT

Natural fibers obtained from plant and animal sources are good biomaterials due to their excellent biocompatibility and are non-conductive. Modification of a biopolymer from non-conductive to conductive, finds wide applications in the field of nano-electronics. In nature, we can find many insects which can produce silk, viz. weaver ant silk, spider silk, etc. Spider silk coated with polymers found potential applications in wide areas such as defence, in medical field, etc. Weaver ant silk fibers mat is also a bio polymer. In our present research work, the properties of weaver ant silk fibers and polyaniline (PANI) composite is reported for the first time. Structural and optical properties of the prepared composite were investigated using optical microscopy and FT-IR spectrometer respectively. From the obtained result it is clear that the prepared composite is having a good compatibility with the polymer.

*Full paper: International conference “Natural, Bio polymers and their composites- ICNP2015” at Mahatma Gandhi University, Kottayam, Kerala, 10\textsuperscript{th} to 12\textsuperscript{th}, April 2015.
Weaver ants (*Oecophylla smaragdina*) are mostly seen in open forests of India, Australia, China and Southeast Asia. The nests of weaver ants are built with silk secreted by their larvae. Silk fibre mat is a biopolymer, containing proteins produced by a broad array of spiders and other insects. In this study some hidden properties of weaver ant silk mat have been examined. The surface and structural studies reveal that the mat possesses very good chemical resistance.
Synthesis and Biological Efficacy of Novel Piperazine Analogues Bearing Quinoline and Pyridine Moieties

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ABSTRACT

A series of novel piperazine analogues bearing quinolin-8-yloxy-butan-1-ones/pyridine-2-yloxy-ethanones were synthesized by a simple and convenient approach based on various substituted piperazine incorporating quinoline and pyridine moieties. The analogues were evaluated for in vitro antioxidant activity against 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferrous ion radical scavenging activities and anti-inflammatory activity by inhibition of Vipera russelli venom (PLA2) and gastric K+/H+_ATPase activities. Most of the title compounds exhibited promising activity. Best antioxidant and PLA2-inhibiting activities were found for piperazine analogues with phenyl and nitro phenyl groups, whereas methoxy group on phenyl piperazine indicated selectivity for the H+/K+_ATPase.

Crystal Structure of 2, 4, 6-Triisopropyl-2',5'-Dimethoxybiphenyl

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ABSTRACT

The title compound, 2,4,6-triisopropyl-2',5'-dimethoxybiphenyl was synthesized from 1-chloro-2,5-dimethoxy benzene, 1,3,5-triisopropylbenzene boronic acid and potassium phosphate in the presence of lead acetate as a catalyst and toluene as a solvent. Its crystal structure is determined by X-ray structure analysis. The crystals are the orthorhombic, $a = 12.3281(4), b = 17.4235(5), c = 19.6550(6)$ Å, $Z = 8$, sp. gr. Pbca. $R = 0.0603$ for 2494 observed reflections.

Synthesis, Characterization, and Antibacterial Activity of 7-Fluoro-2-oxo-2H-Chromene-3-Carboxylic Acid Ethyl Ester

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ABSTRACT

The title compound was synthesized by reacting 2-hydroxy-4-methoxy-benzaldehyde with diethyl malonate in the presence of catalyst piperidine. The compound was characterized by elemental analysis, FT-IR, 1H-NMR, and 13C-NMR. The structure was confirmed by single crystal X-ray diffraction technique. The compound crystallizes in the monoclinic crystal system, P21/n space group with unit cell parameters a=7.8824(7) Å, b = 13.5854(10) Å, c = 20.6072(16) Å, β = 98.786(3)°, and Z = 8. The molecular and crystal structure of the title compound are stabilized by inter- and intramolecular interactions of the type C–H...O. This newly synthesized compound was screened for antibacterial activity with two Gram positive and three Gram negative bacteria.

Synthesis Characterization and Antibacterial Activity of Coumarin Ester

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ABSTRACT

The compound was synthesized by reacting substituted benzaldehyde with diethyl malonate in the presence of catalyst piperidine. The compound was established by elemental analysis, FT-IR, 1H-NMR, 13C-NMR, Mass Spectroscopy and also confirmed by single crystal X-ray diffraction technique. The compound crystallizes in monoclinic crystal system, C2/c space group, a = 26.875(3) Å, b = 5.8414(9)Å, c = 13.8147(16)Å, β = 103.878(4)° unit cell parameters, and Z = 8. In the crystal structure, the molecules are linked by intermolecular interactions of the type C—H…O. This newly synthesized compound was screened for antibacterial activity against both positive and negative bacteria.

Variation of Profile Parameters in Dyed Silk Fibers

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ABSTRACT

Several varieties of silk fibres, all belonging to Bombyx Mori family, were investigated for the micro structural changes when, dyed using X-ray diffraction method. The variation of these parameters indicates that there is degradation of fibres due to dying. These changes in fibres occur due to fragility of hydrogen bonds, which are perpendicular to the fibre axis in the β-pleated sheets.

Surface Morphological Studies of Cu2ZnSnS4 (CZTS) Thin films by Thermal Evaporation Method

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ABSTRACT

Conventionally used silicon based thin film photovoltaics are having higher efficiencies, but these devices are cost expensive. Also, to the nature as they are non-biodegradable. So, researchers have found a cheaper flexible way of using thin films. The merit of using these cells is the variable band gap. Some commonly used thin films are Copper-Indium-Gallium-Sulphide (CIGS), Cadmium Telluride (CdTe) etc. However, the materials are having rare earth materials and toxic materials. Development and commercialization of Photovoltaics has been focus due to its low cost, high absorption coefficient and suitable direct band gap for solar energy conversion applications. An attempt has been made in this work to synthesize the CZTS thin films by Thermal evaporation method on Molybdenum (Mo) glass substrates. Surface morphology, Phase studies and optical properties have been studied using Atomic Force Microscopy, Scanning Electron Microscopy, X-ray diffractometer and UV-Vis Spectroscopy.

*Full Paper: Conference on Sastra University, Thanjavur, Tamilnadu, 29th & 30th, 2015*
Synthesis and Crystal Structure of 7, 8-dihydroxy-2, 4-dimehyl Chromylium Perchlorate Using Hirshfeld Surface Analysis

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ABSTRACT

The title compound, C11H11ClO7, crystallizes in the monoclinic crystal system and space group P2₁/n with cell parameters a = 6.8920(4)Å, b = 18.5260(15)Å, c = 9.9480(8)Å, β = 106.420(5)°, V = 1218.37(16)Å³ for Z = 4. The structure exhibits both intra and intermolecular hydrogen bonds of the type O H...O and C H...O.

Synthesis and Crystal Structure of 2, 4, 7-Trimethyl Chromylium Perchlorate Using Hirshfeld Surface Analysis

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ABSTRACT

The title compound C12H13ClO5, crystallizes in monoclinic crystal class in spacegroup P21/c with cell parameters a=8.0400(5)Å, b=11.8590(11)Å, c=13.3490(13)Å, β = 102.325(6)°, V =1243.44(18)Å³ and Z = 4. The final residual factor R₁ = 0.0617. The structure exhibits both intra and inter-molecular hydrogen bonding of the type C-H...O.

*Full paper: Journal of Single Molecular Research, Published: 25 May 2015, pp 7-12
Synthesis and Crystal Structure of 4-(3, 4, 5-Trimethoxyphenyl)-N3,N5-BIS(3-Chloro-4-Fluoro-Phenyl)-2,6-Dimethyl-Pyridine

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ABSTRACT

The title compound, C\textsubscript{30}H\textsubscript{29}Cl\textsubscript{2}F\textsubscript{2}N\textsubscript{3}O\textsubscript{7}, crystallizes in the triclinic crystal system and space group P-1 with cell parameters a = 7.0250(18) Å, b = 14.311(5) Å, c = 15.841(6)Å, \( \alpha = 107.437(7)° \), \( \beta = 91.69(2)° \), \( \gamma = 100.36(2)° \), V = 1488.7(9) Å\textsuperscript{3} for Z = 2. The structure exhibits inter-molecular hydrogen bonds of the type N-H \cdots O.

A Nano-MgO and Ionic Liquid-Catalyzed ‘Green’ Synthesis Protocol for the Development of Adamantyl-Imidazolo-Thiadiazoles as Anti-Tuberculosis Agents Targeting Sterol 14α-Demethylase (CYP51)

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ABSTRACT

In this work, we describe the ‘green’ synthesis of novel 6-(adamantan-1-yl)-2-substituted-imidazo[2,1-b][1,3,4]thiadiazoles (AITs) by ring formation reactions using 1-(adamantan-1-yl)-2-bromoethanone and 5-alkyl/aryl-2-amino1,3,4-thiadiazoles on a nano material base in ionic liquid media. Given the established activity of imidazothiadiazoles against M. tuberculosis, we next examined the anti-TB activity of AITs against the H37Rv strain using Alamar blue assay. Among the tested compounds 6-(adamantan-1-yl)-2-(4-methoxyphenyl) imidazo[2,1-b][1,3,4]thiadiazole (3f) showed potent inhibitory activity towards M. Tuberculosis with an MIC value of 8.5 μM. The inhibitory effect of this molecule against M. Tuberculosis was comparable to the standard drugs such as Pyrazinamide, Streptomycin, and Ciprofloxacin drugs. Mechanistically, an in silico analysis predicted sterol 14α-demethylase (CYP51) as the likely target and experimental activity of 3f in this system corroborated the in silico target prediction. In summary, we herein report the synthesis and biological evaluation of novel AITs against M. tuberculosis that likely target CYP51 to induce their antimycobacterial activity.

*Full paper: PLoS One, October 2015, pp 1-12
Crystal structure of 2-amino-N-(2-fluorophenyl)-4,5,6,7-tetrahydro-1-benzothiophene-3-carboxamide

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ABSTRACT

In the title compound, C_{15}H_{15}FN_{2}OS, the dihedral angle between the planes of the benzothiophene ring system and the fluorobenzene ring is 3.74 (14)°. The six-membered ring of the benzothiophene moiety adopts a half-chair conformation. The molecular conformation is consolidated by intramolecular N-H...F and N-H...O hydrogen bonds. In the crystal, molecules are linked by N-H...O hydrogen bonds, generating C (6) [001] chains.

*Full paper: Acta Crystallographica, 2015, pp 01-08
Crystal structure of 10-((3-oxo-3H-benzo[f]chromen-1-yl) methyl)-2-(trifluoromethyl)-9a,10-dihydrobenzo[4,5]imidazo[1,2-a]pyrimidin-4(5aH)-one

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ABSTRACT

In the title compound, C25H14F3N3O3, the dihedral angle between the planes of the benz[4,5]imidazo[1,2-a]pyrimidine unit (r.m.s. deviation = 0.035 Å) and the benzochromene ring system (r.m.s. deviation = 0.106 Å) is 72.82 (5)°. In the crystal, molecules are linked by C-H...O interactions, generating [010] C(9) chains. A weak aromatic stacking interaction [centroid-centroid separation = 3.5376 (15) Å] is also observed.

Novel 5-Functionalized-Pyrazoles: Synthesis, Characterization and Pharmacological Screening

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ABSTRACT

In the present study a series of O-substituted pyrazoles 7(a–f) and N-substituted pyrazoles 9(a–f) were synthesized via phase-transfer catalyzed reaction of ethyl 5-(bromomethyl)-1,3-diphenyl-1H-pyrazole-4-carboxylate 5 with various oxygen and nitrogen containing compounds in presence of tetrabutylammonium bromide (TBAB) in THF. The compound 5 was obtained by the efficient bromination with N-bromosuccinimide (NBS) in presence of a catalytic amount of azoiso-bis-butyro nitrile (AIBN) in refluxing CCl₄. The synthesized compounds were evaluated for their in vitro antimicrobial and antidiabetic activity and were compared with standard drugs. Among the synthesized compounds, compound 9b emerged as an excellent antimicrobial and antidiabetic agent. Newly synthesized compounds were characterized by analytical and spectral (IR, 1H NMR, 13C NMR and LC–MS) methods.

*Full paper: Bioorganic Medicinal Chemistry Letter, Vol. 25, Issue No. 17, Mysuru University, Mysuru, 2015, pp 3671-3675,
Synthesis and Characterization of Novel Oxazines and Demonstration that They Specifically Target Cyclooxygenase 2


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ABSTRACT

In the present study, we used solution combustion synthesis-bismuth oxide (Bi2O3) as catalyst for the simple and efficient synthesis of 1,2-oxazine based derivatives of 6-fluoro-3-(piperidin-4-yl)benzo[d]isoxazoles, 1-arylpiperazine and carbazoles. (4aR,8aR)-4-(4-Methoxyphenyl)-3-((4-(4-methoxyphenyl)piperazin-1-yl)methyl)-4a,5,6,7,8,8a-hexahydro-4H-benzo[e][1,2]oxazine was found to be the most potent compound with a high degree of selectivity in inhibition towards COX2 (1.7 μM) over COX1 (40.4 μM) demonstrating the significance of 1,2-oxazine derivatives in developing COX2 specific inhibitors. Molecular docking analyses demonstrated that an isoleucine residue in the active site of COX1 is responsible for lower affinity to COX1 and increased potency towards COX2. Overall, our study reveals that the new 1,2-oxazine-based small molecules qualify as lead structures in developing COX2-specific inhibitors for anti-inflammatory therapy.

*Full paper: Bioorganic Medicinal Chemistry Letter, Vol. 25, Issue No. 15, Mysuru University, Mysuru, 2015, pp 2931-2936
Crystal structure of 4-azidomethyl-6-tert-butyl-2H-chromen-2-one

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ABSTRACT

In the title compound, C₁₄H₁₅N₃O₂, one of the methyl C atoms of the tert-butyl group lies almost in the plane of the chromene ring system [deviation = -0.097 (2) Å], one lies above and one lies below [deviations = 1.460 (3) and 1.006 (3) Å, respectively]. The C-C-N-N torsion angle is 142.33 (17)°. In the crystal, molecules are linked by weak C-H···O hydrogen bonds to generate C(6) chains propagating in the [010] direction.

*Full paper: Acta Crystallographica Section E: Crystallographic Communications, E 71, (Part 1), Mysuru University, 2015, pp 218-219
Crystal structure of 2-(4-methylphenyl)-4H-1,3-benzothiazine

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ABSTRACT

In the title compound, C_{15}H_{13}NS, the thia-zine ring adopts a boat conformation. The dihedral angle between the planes of the benzene ring of the benzothiazine unit and the tolyl ring is 19.52 (9)°. In the crystal, molecules are linked by weak C-H...π interactions into a tape structure along the b-axis direction.

*Full paper: Acta Crystallographica Section E Crystallographic Communications, 71 (Part 2), Mysuru University, 2015, pp 071-075
FT-IR, Laser-Raman Spectra and Computational Analysis of 5-Methyl-3-Phenylisoxazole-4-Carboxylic Acid

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ABSTRACT

In this study the experimental and theoretical vibrational frequencies of a newly synthesized anti-tumor, antiviral, hypoglycemic, antifungal and anti-HIV agent namely, 5-Methyl-3-phenylisoxazole-4-carboxylic acid has been investigated. The experimental FT-IR (4000-400 cm(-1)) and Laser-Raman spectra (4000-100 cm(-1)) of the molecule in solid phase have been recorded. The theoretical vibrational frequencies and optimized geometric parameters (bond lengths, bond angles and torsion angles) have been calculated by using density functional theory (DFT/B3LYP: Becke, 3-parameter, Lee-Yang-Parr and DFT/M06-2X: highly parametrized, empirical exchange correlation function) with 6-311++G(d,p) basis set by Gaussian 09W software, for the first time. The assignments of the vibrational frequencies have been done by potential energy distribution (PED) analysis by using VEDA 4 software. The theoretical optimized geometric parameters and vibrational frequencies have been found to be in good agreement with the corresponding experimental data and results in the literature. In addition, the highest occupied molecular orbital (HOMO) energy, the lowest unoccupied molecular orbital (LUMO) energy and the other related molecular energy values of the compound have been investigated by using the same theoretical calculations.

Partition Energy of a Graph

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ABSTRACT

Let $G = (V,E)$ be a graph. Let $V_1,V_2,...,V_k$ be non-empty disjoint subsets of $V$ such that union is equal to $V$. The $P_k = \{V_1,V_2,...,V_k\}$ is called $V$. Using this partition the graph $G$ can be uniquely represented by a matrix called L-matrix $P_k(G)$, where entries belong to the set $\{2, 1, 0, -1\}$ and defined as follows:

$$a_{ij} = \begin{cases} 
2 & \text{if } v_i \text{ and } v_j \text{ are adjacent where } v_i, v_j \in V_r \\
-1 & \text{if } v_i \text{ and } v_j \text{ are non-adjacent where } v_i, v_j \in V_r \\
1 & \text{if } v_i \text{ and } v_j \text{ are adjacent between the sets } V_r \text{ and } V_s \text{ for } r \neq s \text{ where } v_i \in V_r \text{ and } v_j \in V_s \\
0 & \text{otherwise}
\end{cases}$$

The eigenvalues of this matrix are called $k$-partition eigenvalues of $G$. The $k$-partition energy $E_{P_k}(G)$ is defined as the sum of the absolute values of $k$-partition eigenvalues of $G$. We determine partition energy of some known graphs and also obtain bounds for $E_{P_k}(G)$.

Minimum Covering Color Energy of a Graph

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ABSTRACT

In this paper, we introduced the concept of minimum covering color energy of a graph $E^c_c(G)$ and computed minimum covering energies of a star graph, complete graph, crown graph and cocktail graphs. Upper and lower bounds for $E^c_c(G)$ are established.
Cluj-Ilmenau Index of Hexagonal Trapezoid system $T_{b,a}$ and Triangular Benzenoid $G_n$

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ABSTRACT

Let $G(V,E)$ be a connected molecular graph without multiple edges and loops, with the vertex set $V(G)$ and edge set $E(G)$, and vertices/atoms $x,y \in V(G)$ and an edge/bond $xy \in E(G)$. Let $m(G,c)$ be the number of qoc strips of length $c$ (i.e. the number of cut-off edges) in the graph $G$. The Omega Polynomial $\Omega(G,x)$ and the Cluj-Ilmenau index $CI(G)$ for counting qoc strips in $G$ were defined by M.V. Diudea as $\Omega(G,x)=\sum_{c=1}^{\infty} m(G,c)x^c$ and $CI(G)=[\Omega(G,x)'^2-\Omega(G,x)'-\Omega(G,x)'']_{x=1}$, respectively. In this paper, we compute an exact formula of these counting topological polynomial and its index for the Benzenoid molecular graphs “Hexagonal Trapezoid system $T_{b,a}$ and Triangular Benzenoid $G_n$”.

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