The National Institute of Engineering
(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)
THE NATIONAL INSTITUTE OF ENGINEERING

A Compendium of Research Publications
2020

Manandavadi Road, Mysuru - 570 008, India

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Department of Civil Engineering
Modeling Lateral Placement and Movement of Vehicles on Urban Undivided Roads in Mixed Traffic: A Case Study of India

Punith B. Kotagi¹, Pooja Raj P², Asaithambi G³

¹Department of Civil Engineering, The National Institute of Engineering, Mysuru
²Student, Department of Civil Engineering, The National Institute of Engineering, Mysuru
³Department of Civil and Environmental Engineering, Indian Institute of Technology Tirupati, Tirupati

ABSTRACT

In India, the majority of urban roads are undivided where the behavior of flows in a particular direction is predominantly influenced by the opposing traffic. Due to lack of lane segregation, the vehicles in ongoing direction occupy the opposing lane, which increases the lateral interactions between vehicles. These lateral interactions are influenced by various parameters such as vehicle types, driver behavior and vehicular speeds. Study of such complex interactions plays an important role in evaluating various management measures using microscopic simulation models. The lateral characteristics of vehicles, such as placement, separation and movement, act as necessary input for simulation models. The present study aims to analyze and model the lateral characteristics of vehicles on two-lane urban undivided roads. To achieve this, traffic flow data were collected from an urban undivided mid-block section in Bangalore City, India, using video graphic technique. Multiple linear regression model was developed for predicting the lateral placement of subject vehicle and it was found that lateral placement of subject vehicle is influenced by types and speeds of subject and opposing vehicles. Lateral separation for different types of ongoing (subject) and opposing pairs was also analyzed. The results show that both the ongoing and opposing vehicles have less freedom to move laterally when their sizes increase and hence, lateral separation decreases. The choice of path of vehicles' lateral shifts (left, current and right) on urban undivided roads was modeled using multinomial logistic regression. Lateral shift of a vehicle is influenced by speeds of subject vehicle and leader vehicle in current path, speed of leader vehicle in target path, and lateral gap between leader vehicles in current path and target path.

Studies on Properties of Flowable Earth Mix Concrete for Monolithic Load Bearing Walls

Gourav K\textsuperscript{1}, Ullas S.N\textsuperscript{2}, Venkatarama Reddy B.V\textsuperscript{3}.

\textsuperscript{1}Department of Civil Engineering, The National Institute of Engineering, Mysore
\textsuperscript{2}Centre for Sustainable Technologies, Indian Institute of Science, Bangalore
\textsuperscript{3}Department of Civil Engineering, Indian Institute of Science, Bangalore

ABSTRACT

The paper presents the results of experimental studies carried out on the properties of Flowable Earth Mix (FEM) Concrete. The FEM concrete can be used for the construction of monolithic load bearing walls in buildings. Smaller structures such as sanitary units, soak pits, water storage tanks etc. can also be built with single casting. Compared to the formwork and compaction energy used in monolithic rammed earth wall constructions, casting FEM concrete requires simpler formwork (minimising the cost of formwork) and minimum compaction energy for casting. The properties of FEM Concrete such as workability, compressive strength, flexural strength, drying shrinkage and moisture movements are discussed. The variables considered included type of soil, clay content of the mix and cement content. The results indicate the feasibility of producing monolithic FEM Concrete walls for load bearing buildings. It is easy to achieve required workability and strength of FEM Concrete through the mix design.

*Full paper: Construction and Building Materials Vol.250, 2020, 118876
Finite Element Model Application To Flexural Behavior of Cement Stabilized Soil Block Masonry

David A. Weed¹, Adam G. Tennant², Mohammad Hosein Motamedi³, Gourav K⁴, Craig D. Foster⁵, B. V. Venkatarama Reddy⁶

¹ANSYS, Inc. Chicago, Evanston, IL, USA
²Department Engineering, 2030 Business and Engineering Center 8600 University Blvd Evansville, USA
³BaseHealth INC, Sunnyvale, USA
⁴Department of Civil Engineering, The National Institute of Engineering, Mysuru
⁵Department of Civil and Materials Engineering (M/C 246), Engineering Research Facility, USA
⁶Department of Civil Engineering, Indian Institute of Science, Bangalore

ABSTRACT

A finite element model for cement-stabilized soil block (CSSB) masonry members—including nonlinear stress-strain relationship—has been developed and compared with experimental results. Primarily, this model serves as a simulation tool to study various problems for a large number of stress–strain state and loading conditions of CSSB masonry elements. The model presented is characterized by several parameters experimentally ascertained through triaxial and other testing. Furthermore, these parameters allow the model to capture the elastic, plastic, and softening behavior of CSSB masonry. From a constitutive behavioral standpoint, at small strain levels, the material is approximated as linear elastic. Plastic deformation of the material is captured with a modified version of the Sandia Geomodel, which is specifically designed to replicate geological material behavior. Lastly, at localized softening failure, a damage-like constitutive model which takes into account the normal and shear traction balance on the slip-weakening surface is employed. This model includes cohesion degradation as well as friction under compression. Within the finite element framework, the Strong Discontinuity Approach is used to track localized material failure from element to element. In addition to this, a novel method for modeling interfaces in finite elements is used to replicate the behavior of brick-mortar interfaces. The two featured experiments which are simulated in this study are normal to bedjoint and parallel to bedjoint masonry setups, simplified via a plane strain approximation.

*Full paper: Materials and Structures/Materiaux et Constructions Vol. 53, Issue No. 61, 2020
A Study on Index Properties of Kaolinite And Bentonite Sand Mixtures


1Department of Civil Engineering, ATMECE, Mysuru
2Department of Civil Engineering, The National Institute of Engineering, Mysuru
3Practicing Engineer, Bengaluru

ABSTRACT

Index properties aid in identification classification, and assessment of behavior of fine grained soils. Index properties also have an influence on the shear strength, compaction, swelling, bearing capacity and shrinkage characteristics of the fine grained soil.

This paper deals with the assessment of index properties of artificially prepared fine grained soil mixtures (Kaolinite- Sand Mixtures and Bentonite-Sand Mixtures of varying proportions). An attempt to correlate the index properties with natural soil has been made in this study. The studies showed that Atterberg limits of the soil under study can be correlated (with respective clay size) linearly with fair degree of accuracy. These correlations are helpful in predicting the index properties of soils.

Characterization of Compacted Fine-Grained Soils

Prasanna H.S1, Basavaraju2, Chaitra A.R3.

1Department of Civil Engineering, The National Institute of Engineering, Mysuru
2 and 3Students Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Compaction control is the most significant factor affecting the behaviour of earthwork projects constructed with compacted fine-grained soils. The durability and stability of a structure are related to the achievement of proper soil compaction. Correlating engineering properties with index properties have assumed greater significance in the field of geotechnical engineering. In the present experimental study, an attempt has been made to establish the correlations between index properties of soils with the compaction characteristics of soils having different clay mineralogy altogether for varying energy levels. The compaction characteristics cannot be explained only by liquid limit and plasticity index of the soils but more effectively by plastic limit of soils. It can be concluded that these correlations can be used for predicting the compaction characteristics of soils in field compaction works.

*Full paper: Lecture Notes in Civil Engineering Vol. 85, 2020
Residual Properties of Normal-Strength Concrete Subjected To Fire And Sustained Elevated Temperatures: A Comparative Study

Sachin V¹, N. Suresh²

¹²Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Purpose
Concrete is a widely used construction material which can be prepared using locally available resources (aggregates, cement and water) by following relevant standard guidelines. The residual properties of concrete determined by heating in an electric furnace may not produce a similar effect of fire. The purpose of this paper is to compare the effect of a fire with that coming from the exposure of normal strength concrete to predetermined reference temperatures, for which two sets of specimens were heated in a fire furnace provided with gas burners and an electric furnace.

*Full paper: Journal of Structural Fire Engineering, 2020
Increasing the Yield of Ring Wells by User Friendly Method

Prasanna H.S\textsuperscript{1}, Harshavardhan S.C\textsuperscript{2}, Chaitra A.R\textsuperscript{3}, Pooja P.K\textsuperscript{4}, Beeresha P\textsuperscript{5}

\textsuperscript{1,2,3,4,5}Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Inadequacy of water for the irrigation purposes is being reported as the remarkable problem from the farmers. The groundwater and well systems have to be promoted where the construction of dams, reservoirs, canals, etc. alone can’t serve the farmers. In this study, an attempt has been made to develop to draw water efficiently, to the ring wells situated along the bank of a river. A ring well was selected as the prototype along the river bank and the physical properties of the soil along the periphery of the well were determined to know the soil profile around the well. A model was simulated accordingly and the yield of the model was determined by conducting recuperation tests. Further, perforated laterals of two different lengths were inserted in eight radial directions alternatively at the bottom of the well, and yield was measured for various combinations of the laterals. Similarly, the recuperation tests are conducted even for the slotted laterals and compared with that of the perforated ones. The yield of the model without laterals and with laterals has been compared to know the efficiency of the model. The combination of laterals which gives the optimum yield in the model was selected and provided in the prototype. From the present study, it can be concluded that usage of laterals increases the permeability of the system and thereby increases the yield of the well without the need for increasing the cross section of the well and thus saving valuable time and money.

*Full paper: Construction in Geotechnical Engineering. Lecture Notes in Civil Engineering, Vol 84, 2020
Analysis of Landslide at Gudar-Gedo Road and Proposal of Mitigation Measures

Anand M Hulagabali¹, K P Deepdarshan², Mahesh P Shetter³, Chetan S Gowda⁴, Kushnappa B K⁵.

¹Department of Civil Engineering, The National Institute of Engineering, Mysuru
²Department of Civil Engineering, Wollega University, Ethiopia
³,⁴Department Of Construction Technology and Management, Wollega University, Ethiopia
⁵Department of Civil Engineering, Mainefhi College of Engineering at Technology, Eritrea

ABSTRACT

Landslides are common problem in hilly or mountainous area. The various causes affect the landslides, namely, soil properties, geological properties and meteorological properties. The present study deals with the study of landslide occurred in GUDAR and GEDO road section at GUDAR place – in Oromia region of Ethiopia. Therefore, this study particularly aimed at investigating geotechnical characteristics, type of soil and their role in landslide initiation, slope stability analysis and to recommend possible remedial measures.

*Full paper: IRE JOURNALS, Vol. 3, Issue. 10, 2020*

Gourav K1, Nanjunda Rao Kenkere2, B. V. Venkatarama Reddy3.

1Department of Civil Engineering, The National Institute of Engineering, Mysuru
2Department of Civil Engineering, Indian Institute of Science, Bangalore

ABSTRACT

A 3D nonlinear finite element analysis has been utilised to simulate the flexural behaviour of masonry wallets subjected to out-of-plane flexure under various precompressions. The material parameters necessary to model the flexural behaviour of masonry have been experimentally determined. The lateral failure load and load-displacement curves representing the flexural behaviour have been predicted and compared with the experimental response.

Dynamic Analysis of Vertical Irregular Tall Structural System

H B Akhilesh¹, B O Naveen².
¹²Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The behaviour of any structure depends upon the structural element present in it. The critical aspect on which the structural configuration depends are shape, length and geometry of the building. In the present study the performance of vertical geometric irregular tall structures under the wind load is evaluated as per IS 16700: 2017 provisions. Three type of vertical geometric irregular tall reinforced concrete buildings having different plan dimensions with cantilevered offset length varying from 11% to 15% of the building lateral dimension with increment of 0.5% are modelled. Modal analysis and wind analysis are performed using structural analysis software ETABS to assess the behaviour of vertical geometric irregular tall structural system with cantilevered offset. Parameter such as time period, frequency, storey displacement and storey drift are studied and compared with the regular building. Multiple linear regression analysis is carried out to formulate a general expression for the responses of the vertical irregular tall buildings.

Dynamic Analysis of Multi-Layered Grid Space Structures

K M Mahanthesha, B O Naveen

1,2Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

In the present study, an attempt has been made to understand the structural behavior of a two-way lattice grid space structure. Two-way lattice grid space structures are analyzed for dynamic earthquake loads such as time-history analysis by STAAD. Pro V8i software, using structural steel hollow tubular sections for a span of 30 m for 4.0 m height column and 3 storeys were considered for a total height of 12 m. Further the dynamic analysis such as displacements and modal analysis to find natural frequency and time period, were carried out for the eight different configurations and three different grid sizes of space truss structure.

Study on Impact of Ecological Sanitation on Water and Possible Health Implications at Mosarahalla Village – Karnataka

Sri Rashmi S1, Varshini R2, D. Istalingamurthy3, K.S. Lokesh4.

1,2Department of Civil Engineering, The National Institute of Engineering, Mysuru
3,4Department of Environmental Engineering, JSS Science and Technology University, Mysuru

ABSTRACT

Sanitation in regions with water scarcity can be achieved by using Eco-San toilets. Eco-San toilets are also called dry toilets since they do not require water for flushing and excreta is composted and later used as manure in agricultural fields. It is important to check whether groundwater is getting polluted by this sanitation system and to know if this system is better than pit latrines or septic tank where pollutant infiltrate the groundwater. In the present study field investigations were carried out at Mosarahalla village of H D Kote taluk, Mysore which had around 50 Eco-San toilets in usage. Water samples were collected and analysed for dissolved oxygen content, pH, fluorides, total iron content, chloride content, calcium hardness, total hardness. The result from the analysis of water samples revealed that concentration of chloride content is high. Interviews were conducted among the respondents in the village using a questionnaire to gather information pertaining to health aspects and insights on usage of water in toilets in houses versus Eco-san toilets in houses.

Drainage Morphometry of Harangi Watershed, Madikeri District, Karnataka State and Its Influence on the Areas Sensitive to Soil Erosion

Anusha M.R1, Annapoorna Hebbar2, M.R. Janardhana3.

1Department of Mines and Geology, Government of Karnataka, Bengaluru
2,3Department of Geology, Yuvaraja’s College, University of Mysore, Mysuru

ABSTRACT

Watershed morphometry involves quantitative measurement and mathematical analysis of a drainage basin. Inference on the erosion of the landforms of the watershed area can be made based on the assessment of morphometric parameters. Toposheets in conjunction with the ASTER DEM were used for delineation of Harangi watershed and its subwatersheds in GIS environment as well for extraction of morphometric data. Relevant drainage morphometric parameters for the assessment of the sites for the vulnerability of erosion were evaluated using established mathematical expressions. The observed drainage patterns such as trellis, subparallel and subrectangular and alignment of the streams to the lineaments in the study area suggest an immense control of structure on the drainage pattern in Harangi watershed. The relief values, high values of ruggedness number and moderate values of dissection index suggest that the northern subwatersheds, which are characterised by steep slopes, witness low infiltration at higher reaches, high gravity flow and runoff. Low values of form factor, circularity (0.3) and elongation ratios (0.18) and high values of Gravelius’s compactness coefficient indicate that the majority of the subwatersheds are elongated in shape. The evaluated linear, areal and relief parameters in GIS environment indicate that the northern subwatersheds are in their late youth stage geomorphic development and are more prone to soil erosion as they are large in areas and consist of more number of streams and high relief compared to their southern counterparts.

Structural Behavior of Floating Column

Kumbla Anupa Nayak¹, Kanchana B. N², K. T. Jyothsna³, Kiran Kumar Patil⁴, Balaji N. C⁵.

¹Department of Civil Engineering, The National Institute of Engineering, Mysuru
²¹st Students Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The use of floating columns in the buildings is to make column free spaces inside the building. The provision for such structural elements in building enhances the usability of the floor spaces to maximum extent. The studies of structural aspects of the floating columns were main concert in understanding the entire structural behaviour of building. In this study, Ground + 3 regular plans building is considered and analysed for reactions and displacements. Three models are studied for the same in ETABS software for structural analysis. The loads considered and designs carried out are as per IS 875 and IS 456-2000 respectively.

*Full paper: Global Conference on Advanced Smart And Sustainable Technologies In Engineering (GCASSTE 2020) on 30th & 31st January 2020, Held at Manglore Institute of Technology and Engineering (MITE), Moodbidri, Mangalore, India
Structural Performance of Concealed Beam: Review Article

Afifa Mariyam N1, Kallesha B. M2, Avinash K3, Mahmadajfar Savanur4, Balaji N. C5

1,2,3,4,5Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

When the depth of the beam is equals to the thickness of the slab that beam is known as Concealed beam or hidden beams. Concealed beams are favoured structural elements because of their many inherent features that characterize them; they save on floor height clearance, formwork material cost and shuttering time. Moreover, they form an aesthetic appearance. The present study deals with the summarization of experimental works from literature on concealed beams, on imparting stiffness to the concealed beam by different techniques. The flexural behavior of slab, with influence of concealed beam was investigated from literature, and the results are summarized.

*Full paper: Global Conference on Advanced Smart And Sustainable Technologies In Engineering (GCASSTE 2020) on 30th & 31st January 2020, Held at Manglore Institute of Technology and Engineering (MITE), Moodbidri, Mangalore, India
Shear Strengthening of RC Beams Using Near Surface Mounted Technique with Glass Fiber Reinforced Polymer

Rashmi M1, Nikitha Anand V2, Balaji N. C3

1,2,3Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This paper presents the experimental investigation results on the shear behavior of strengthened reinforced concrete beams by using Glass Fiber Reinforced Polymers (GFRP) strips. Several techniques have been developed for shear strengthening of Reinforced Concrete (RC) members by using Fiber Reinforced Polymer (FRP) but Near Surface Mounted (NSM) technique is one of the most effective technique. NSM-FRP reinforcement has been found to perform efficiently as a shear strengthening technology for RC members. NSM technique contains a groove on the outside surface of the concrete member, the epoxy paste was filled into groove, and then GFRP strip is mounted in the groove. The main objective of experimental work is to study the effect of NSM technique on shear resistance for RC beam, effect of NSM orientation on strengthened beams, and the effect of spacing of GFRP strips. Analyze the behavior of shear strengthened beams, was compared with beams reinforced with conventional steel stirrups and contribution of GFRP strengthened specimen for shear resistance. This work involved casting of RC beams and was tested up to failure. The experimental program included an un-strengthened beam which is referred as Control Beam and strengthened beams using NSM technique with different NSM orientation (90° and 45°) and different spacing of GFRP strips. The test results included ultimate capacity load, deflection, linear displacement, cracking, and mode of failure. Beams strengthened with GFRP strips showed an increase in the load carrying capacity ranging between 48% to 93.5% comparing to the control beam.

*Full paper: International Conference on Material Science, Smart Structures and Applications (ICMSS 2020)”, organized by Surya Engineering College, Erode, Tamil Nadu, India on held on 15th – 16th October 2020*
Flexural Strengthening of RC Beams Using Near Surface Mounted - Glass Fiber Reinforced Polymer Strips

Ummar Shariff F1, Nikitha Anand V2, Balaji N. C3

1,2,3Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Near-surface mounted (NSM) fiber-reinforced polymer reinforcement is one of the latest and effective strengthening techniques for reinforced concrete structures. Existing structural components require strengthening due to increase in service load, error in design, mechanical damage thereby extending the service period. The present experimental work is carried out on NSM technique incorporating NSM composites, namely glass fiber-reinforced polymer (GFRP) strips, as reinforcement. A total of 9 concrete beams were tested. Out of which 6 beams were strengthened with GFRP strips and remaining 3 beams are unstrengthen. A four-point bending test was applied on beams strengthened with different sizes of NSM reinforcement. Efficiencies of RC beams strengthened in flexure when different sizes of GFRP strips are compared. The failure characteristics, yield, and ultimate capacities, deflection, strain and cracking behaviour of the beams will be studied based on the experimental output. The test results indicate an increase in the ultimate load of 30% to 50% compared with that of control beam.

*Full paper: International Conference on Material Science, Smart Structures and Applications (ICMSS 2020)”, organized by Surya Engineering College, Erode, Tamil Nadu, India on held on 15th – 16th October 2020
Studies on the Behavior of Gabion Wall Subjected To Lateral Monotonic Loading

Chirdeep N. R, Rohith Jain, Suresh G. S, Balaji N. C

1,2,3,4Department of Civil Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This paper presents the experimental investigation results on the behavior of gabion wall subjected to lateral monotonic loading. Behavior of reinforced concrete retaining wall due to lateral loading could be significantly improved by replacing concrete wall by gabion wall. Diameter of mesh wire, spacing between the wires and void ratio of infill material and tensile strength of the wire significantly influence the behavior of gabion walls. Single twisted wire mesh was used as outer cage and stones and soil were used as infill materials for the construction of gabion wall. Concrete reaction retaining wall was constructed in the laboratory to support the gabion wall and to resist the reaction of load applied on the gabion wall. The main objective of experimental work is to study the behavior of gabion wall having soil and stone as infill material subjected to lateral loading. Lateral monotonic loading was applied and the strain in the mesh wire was measured using vernier caliper for each load increment. The test results included experimental load-strain curve, load-deformation curve, H/Δ ratio and moment-curvature characteristics. Gabion wall having stone as infill material showed an increase in resistance to deformation ranging from 30% to 40% compared to gabion wall having soil as infill material.
Possible Risk on Human Health and Agricultural Land Associated With Application of Humanure

Sri Rashmi S1, Varshini R2, D. Istalingamurthy3, K.S. Lokesh4.

1,2Department of Civil Engineering, The National Institute of Engineering, Mysuru
3,4Department of Environmental Engineering, JSS Science and Technology University, Mysuru

ABSTRACT

Ecological sanitation can be used in water scare places, this type of sanitation the end product obtained is humanure which can be applied to agricultural field to improve the fertility of soil. Ground water contamination, soil pollution can be avoided by this type of sanitation. The study area is Mosarahalla (singapatna) in H.D. Kote taluk, Mysuru. This village has over 57 eco San toilets installed in 2006. The decomposed manure is removed once in a year and applied to fields during pre-monsoon season in bear hands. The soil and water samples were collected from different sources of village and was analysed. The chemical parameters like pH, fluoride, total iron, Calcium hardness, Total hardness, chloride and electric conductivity of water was analysed and a comparative study was made as all the sample were in Limits as specified. Soil samples were analysed for pH, electrical conductivity, organic carbon, potash, available nitrogen, available potassium. A questionnaire survey was made to understand the health of the villages. Most of them suffered from skin infection, gastro intestinal problem and also respiratory related issues. Microbial analysis was done for soil and showed that the presence of certain fungi may be responsible for the disease caused among the villagers. The results of analysis of soil and water sample showed that increases chloride content, moderately hard water may be the reason for skin infection and cardiovascular diseases. Microbial analysis showed that certain fungi present in soil samples are carcinogen and potent to cause respiratory disorders. Proper treatment like reverse osmosis can be done to decrease the increased levels of chloride and hardness. Taking proper measure during to application of humanure and proper storage with application of fungicides, the risk of getting effected by humanure can be avoided.

*Full paper: International Conference on Civil Engineering trends and challenges for sustainability CTCS 2020 Under ICETE 2020- December 22nd- 23rd 2020, Organized by NMAM Institute of Technology Nitte, Karanataka
Assessment of Effect of Deep Excavation on Adjacent Structures Using Finite Element Analysis


¹Department of Civil Engineering, The National Institute of Engineering, Mysuru
²PhD Research Scholar, NITK Suratkal
³Department of Civil Engineering, SVNIT, Surat
⁴Department of Civil Engineering, IIT Madras, Chennai

ABSTRACT

Deep excavations and its impact on neighboring buildings is one of the most important issue when planning to construct new facility. In metropolitan city, it’s a challenging task for the execution of underground construction due to limited space and high cost of land. Hence, this implies that deep excavation has become necessary for the proper utilization of available space. Therefore, it’s important to make sure that adjacent structures are safe against deep excavation induced deformation. In this study a two-dimensional Finite Element Method in PLAXIS 2D has been chosen for the soil-structure analysis of deep excavation supported by contiguous pile wall located in Addis Ababa. For the numerical analysis two constitutive models Mohr-Coulomb and Hardening Soil have been applied in drained effective stress condition. The objective of this study is to investigate the effect of deep excavation on adjacent structures by considering support stiffness, ground water condition, neighboring building distance from face of excavation and building load. The analysis of this study monitors parameters like maximum lateral wall deflection (δ hm ), maximum settlement (δ vm ), angular distortion of the neighboring structures, horizontal strain, and maximum bending moment of contiguous pile wall. Moreover, normalization of lateral wall deflection (δ hm /H e ) and settlement (δ vm /H e ) to the excavation depth (H e ) and neighboring building distance-excavation (D/H e ) has been presented. Parametric studies have been carried out by varying parameters of diameter of contiguous pile wall, horizontal anchor spacing and pre-stress force of anchor. The analysis result has been recorded in terms of lateral wall deflection, ground settlement and bending moment.

*Full paper: Indian Geotechnical Conference, Andhra University, Visakhapatnam, A.P, India, December 17-19, 2020*
Numerical Simulation of Field Vane Shear Test Using Finite Element Method


¹Department of Civil Engineering, The National Institute of Engineering, Mysuru
²PhD Research Scholar, NITK Suratkal
³Department of Civil Engineering, SVNIT, Surat
⁴Department of Civil Engineering, IIT Madras, Chennai

ABSTRACT

One of the most versatile and widely used devices for investigating the undrained shearing strength and sensitivity of soft deposits of clay is the field vane shear test. However, in spite of its common usage, the interpretation of the vane test has been quite often a controversial issue. Thus, this paper aims to analyze the effects of vane blade thickness and the conventional interpretation of determining shear strength from the shear vane test using the finite element method. The soil stress-strain response has been simulated using the Mohr-Coulomb constitutive model and the Hardening soil model. The sensitivity analysis of boundary conditions has been performed to select the best boundary condition among the different alternatives and to use it properly to get better output for further analysis. The results of numerical simulations have been compared with the conventional interpretation results in verifying and analyzing the performance of the numerical model. It is observed that the measured torque at failure obtained from PLAXIS 3D using the Hardening soil model fits well with the result from the theoretical calculation. However, the Mohr-Coulomb gave too large the torque at failure and the big difference between simulated and hand calculation. The measured undrained shear strengths are inversely proportional to the perimeter ratio of the vane and the same type of soil but different blade thickness, the Undrained shear strength can vary significantly. The failure geometry around the blade is recognized in the plastic points, more emphasized at the top than in the middle of the device.

*Full paper: Indian Geotechnical Conference, Andhra University, Visakhapatnam, A.P, India, December 17-19, 2020
Numerical Study on Prediction of Behaviour of Braced Excavation in Heterogeneous Soil


1Department of Civil Engineering, The National Institute of Engineering, Mysuru
2PhD Research Scholar, NITK Suratkal
3PG Student, BEC Bagalkote
4Department of Civil Engineering, SVNIT, Surat

ABSTRACT

Construction works in the urban areas has become a challenge to construction industry. The lack of adequate space in the urban areas has compelled to excavate deeper into the ground. With recent rise in commercial/residential multi-storied buildings, there has been increasing requirements of car parking and other utilities. Unusual features of urban settings are insufficient space for equipment, restricted movements, foundation interaction, soil heterogeneity and effects of changes in the water table. Deep excavation for the construction of buildings has become the important part of construction work. Structures in the close vicinity of excavations, dense traffic state have made excavations a difficult task to execute in urban area. The faces of the deep excavation cuts need to be protected by retention systems. The role of Geotechnical Engineer is to provide safe and economic design of retention systems to execute deep excavation without affecting the surrounding. In view of the importance for the protection of deep excavation numerical study is carried out. The aim of the present study is to perform numerical analysis of braced deep excavation using finite element analysis tool PLAXIS 2D. In this study two soil profiles are considered each consisting of 5 layers, (soil profile 1) in which stiffness increased with depth, (soil profile 2) in which stiffness decreased with depth. The study on behavior of wall displacement with respect to depth of retaining systems; determination of settlement of retention systems with respect to distance from back wall is carried out. Also, the depth of embedment is varied in different ratios to predict the behavior of the wall. In 1st soil profile, as the depth of excavation increases the lateral wall displacement also increases and in the 2nd soil profile, due to reduced soil stiffness the vertical settlement of the ground surface increases with increase in depth of excavation.

*Full paper: Indian Geotechnical Conference, Andhra University, Visakhapatnam, A.P, India, December 17-19, 2020
Role of Composition in Enhancing Heat Transfer Behavior of Carbon Nanotube-Ethylene Glycol Based Nanofluids

Bindushree N1, Dhabale A2, Dhanush M.S3, Honakeri A4, Ankit A5, Anusha M.K6, Kumar R7, Choudhary H.K8, Khopkar V9, K. Chandra Sekhar 10, Sahoo B11.

1,6,10Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
2,3,4,5Department of Mechanical Engineering, Ramaiah Institute of Technology, Bangalore
7,8,9,11Materials Research Centre, Indian Institute of Science, Bangalore

ABSTRACT

We report the method of tuning the thermal conductivity through the composition of multiwall carbon nanotube (MWCNT) dispersed ethylene glycol based nanofluids. The structure and properties of the MWCNTs were characterized by scanning electron microscopy, transmission electron microscopy, X-ray diffraction, Raman spectroscopy and thermogravimetric analysis. A parallel plate thermal conductivity (PPTC) set up was fabricated and used for measurement of thermal conductivity of the nanofluids. We have prepared ethylene glycol based nanofluids containing 0.05, 0.1, 0.15, 0.20, 0.25 and 0.35 wt% of MWCNTs. The thermal conductivities of these fluids were measured by keeping them between the two (parallel) plates, referred as the hot and the cold plates, of the sample holder in the PPTC apparatus. The lower plate was water-cooled and the upper plate was heated. The temperature of the hot plate was varied between 35 and 80 °C. The thermal conductivity of the fluids was calculated using the one-dimensional heat conduction equation. According to our observation, an efficient heat transfer occurs through the nanofluids with an optimum concentration of 0.20 wt% of CNTs. Our work demonstrates the importance of the composition of the nanofluids and their structural defects in heat transfer.

Studies on Mechanical, Thermal and Tribological Properties of Carbon Fibre-Reinforced Boron Nitride-Filled Epoxy Composites

Muralidhara B¹, Babu S.P.K², Suresha B³.

¹²Department of Metallurgical and Materials Engineering, National Institute of Technology, Tiruchirappalli
³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This research focuses on the static mechanical, thermal and tribological properties of carbon fibre epoxy (CF/Ep) composites filled with boron nitride (BN) micro-filler powder (BN-CF/Ep). The mechanical properties studied were tensile, flexural, interlaminar shear strength and hardness. The thermal properties studied were dynamic mechanical and thermogravimetric analyses which were analysed through dynamic mechanical analyser and thermogravimetric analyser, respectively. The curing ability and dispersion of BN filler in the Ep and composites were investigated through differential scanning calorimetry, Fourier-transform infrared spectra and scanning electron microscopy. The tribological properties focused were three-body abrasion and dry sliding friction and wear conduct. Three-body abrasion tests were studied with silica sand of 212 µm particle size, 30 N load, 2.38 m s⁻¹ sliding velocity and variable abrasive distances of 250 m, 500 m, 750 m and 1000 m. The dry sliding wear tests were performed using pin-on-disc (POD) wear experimental set-up with 60 N load, 3 m s⁻¹ sliding velocity and variable sliding distances of 1000 m, 2000 m and 3000 m. The results followed the trend of BN1% > BN3% > BN5% composites in all mechanical properties. The carbon fabric reinforcement along with the BN-Ep matrix improved enormously all the mechanical properties except impact resistance. Further, it was exhibited that 1 wt% BN into CF/Ep prompts better mechanical properties with predominant damping capacity and thermal stability. Both the dry sand abrasive wear and POD test outcomes revealed that all BN-CF/Ep composites prompt predominant wear resistance. CF along with BN improves enormously the wear resistance with friction coefficient. Further, it was exhibited that 1 wt% BN into CF/Ep in both three-body abrasive and POD tests prompts better wear resistance. Generally speaking, it was presumed that BN-CF/Ep gracefully and successfully improved the mechanical, thermal and tribological properties and morphology of Ep for various mechanical, electrical components and load-bearing applications used in automotive and engineered applications.

*Full paper: High Performance Polymers, Vol.32, Issue.9, 2020*
Influence of Reinforcement on Tribological Properties of Friction Stir Welded Glass Fiber Reinforced Polyamide 66

NandhiniRavi¹, MuthukumaranShanmugam², SureshaBheemappa³, NadarajahGowripalan⁴.

¹,²Department of Metallurgical and Materials Engineering, National Institute of Technology, Tiruchirappalli
³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁴School of Civil and Environmental Engineering, University of Technology Sydney

ABSTRACT

Reinforcement of glass fibers at the weld joint interface of polyamide 66 (PA66) was investigated aiming to improve the weld strength but rather found to improve the tribological properties. The weld strength of glass fiber reinforced polyamide 66 was found to be in the range of 46 %–52 % of that of the parent material. The dry sliding wear behavior of the friction stir welded polyamide 66 with and without glass fiber strengthening was investigated in this experimental study, using a pin-on-disk wear tester. The worn surface topography and morphology were analyzed via white light interferometry and scanning electron microscope, respectively. The wear study confirmed that PA66 reinforced with high fiber content of 20 % by weight of polymer (GF/PA66) yielded a minimum specific wear rate and coefficient of friction.

*Full paper: Journal of Manufacturing Processes, Vol.58, 2020
Crystal Growth And Effect of Defects on The Dielectric Properties of Ammonium Dihydrogen Phosphate (ADP) Single Crystals

Thejashwini B.R1, Khopkar V2, Madhusudhana R3, Sahoo B4.

1,2,4Materials Research Centre, Indian Institute of Science, Bangalore
3Department of Mechanical Engineering, Centre for Nanotechnology, The National Institute of Engineering, Mysuru

ABSTRACT

We report the growth of ammonium dihydrogen phosphate, NH₄H₂PO₄ (ADP) single crystals by slow evaporation method and study of their dielectric property. Furthermore, we correlate the effect of the defects present in the single crystals with the dielectric and other related properties. After determination of the solubility limit of ADP salt in water at different temperatures, the seed crystals were nucleated and grown in the supersaturated solution, which was obtained by cooling the higher temperature saturated solution to room temperature. The phase purity of synthesized ADP crystals was studied by powder X-ray diffraction technique, on the finely ground seed crystals. The seed crystals of appropriate size were used for growth of large crystals and also used for dielectric measurements. Two single crystals with different concentrations of defects were used for the investigation of dielectric property at room temperature. The obtained dielectric data are discussed along with their representation in modulus and impedance formalism to understand the dielectric properties of these crystals. Overall, the low frequency Maxwell–Wagner interfacial polarization was found to increase due to the presence of defects in the ADP single crystals.

Physico-Mechanical Properties of Nano Silica-Filled Epoxy-Based Mono and Hybrid Composites for Structural Applications

Suresha B1, Divya G.S2, Hemanth G3, Somashekar H.M4.

1,2Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
3Department, Robert Bosch Engineering and Business Solutions, Bengaluru
4Department of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bengaluru

ABSTRACT

This research article describes the results of nano-silica (nSiO₂) filled epoxy (Ep) mono composites with different contents (0.5, 1.0, 1.5, 3, and 5 wt.%) and carbon fabric-reinforced epoxy (CFE) with 1.5 and 3 wt.% of nSiO₂ hybrid composites and their physical and mechanical properties characterized by different techniques as per ASTM standards. Mechanical mixing and sonication techniques were followed to disperse nSiO₂ into Ep resin. Furthermore, the same nSiO₂/Ep is reinforced with carbon fabric by hand lay-up followed by vacuum-bagging technique. The morphological features were studied by scanning electron microscopy. The properties of the Ep based mono and hybrid composites showed that the hardness, tensile strength/modulus, and flexural strength/modulus, as well as impact strength of the composites enhanced with nSiO₂ wt.% up to 3 wt.% for mono and hybrid composites and decreased thereafter, suggesting that the beneficial properties ensued up to 3 wt.% nSiO₂ content.

*Full paper: Silicon, November 2020*
M-Learning Based Remote Laboratory for Electronics Experiments


1Assistant Professor, Department of Electronics and Communication Engineering Sri Jayachamarajendra College of Engineering, Mysuru
2Professor, Department of Electrical and Electronics, Malnad College of Engineering, Hassan
3Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The paper goals on the implementation of Mobile learning (M-learning) based Remote Laboratory to maximize the available resource as well as to improve self learning ability. The developed system provides practical experience to the learners in the field of analog electronics. This laboratory permits the learners to conduct experiments on real time with the internet facility using developed android mobile application. A characteristic of Junction Field Effect Transistors (JFET’s) related to analog electronics has been considered for remote laboratory experimentation. The designed system can be expanded by adding new experiments without any complexity. This M-learning based remote laboratory approach enables the sharing of resource between the institutions for the minimization of expense and also encourages learners by enhancing engineering education.

Wear Behaviour of Sansevieria and Carbon Fiber Reinforced Epoxy with Nanofillers: Taguchi Method

Anjum N1, Suresha B2, Ajit Prasad S.L3, Harshavardhan B4

1,2,3,4Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Sliding wear behaviour of combined chemically modified Sansevieria and Carbon fiber reinforced epoxy (TSria/CF-E) and its multi-phase nanocomposite coupons has been carried out by Taguchi design of experiments. A Taguchi L16 orthogonal array and ANOVA were used to examine the consequence of tribo-system parameters on the tribological behaviour of hybrid TSria/CF-E composites filled with nano-CaCO3 and nano-SiC. The specific wear rate was calculated for each experiment for nano-CaCO3 and nano-SiC multi-phase composites. The normal load was found to have the highest significant influence of 42.15% on the SWR of the nano-CaCO3 composite, whereas in case of the nano-SiC filled composites, the filler loading was found to have the highest significance of 62.34% on the SWR. The improvement in the wear resistance was attributed to high strength, high hardness, and good dispersion of nano-SiC particles, which can enhance the interfacial bonding of nanofiller and the epoxy matrix. The lowest specific wear rate of composite was 0.06 × 10-4 mm3/N m. Examination of the worn micrographs of the confirmation experiment shown adhesive and abrasive wear as the prevailing mechanisms.

Mechanical Performance of Hdpe/Uhmwpe Hybrid Composites and Tribological Characterization Using Taguchi Method

Suresha B1, Sriraksha2, Hemanth R3.

1,2Department of Mechanical Engineering, The National Institute of Engineering, Mysore
3Department of Mechanical Engineering, NIE Institute of Technology, Mysore

ABSTRACT

The physical, mechanical and tribological properties of short glass fiber (SGF) reinforced high density polyethylene/ ultra high molecular weight polyethylene (HDPE/UHMWPE blend) composites and zirconia (ZrO₂) filled hybrid composites were studied herein. The interfacial adhesion and the influence of the combined SGF and ZrO₂ reinforcements loading were examined to characterize the positive hybrid effect. The physical, mechanical and tribological properties of these hybrid composites were evaluated as per ASTM standards. The presence of SGF and ZrO₂ in the HDPE/UHMWPE blends enhanced the tensile strength. The three-body abrasive wear test were also investigated and the specific wear rate was increased with the increase in fiber/filler content. The selected fracture and worn surfaces of the test specimen were investigated by scanning electron microscopy.

The polymer blend of polyamide 66 and high density polyethylene (PA66/HDPE) (70/30 wt. %) was selected for the study. The polymer blend was reinforced with 20 and 25 wt. % short basalt fibers (SBFs). Blend reinforced with 25wt. % SBFs was further loaded with 5 and 10wt. % zirconia (ZrO$_2$) to study the positive hybrid effect. The physical properties such as density, void content and hardness of the composites were determined along with the mechanical properties such as tensile and impact as per the ASTM standards. Lastly, the fractured surfaces of specimens were examined using scanning electron microscope (SEM).
Design and Implementation of IoT Based Remote Laboratory for Sensor Experiments

Ramya M.V\textsuperscript{1}, Purushothama G.K\textsuperscript{2}, Prakash K.R\textsuperscript{3}.

\textsuperscript{1}Assistant Professor, Department of Electronics and Communication Engineering Sri Jayachamarajendra College of Engineering, Mysuru
\textsuperscript{2}Professor, Department of Electrical and Electronics, Malnad College of Engineering, Hassan
\textsuperscript{3}Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This article describes the design and implementation of a remote laboratory for learning sensors based experiments and its applications using embedded systems and Internet of Things (IoT) platform. The main objective of this remote laboratory is to enhance the learning on sensors in engineering education and dealing with the industrial automation applications. With the growing IoT platform for automation, the proposed system can monitor the sensor data and allows the learner to work from anywhere and anytime using mobile android application. Thus, learners can develop knowledge on sensors and control algorithms required for the automation industries and then deploy them on the real industrial automation modules.

Modal Analysis of FIAT Bogie of LHB Railway Coach

Suresh B.S1, Prithvi C2, Ramachandracharya S3.

1-2Department of Mechanical Engineering, The National Institute of Engineering, Mysore
3Department of Mechanical Engineering, SJCE, Mysuru

ABSTRACT

The Free vibration response of the Railway Bogie is an important area in the design of the Rail coach and to improve the ride comfort of the passengers. In this study, the railway Bogie considered is Fabric Italia de Automobil Torino, Switzerland (FIAT) Bogie of Linke Hofmann Busch (LHB) AC 3 Tier coach. This paper aims at the study of the vibration response of a FIAT Bogie of coach subjected to free vibration and to find the Natural frequencies of vibration and mode shapes. The geometric model FIAT Bogie and other related components is modelled using Solid works 2016 package and analyzed using numerical simulation package ANSYS 19.1 Workbench. The Primary and Secondary suspension systems and various dampers used in FE analysis are modelled as spring and damper elements respectively. In this work, free vibration analysis or modal analysis of the FIAT railway bogie is carried out to extract the first few modes of vibration. The Natural frequencies obtained along with the corresponding mode shapes of the bogie show that they are within the permissible range specified by the standards of railway department also for better ride comfort of the passenger.

We report the mechanism involved in sol-gel auto-combustion synthesis of Ba–Sr-hexaferrite (Ba$_{1-x}$Sr$_x$Fe$_{12}$O$_{19}$; $x = 0, 0.25, 0.5, 0.75$ and $1$, BSFO) ceramic powders through the analysis of the phases evolved during annealing of the as-synthesized powders, along with their structure and morphological studies. The XRD patterns of the as-synthesized samples indicate the formation of barium/strontium monoferrite ((Ba/Sr)Fe$_2$O$_4$) and maghemite ($\gamma$-Fe$_2$O$_3$) phases along with a minute amount of hematite ($\alpha$-Fe$_2$O$_3$) phase. Annealing of these samples facilitates formation of BSFO phase through the solid state reaction between BaFe$_2$O$_4$ and $\gamma$-Fe$_2$O$_3$ phase. Interestingly, after annealing the samples with $x = 0, 0.5$ and $1$, at $1000 \, ^\circ$C for $2$ h, we observed that phase pure Ba–Sr hexaferrite structure forms, but for samples with $x = 0.25$ and $0.75$, high amount of hematite ($\alpha$-Fe$_2$O$_3$) phase is observed, especially for $x = 0.75$. The reason associated with this could be the large difference between the ionic radii of Ba$^{2+}$ and Sr$^{2+}$ ions occupying the oxygen site. Furthermore, our study on annealing dependent phase evolution confirms that, this difference in ionic radii forbids the formation of a single phase Ba–Sr hexaferrite. The growth of clear hexagonal-shaped plate-like particles with varied particle sizes was observed for all the samples. The particle size variation may be due to the influence of the ionic radii difference on the sinterability of the samples. Our study provides a better understanding of synthesis mechanism of Ba–Sr hexaferrite samples.

*Full paper: Ceramics International, 2020
Effect of Substituting Fine Rutile of the Flux With Nano TiO₂ on the Improvement of Mass Transfer Efficiency and the reduction of welding fumes in the Stainless Steel SMAW Electrode

Vishnu B. Rajeswari¹, Sivapirakasam Suthangathan Paramashivan², Sreejith Mohan³, Shaju K Albert⁴, Rahul M⁵.

¹,²,⁵National Institute of Technology Tiruchirappalli
³Department of Mechanical Engineering, The National Institute of Engineering, Mysore
⁴Materials Technology Division, Indira Gandhi Centre for Atomic Research, Kalpakkam

ABSTRACT

This paper presents a novel method for reducing fume formation rate (FFR) and hexavalent chromium (Cr(VI)) concentration in welding fumes by substituting fine rutile in the flux of SMAW electrode with nano TiO₂. A maximum reduction of FFR up to 21% and Cr(VI) up to 42% was achieved in the experimental electrode. For the first time, the experimental study related the efficacy of mass transfer of specific elements to their percentage reduction in the emission. The results of the constituent analysis showed that Fe, Ni, Cr and Mn in the welding fumes were reduced up to 16%, 44%, 32% and 28% respectively due to the deoxidization property of the nano-Ti, which prevented the target elements to get oxidized.

Role of Nano-Caco₃ on Mechanical and Thermal Characteristics of Pineapple Fibre Reinforced Epoxy Composites

Mahadevaswamy H.S¹, Suresha B²

¹,²Department of Mechanica Engineering, The National Institute of Engineering, Mysore

ABSTRACT

In current research work, influence of nano-calcium carbonate (N-CaCO₃) with different filler loading (1, 3 and 5 wt%) on the mechanical behavior and thermal stability of pineapple fibre reinforced epoxy (PF/Ep) composites were considered. Hand lay-up method and ultrasonication method were used for the fabrication of agglomeration-free composite slabs. Test results showed that upon incorporation of N-CaCO₃ up-to 3 wt% enhanced the tensile, flexural properties and fracture toughness. Impact test results also showed an improvement in impact strength of N-CaCO₃ filled PF/Ep composites at 1 wt%. Thermal stability of PF/Ep composites was analyzed using thermo gravimetric analysis (TGA), and the data showed that the thermal stability of N-CaCO₃ filled PF/Ep composite was better when compared to unfilled PF/Ep composites.

Role of Graphene Nanoplatelets and Carbon Fiber on Mechanical Properties of Pa66/Thermoplastic Copolyester Elastomer Composites

Suresha B1, Hemanth G2, Hemanth R3, Lalla N.P4

1,2Department of Mechanical Engineering, The National Institute of Engineering, Mysore
3Department of Mechanical Engineering, NIE Institute of Technology, Mysore
4UGC-DAE-Consortium for Scientific Research, Indore Centre

ABSTRACT

In this work, the effect of graphene nanoplatelets (GNPs) on the physico-mechanical properties of short carbon fiber (SCF) reinforced polyamide 66/thermoplastic copolyester elastomer composites was investigated. The composites were fabricated with extrusion followed by injection molding method. The host matrix, fiber plus host matrix and graphene nanoplatelets loaded hybrid composites were examined for density, hardness, tensile, flexural and impact properties according to the governing ASTM standard. Fiber reinforcement decreased void content to < 1 % but GNPs were able to keep void content under limits. Hardness and impact strength augmented with 2 wt. % graphene nanoplatelets loading, owing to superficial dispersion developing the relationship between the hardness and impact strength. Graphene nanoplatelets loading benefitted the tensile property. However, the same has a deteriorating effect on flexural strength. Flexural modulus increases until 2 wt. %. Improvement in mechanical properties upon GNPs loading is very feeble when compared to the enhancement with SCFs loading to the host. Upon comparing the properties, it was observed that 2 wt. % of graphene nanoplatelets performed admirably and was recognized as an optimum filler loading. Morphology of fractured surfaces was studied by analyzing the scanning electron microscope images to understand the various features and mechanisms.

Dry Sliding and Abrasive Wear Behaviour of Al-7075 Reinforced With Alumina and Boron Nitride Particulates

Rakshath S¹, Suresha B², Sasi Kumar R³, Saravanan I.⁴

¹,²Department of Mechanical Engineering, The National Institute of Engineering, Mysore
³Department of Mechanical Engineering, Selvam College of Technology, Namakkal
⁴Department of Mechanical Engineering, Adhi College of Engineering and Technology, Kanchipuram

ABSTRACT

Present research examination focuses on the surface morphology; mechanical properties and wear conduct of Al-7075 metal matrix composites reinforced with alumina and hexagonal boron nitride fillers. Particulate reinforced Al-7075 metal matrix composites were manufactured following the two step stir casting method with differing the weight percentage (2.5 and 5) of reinforcement. Uniform dispersion of alumina and hexagonal boron nitride in pure alloy was verified by optical microstructure. The fabricated samples were subjected to abrasion using dry sand rubber wheel abrasive wear test rig by varying the abrading distance and the applied normal load. Silica sand of particle size 350–400 μm was used as abrasive medium. Mechanical and dry sliding wear test results indicated that both alumina and hexagonal boron nitride fillers show improved mechanical properties and wear resistance. From the abrasive wear test results, it was recognized that the wear resistance of composites is increased by increasing the weight percentage of reinforcements and the reinforced composite gave better resistance against abrasion than the control sample (Al-7075). Further, it was adjudicated that 5 wt% micro hexagonal boron nitride reinforced Al-7075 composite prompts predominant abrasion resistance. Finally, it was presumed that hexagonal boron nitride and alumina fillers gracefully and successfully improved morphological, mechanical, and also the wear properties of Al-7075 alloy for various engineered load-bearing applications.

Tribological Behaviour of Neem oil with and without Graphene Nanoplatelets Using Four-Ball Tester


1, 2, 3 Department of Mechanical Engineering, The National Institute of Engineering, Mysore
4 Visvesvaraya Technological University, Belagavi

ABSTRACT

The present work was aimed to study the friction and wear behaviour of graphene nanoplatelets (GNPs) under extreme pressure conditions as an anti-weld additive for neem oil. The effect of neem oil, blended with various loading of GNPs on the friction and wear characteristics has been investigated. From the experimental results, it was found that 1 wt.% of GNPs in neem oil showed the least coefficient of friction and smoother wear scar diameter. The extreme pressure test was performed on neem oil with and without GNPs as per ASTM standards. The extreme pressure test results indicated the improvement in seizure load of neem oil by 27.8% at 0.5 wt.% of GNPs as compared to pure neem oil. Optical microscopy of worn steel ball surface revealed the pit formation and the formation of wedge cutting edge in GNPs modified neem oil.

*Full paper: Advances in Tribology, 2020
Microstructure, Mechanical Properties and Sliding Wear Behaviour of Silicon Carbide Reinforced Al 6026 Composites

Somashekar H.M\textsuperscript{1,}, Gowthama K\textsuperscript{2,}, Suresha B\textsuperscript{3,}

\textsuperscript{1,2}Department of Mechanical Engineering, Dr. Ambedkar Institute of Technology, Bengaluru
\textsuperscript{3}Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

In this research work, the role of fine silicon carbide (SiC) particles on mechanical properties and dry sliding wear behaviour of Al 6026 composites were investigated. Al 6026 matrix reinforced with different weight percentages (3, 5, 7, and 10) of SiC particles have been fabricated following liquid metallurgy route. Microstructure, hardness, and tensile properties of these composites were evaluated and compared with Al 6026. In addition, dry sliding wear behaviour of Al 6026 based composites were conducted using pin-on-plate wear test rig. Worn-out coupons of the selected composites were analyzed using scanning electron microscope for predicting the involved wear mechanisms. The major findings are: i) Al 6026 composites showed improved hardness, tensile strength and Young’s modulus, ii) tensile properties of Al 6026/10\% SiC composites were lower than Al 6026/7\% SiC indicating that the critical weight fraction of SiC in Al 6026 is 7\%, iii) specific wear rate of Al 6026 and SiC reinforced Al 2026 composites increases with increasing applied normal load and coefficient of friction decreases slightly at higher load, and iv) specific wear rate and friction coefficient of Al– SiC are lower than that of unreinforced Al 6026. These results reveals the effect of SiC reinforcement on improved mechanical properties, reduced friction coefficient, and better wear resistance of Al 6026 composites and provide a useful attendant for healthier control of their wear.

Multi-Objective Optimization for Preemptive and Predictive Supply Chain Operation

Kiran Kumar Chandriah 1, Raghavendra N.V 2.

1Mercedes Benz Research and Development, Bengaluru
2Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

At present, the manufacturing industry has undergone a tremendous change in its operating principle with respect to the supply chain management system where the demands of consumers are dynamically and exponentially rising. Although Industry 4.0 offers a significant solution to this principle with the aid of its predictive automated operating process, till date there is less number of fault tolerant model that can effectively meet the standard demands of supply chain planning. Therefore, the proposed system introduces an analytical model where predictive optimization is carried out towards bridging the gap between supply and demands in supply chain 4.0. An analytical framework is a design from constraints derived from practical environment in order to offer better applicability of it. The study outcome shows that the proposed model could offer better performance in comparison to the existing optimization method with respect to the better budget control system for offering predictive and preemptive model design.

Optimization of Abrasive Wear Behaviour of Halloysite Nanotubes Filled Carbon Fabric Reinforced Epoxy Hybrid Composites

B Muralidhara¹, S P Kumaresh Babu², G Hemanth³, B Suresha⁴

¹,²Department of Metallurgical and Materials Engineering, National Institute of Technology, Tiruchirappalli
²Robert Bosch Engineering and Business Solutions Pvt Ltd, Bangalore
³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This research article presents the role of halloysite nanotubes (HNTs) incorporated carbon fabric/epoxy under a dry sand three-body abrasive wear (D3BW) condition. HNTs filled carbon fabric/epoxy nanocomposites are structured by hand layup assisted by the vacuum bagging process. The experiments were planned using L16 Taguchi array. The load, abrading distance, and filler loading were considered as a controlling factor. Wear volume loss associated in D3BW with two different sand particles size (212 μm and 425 μm) were investigated. Post-wear surface morphology was observed under the scanning electron microscope, and micro-cutting, and micro-ploughing were predominant. Both 212 μm and 425 μm sand particles had a similar wear volume loss, but, the composites were wear-resistant towards the 425 μm sand particles. Based on the experimental results, analysis of variance and multi-linear regression models, the load, abrading distance, load + abrading and load + filler loading had considerable impact on the abrasive wear on the composites. However, the filler loading had no definite impact on the abrasive wear behaviour.

*Full paper: Surface Topography-Metrology And Properties, Vol.8, Issue.4, 2020
A Review on TiO2 in Photo Catalytic Activity and Self Cleaning Effect

Madhusudhana R¹, Madhurya S², L. Krishnamurthy³, R. Gopalakrishne Urs⁴.

¹,²,³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁴Department of Physics, The National Institute of Engineering, Mysuru

ABSTRACT

This review exemplifies the significance of TiO₂ in Photo Catalytic Activity and Self Cleaning Effect. Photo induced hydrophilicity of titanium dioxide can be used in self-cleaning. In order to comprehend the self-cleaning effect, we should first know the relation between the photo hydrophilicity and photo catalysis. The main barrier is that quick association of photo generated electron-hole pair and poor activation of TiO₂ by visible light. So to expand the activation range of TiO₂, many investigators are conducting researches by adding different kinds of dopants to TiO₂ to optimize the effects.

Advancements in Quantum Computing - A Review

R Madhusudhana1, K C Navyashree2, L Krishnamurthy3, R. Gopalkrishne Urs4.

1,2,3Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
4Department of Physics, The National Institute of Engineering, Mysuru

ABSTRACT

Quantum Computing is the rapidly developing research field. This paper gives an insight to the Quantum Computing and its advancements till date. The quantum technique combines the Quantum Mechanics, Computer Science and Classical Information Theory. Here generally, the information will be identified first. Then this information will propagate to cause the quantum computation effect. It has a fundamental position in the physics [3]. However, the mathematical treatment of information, especially information processing, is quite recent and necessary to get error free information. In the classical computation Moore’s law was being applied to process the information. But Moore's law will stop being relevant soon, as we are beginning to utilize another type of calculation which is Quantum Computing. For a very long time at this point, computers have been getting smaller and more remarkably powerful. However, in spite of these advances, there are as yet numerous issues that can't be unraveled by amazing PCs and there is no assurance we will have the option to illuminate them yet it might be solved through the quantum processing [9].

*Full paper: International Journal of Scientific Engineering and Research (IJSER), Vol. 8, Issue 12, 2020
**Carbon Nanotubes as Cementious Material, Effects and Properties in Cement Composites – A Review**

R. Madhusudhana¹, K. L. Sushma², L. Krishnamurthy³, R. Gopalkrishne Urs⁴.

¹,²,³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁴Department of Physics, The National Institute of Engineering, Mysuru

**ABSTRACT**

Cement is commonly used in all the construction industries. This wide usage of cement has become more which may cause some important environmental impact. In order to avoid this, Carbon Nanotubes (CNT’s) are used as cementious material as they exhibit remarkable mechanical properties like tensile strength, compression strength. These kinds of Nano materials also enable structural and energy conversation. In this paper, we review the effects of incorporation of CNT’s used as cementious material and the methods by which CNT’s are dispersed into cement.

Influence of Surface Treatment on ABS Parts Printed Using Fused Deposition Modelling

Sunil Gaekwad¹, Santosh Kumar A. N².
¹²Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Fused Deposition Modeling (FDM) is the most commonly used Additive Manufacturing (AM) method for converting 3D designs into physical plastic models. The layer by layer addition of the material results in an uneven surface finish of the final product. In this study, the samples for the coating processes were printed as per the ASTM standards needed for mechanical tests, different post processing techniques viz. sputtering, spray painting and acetone dipping were carried out and these coated specimens were then tested for hardness & measured for roughness and the results showed noticeable improvements. A comparison has been made between the results of different post processing techniques in order to determine the most suitable process.
Improvement in Properties of Chromium Coated ABS Parts

Sunil Gaekwad¹, Dr. Santosh Kumar A. N².

¹Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
²Department of Mechanical Engineering, Sri Jayachamarajendra College of Engineering, Mysuru

ABSTRACT

Fused Deposition Modelling (FDM) creates parts with complex designs by extruding layers of polymers, such as acrylonitrile butadiene styrene (ABS) one on top of another. All parts printed using FDM have presented with a rough surface. There are numerous parameters that influence the thermo-mechanical properties of the FDM parts and further study is needed to fully comprehend their inter relationship. Most studies agree on the fact that coating will improve its mechanical properties. However, very few standards have been established. An attempt has been made to coat ABS parts with a chromium based paint in order to determine the significance of the coating. Tests conducted on the coated parts have shown an increase in hardness and impact strength while the surface roughness has reduced. KEYWORDS: Rapid Tooling, Fused Deposition Modelling, Additive Manufacturing, Surface Roughness, Thermo Mechanical Properties & Chromium Coating.

Implementing SCADA System by Using Rexroth Winstudio for Automated Industrial Process

M. S. Vikas¹, V. Vikram Athreya².

¹²Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This paper represents controlling and monitoring of machine failures that happen a lot over the industry; the injuries are due to the collapse of machines or monitoring, irregular checking, and machine controlling. These accidents are very harmful to individuals working in a factory environment. To handle such situations, machine failure and monitoring can be detected by using the SCADA system with the help of IOT, to handle the system parameter mechanically. This paper provides modern solutions for controlling and monitoring machine faults from anywhere, anytime by using the internet which will boost worker safety in the industries.

Effect of Fiber Orientation on Vibration Response of Glass Epoxy Composite Beam

Prasanta Kumar Samal1, I.S Pruthvi2, B.S. Suresh3.

1,2,3Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Composite materials constitute a considerable portion of today’s most of the applications like space, missiles, submarines, and sports equipment due to their properties such as high strength and stiffness to weight ratios, high durability, fatigue life, and high corrosion resistance. The performance of composite materials is generally based on the mechanical and dynamic characteristics such as tensile, compression, flexural, impact, and free vibration properties. It is therefore essential to establish material performance under various conditions. In this study, the effect of fiber orientation on vibration response of composite beam examined with different boundary conditions. Composite beam specimens were fabricated using glass fiber and epoxy resin with different fiber angle orientations. Dynamic properties such as natural frequency and damping factor were experimentally determined by experimental modal analysis. The accelerometer is mounted on the specimen, and by using the National Instruments data acquisition system NI-DAQ the signals were acquired and the results were plotted. Graphs are obtained in both the time domain and frequency domain. With the help of time-domain graph, damping ratios were calculated using the logarithmic decrement method and from frequency domain graph natural frequencies were obtained. Numerical analysis was carried out in ANSYS with different boundary conditions. The effect of fiber angle orientation on natural frequency and damping factor was studied. It is found that as fiber orientation increases from 0° to 90° natural frequency decreases but damping ratio increases.

*Full paper: Materials Today: Proceedings, 2020
Experimental Determination of Mode Shapes of Beams By Roving Impact Test

C.Amara Chandra¹, Prasanta KumarSamal²

¹²Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

In this work, an attempt has been made to determine the mode shapes of a beam by experimental roving impact tests without using an FFT analyzer. The roving impact test was performed by acquiring the vibration using the National Instruments data acquisition system (NIDAQ) and LabVIEW. The acquired data was subjected to post-processing using MATLAB to determine the mode shapes. The mode shapes were determined using both roving accelerometer and roving hammer impact tests. The results were found to be in good agreement with each other. The numerical modal analysis of the beam was also carried out using the finite element package, ANSYS and compared with the experimental results. The maximum percentage error in natural frequency was found to be 4.26%.

*Full paper: Materials Today Proceedings, 2020*
Machine Logic Program Development and Electrical Design of H Gantry Automation System for Compressor Housing

Ravikumar Beeranur¹, K.R.Prakash², Ravikiran B.P³

¹,²,³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Automation is one of the growing fields, and is being used at levels from small scale industries to very a large scale industries due to the advantage of increase in productivity and quality, along with it recently new revolution in the automation 4.0 enabling the data monitoring possible which helps in better control and monitoring of machineries and equipments. The objective of the work is to design electrical circuit and perform suitable control actions such as loading and unloading of heavier components to machines, indexing, providing suitable safety for the devices and improvising productivity and quality rate in the production line. These activities are being done by a control system adopted to gantry system, in such control systems there will be provision for manual control, auto mode, jog mode & edit mode to enable the work to be carried out smoothly and effectively. Such complete system is designed to reach the customer required production cycle time with 6 axis (y,z1,z2,x1,x2,c), these axis are controlled by CNC controller and all other Stations like IPC, OPC, tilting stations are controlled by the PMC controller, which is the part of CNC.

Study of Tribological Properties on Aluminium Based Hybrid Composite Developed Through Microwave Energy

K.Raghavendra Pai¹, Ajit M.Hebbale², J.S.Vishwanatha³, B.Sachin⁴

¹²³ Department of Mechanical Engineering, N.M.A.M. Institute of Technology, NITTE, Udupi
⁴ Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bengaluru

ABSTRACT

Aluminium alloy 6061 is used as a matrix material and reinforced with alumina and molybdenum disulfide by microwave sintering method. The conventional sintering technique has taken many years as of now and which also has several limitations like time and power-consuming. Microwave processing techniques are in the recent use of attraction to resolve the limitation of conventional techniques. In the current work Al6061 hybrid metal matrix composite reinforced with alumina and molybdenum disulfide (Al + 4% of Al₂O₃ + 2% of MoS₂) was developed through a domestic microwave oven. The microstructural study reveals the consistent distribution of Al₂O₃ and MoS₂ reinforcement in the microwave developed composite material and very minute porosity was observed in the developed structure. Microwave processed composites shown higher wear resistance than the aluminium alloy. The wear rate of the Al matrix is more compared to that of the developed microwave hybrid metal matrix composite with a composition of Al + 4% Al₂O₃ + 2% MoS₂. The Addition of Al₂O₃ and MoS₂ reinforcement might have resulted in the improvement of wear resistance of the developed material. Plastic deformation and formation of oxide on the surfaces at elevated temperature were observed on the developed microwave composite, which further allows for easy sliding over the surface of the disc surface and reduction of wear loss at faster speeds.

*Full paper: Materials Today: Proceedings, 2020*
Physical and Mechanical Properties, Morphological Behaviour of Pineapple Leaf Fibre Reinforced Polyester Resin Composites

Praveena B A¹, Balachandra P Shetty², B.Sachin³, Shiv Pratap Singh Yadav⁴, Avinash L⁵
¹,²,³,⁴,⁵Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bengaluru

ABSTRACT

The article focuses on the study of the physical, mechanical, and SEM of pineapple leaf fibre reinforced polyester composites. An investigation has been carried out in this relation to allow better use of PALF to manufacture value-added goods. Normal composites made from fibre are under intensive research because of their environmentally friendly nature and peculiar character. Their continuous supply is beneficial for natural fibres, simple to handle and naturally biodegradable. In this research, the hand lay up process was used to manufacture composites. SEM was used to clarify the topography of fibre, matrix adhesion, fibre breakage, and failure. Related with additional regular fibre composites based on cellulose, the PALF polyester composites have greater mechanical properties. It was also experiential that as the fibre content increase young’s modulus and tensile strength also increases and it was found to be 2545 MPa and 66 MPa, respectively, at 40 Wt. %. Even compression strength & hardness values also increase with an increase in the fibre content at 40 Wt. %. The compression strength of 23 MPa and hardness of 83 was recorded. This was observed with SEM where fibres and matrix have exposed well miscibility at 40 wt. % of PALF.

*Full paper: Advances in Materials and Processing Technologies, 2020
Effect of ECAE Die Angle on Microstructure Mechanical Properties and Corrosion Behavior of AZ80/91 Magnesium Alloys

Gajanan Manjunath Naik¹, Sachin Bandadka², Manjaiah Mallaiah³, Ravindra Ishwar Badiger⁴, Narendranath Sannayellappa⁵

¹,³,⁴,⁵Department of Mechanical Engineering, National Institute of Technology, Surathkal
²Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bengaluru

ABSTRACT

Magnesium alloys have poor tensile strength, ductility and corrosion resistance properties associated with other engineering materials like aluminum alloys, steels and superalloys etc. Therefore, many researchers worked on equal channel angular pressing of magnesium alloys to improve the mechanical properties and corrosion resistance. In this work, the effect of channel angles on material properties was investigated during equal channel angular pressing of AZ80/91 magnesium alloy using processing route-R at 598 K processing temperature. Channel angles of 900 and 1100, common corner angle of 300 have been considered for the study. It has been revealed that the channel angle has a significant influence on deformation homogeneity, microhardness, ultimate tensile strength, ductility, and corrosion behavior of AZ80/91 magnesium alloys. Specifically, AZ80/91 Mg alloys processed through 900 channel angle i.e. die A is considered as optimal die parameter to improve above-said material properties. Investigation showing asreceived AZ80 and AZ91 Mg alloy indicates 11%, 14% improvement of UTS and 69%, 59% enhancement in ductility after processing through 4P through die A (90°) at 598 K respectively. Also, the corrosion rate reduces to 97% and 99% after processing the sample with 4P-ECAP die A (90°) at the same processing temperature for AZ80 and AZ91 Mg alloys respectively. This is mainly due to grain refinement and distribution of Mg17Al12 secondary phase during ECAP.

*Full paper: Magnesium Alloys, 2020
Microstructure and Mechanical Properties of TiO2 Reinforced ZA22 Metal Matrix Composite

Gajanan M.Naik¹, B.Sachin², Ravindra I.Badiger³, Ajit M.Hebbale⁴,

¹Department of Mechanical Engineering, Mangalore Institute of Technology and Engineering, Moodbidri, Mangaluru
²Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bangalore
³Department of Mechanical Engineering, Yenepoya Institute of Technology-Moodbidri, Mangalore
⁴Department of Mechanical Engineering, NMAM Institute of Technology, Karkala

ABSTRACT

The mechanical and physical properties that are achieved with Zn-Al metal matrix composites (MMCs) have made them popular candidate materials for automotive, aerospace and several other applications. In recent years, Zn-Al alloys are used as bearing and bushing materials as a substitute for copper based and aluminium based bearing materials due to their relatively low costs and superior tribological characteristics. Additions of hard ceramic particulates like SiC, Al₂O₃, TiO₂, graphite etc., contribute in significant improvement of mechanical properties and sliding wear behavior of MMCs. In the present work, four Zn-22Al-2.5Cu alloys were developed by addition of TiO₂ varying between 0 and 6% through stir casting route. The effect of TiO₂ addition on Zn-22Al-2.5Cu alloys has been investigated through microstructural study, tensile test, hardness test and wear characteristics. The alloy with 6% TiO₂ addition revealed a dendritic structure and exhibited superior mechanical properties and sliding wear behavior over the other three compositions.

*Full paper: Materials Today: Proceedings, 2020*
Application of Desirability Approach to Optimize the Control Factors in Cryogenic Diamond Burnishing

B. Sachin¹, S. Narendranath², D. Chakradhar³

¹Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bangalore
²Department of Mechanical Engineering, National Institute of Technology, Surathkal
³Department of Mechanical Engineering, Indian Institute of Technology Palakkad

ABSTRACT

Cryogenic diamond burnishing is an impactful method to enhance the functional performance of the product. In this article, an experimental study on the diamond burnishing of 17-4 precipitation hardenable stainless steel in a cryogenic cooling condition has been presented. This material has excellent corrosion resistance, high strength and enormous applications in the manufacturing industries. The control variables were namely burnishing force, burnishing feed and burnishing force have been studied and modeled for the output responses explicitly surface hardness and surface roughness. The influence of control variables on performance features has been analyzed using response surface graphs. The significant influence of burnishing conditions on the output responses was established by analysis of variance. Desirability function approach has been employed to optimize the multi-performance characteristics. At the corresponding highest desirability, the optimal process parameter combination was found to be burnishing feed = 0.053 mm/rev, burnishing speed = 31.29 m/min and burnishing force = 200 N which yields a minimum surface roughness = 0.199 µm and maximum surface hardness = 397.48 HV. The maximum percentage of error among the predicted and experimental results was found to be 10% and 2%, respectively, for surface roughness and surface hardness. The investigational findings were observed to be in agreement with the predicted value with permissible deviation.

Effect of Reinforcement on Tensile Behaviour of MWCNT Filled Thermoplastic Composites

Shrinatha R. Katti1, M. V. Achutha2, B. K. Sridhara3.

1Department of Mechanical Engineering, NIE Institute of Technology, Mysuru
2,3Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Polypropylene (PP) is one of the most widely used engineering polymers. In this study, multiwalled carbon nanotube (MWCNT) and carbon Nanopowder (CNP) were melt blended into PP in the different ratios for two different set of composites. For first set 2.5, 5 and 10 wt.% was mixed using twin screw extrusion process. The extruded pellets were then injection moulded using a 50 Ton injection moulding machine to produce PP+MWCNT composite flattest specimens according to ASTM standards and were used to carry out the tensile tests. While there is a reduction in failure strain and a marginal increase in ultimate tensile strength, there is nearly 65 % increase in young’s modulus with MWCNT as reinforcement. These experimental values were compared with the theoretical values calculated using Halpin-Tsai model for randomly oriented fibres. There was significant deviation of the theoretical data from the experimental data. The comparison and analysis of theoretical and experimental results are carried out in the present work. A mathematical model equation has been fit for the variation of young’s modulus in both the sets of composites. The variation has been found to be constant in terms of the parameters of the equation. This shows the variation of the tensile properties are proportional to the degree of reinforcement.

Opportunities for Aluminium Lm6 -Boron Carbide (B₄C) Metal Matrix Composites in Fatigue Based Applications: A Review

Arun C Dixit¹, M V Achutha², B K Sridhara³, GVN Elavindhan Vaither⁴.

¹,⁴Department of Mechanical Engineering, Vidyavardhaka College of Engineering, Mysuru
²,³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Due to their low density and high stiffness, metal matrix composites are becoming increasingly relevant in many load-bearing and fatigue related applications. MMC offer exceptional mechanical and tribological properties over traditional monolithic metals and presently are considered as probable material for light weight applications. The lesser density, high elastic modulus, strong efractoriness and higher hardness compared to other cermaic reinforcements make boron carbide a better option as reinforcement. This paper comprehensively reviews processing, properties and microsturcture of boron carbide reinforced composites and justifies the incorporation or use of aluminum LM6 alloy as a potential matrix material. Also, current developments and opportunities of using boron carbide reinforced aluminum LM6 metal matrix composites for numerous fatigue related applications are discussed.

*Full paper: International Journal of Mechanical and Production Engineering Research and Development (IJMPERD), Vol.10, 2020
Elastic Properties of Aluminum Boron Carbide Metal Matrix Composites

Arun C.Dixit¹, M.V.Achutha², B.K.Sridhara³.

¹Department of Mechanical Engineering, Vidyavardhaka College of Engineering, Mysuru
²³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Metal matrix composites are being used increasingly for various applications in automotive, aerospace and industrial applications. The present investigation deals with boron carbide used as reinforcement with Aluminum alloy LM6. They offer distinct advantage as they result in a composite with net weight decreasing since density of boron carbide is less compared to aluminum. Since aluminum has better strength to weight ration compared to steel they can be proposed as the candidate material for automotive and especially driveshaft applications. Tension test and Torsion test were carried out according to ASTM E8 and ASTM E143 standards respectively. The weight percentage of reinforcement was chosen up to 7.5 percent. The prepared composite specimen’s demonstrated increase in tensile strength, young’s modulus, torsional strength and shear modulus up to 6 percent weight percentage of reinforcement. Consequently, there was decrease in percentage of elongation, angle of twist and Poisson’s ratio with the incorporation of boron carbide.

*Full paper: Materials Today: Proceedings, 2020*
Design and Development of IOT Based Smart Electronic Energy Meter and AC Control System for Smart Homes

Sririsha P1, Dr. M V Achutha2, Yogesh M Iggalore3.

1,2Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
3Department of R&D IOT, METI M2M Pvt Ltd, Mysore

ABSTRACT

Increasing demand and cost of energy has led many organizations to find smart ways for controlling, monitoring and saving energy [7]. This project proposes the concept of monitoring the energy/power consumed by the smart homes. Data such as voltage, frequency, KWH is fetched from the energy meter through Modbus protocol and sent to the cloud. The fetched data can be viewed in real time through mobile application. We can see the person coming from electricity board, whose duty is to read the energy meter and give the bills to the house owner every month. According to that reading which is given by electricity board we have to pay the bills. The main drawback of this system is that person has to go everywhere to read the meter of every house and handover the bills. To overcome this problem we have come up with an idea which will eliminate the third party or the human resource between the consumer and service provider (electricity board), even the errors will be overcome. From this energy monitoring and optimization, the energy can be utilized efficiently and will save the amount of energy. In this project we are designing an efficient IOT based electronic energy meter which is used in optimization of energy consumption and in billing system. In this project we also design an AC control device which helps in ON and OFF of the AC appliances. The data which is stored in the cloud, can be used for analyzing the energy consumption as well as the amount of energy saved by energy optimization.
Fatigue Behaviour of Polymer Nano Composites-A Review

Shrinatha R. Katti¹, M. V. Achutha², B. K. Sridhara³.

¹Department of Mechanical Engineering, NIE Institute of Technology, Mysuru
²³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Most of the household articles and devices which we use in everyday life are made of natural polymers and synthetic polymers. Existing research also reports that polymer nanocomposites show far better performance versus micro-fillers. Premature failure, of the machine components, occurs well within the endurance limit of the material. This failure due to fatigue is a common phenomenon on many of the applications across industries and hence the prediction and prevention of fatigue failures is critical for safe and economic operation of machines. This work reviews various methods of fatigue characterization of polymer composites. Stress–life and strain–life approaches have been applied by many researchers in this domain. The fatigue characterization leads to the development of life estimation curves by both these methods. There are also works done on other methods to arrive at Stress–life curves. This paper addresses these different methods of characterization and compares them. The analysis of these data for evaluation of various fatigue parameters is also covered in this work.

Performance Evaluation of Automotive Plastic Fuel Tank Using Finite Element Analysis

Mudassar Bhisty\textsuperscript{1}, Dr. Sharath Chandra N\textsuperscript{2}.

\textsuperscript{1}Student Department of M.Tech (Machine Design), The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The requirement in an automotive industry is to have lightweight, safe and efficient Systems. A Fuel tank is one of important systems which feeds the engine of the vehicle. In current era where the transition is taking place from conventional steel tank to the plastic fuel tank, it is required to have a safe structural container for the fuel. In case of hybrid vehicles where the engine is run by battery as well as fuel, it is challenging for the plastic fuel system to resist the high internal vapor pressure due to overheating of fuel. To overcome with this difficulty, rectangular tank geometry with various bead configurations and stiffening pillars is considered in an approach to study their effect in reducing tank deformations. The approach relies on determination of the tank behaviour in terms of displacement and von mises stress for the applied test pressure. CATIA modelling tool is used to build the CAD model of the Fuel Tanks and FE model preparation is carried in Altair HyperMesh pre-processing package. Ansys Mechanical APDL is utilized to solve these models. Results obtained showed that stiffeners inside the fuel tank have improved the structural strength to avoid failure due to large deformations by fulfilling the industrial requirement for automotive fuel tank.

*Full paper: International Conference on Advances in Mechanical Engineering Sciences & Management-2020” (ICAMESM-2020), 2020*
Design, Analysis and Fabrication of a Roll cage for an All-Terrain Vehicle (ATV)

Sandeepa Bola Kamath¹, Sandesh Prasanna Kamat², K.R.Mrinal³

¹,²,³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The chassis or roll cage is an important part of an All-Terrain Vehicle (ATV) that provides a structural support and also a protective shield to the driver in case of any accidents and roll overs. It also serves as a blueprint for the mounts of various other subsystems such as brakes, steering, engine, gearbox and suspension. The roll cage is designed by the guidelines from the Society of Automotive Engineers (SAE). The design aims to make a compact, lightweight and high strength roll cage. This study involves the material selection, design and analysis of the roll cage. Also to find the optimum values of Factor of Safety (FOS) for all the impact conditions that the roll cage can undergo at the event site.

*Full paper: 1st International Conference on Frontiers in Engineering Science and Technology, 2020, Yenepoya Institute of Technology, Moodabidri, Mangalore, Karnataka 574225
Static Analysis of LHB Railway Coach with FIAT Bogies

B. S. Suresh¹, C. Prithvi², Srinidhi Ramachandracharya³.

¹Student Department of M.Tech (Machine Design), The National Institute of Engineering, Mysuru
²Assistant Professor Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
³Professor Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Analysis of Rail coach is a major aspect of the design of Rail coaches under Static loading conditions. The study of Fabric Italina de Automobil Torino, Switzerland (FIAT) railway bogie forms a basis for investigating the behavior of the entire LHB coach. Linke Hofmann Busch (LHB) 3 Tier AC coaches consist of two Fiat bogies, where the central distance between the bogies is 14.9 m. This paper aims at the study of the behavior in an LHB Rail coach with FIAT Bogie subjected to static loading using Finite Element analysis. In this work, static analysis of the FE Model of a LHB coach is performed in ANSYS 19.1 by applying a static load at the location of Centre of Gravity of the coach. Initially, major components of LHB coach is modelled using Solid works 2016 package and the geometry is exported to the finite element tool (ANSYS). The Boundary conditions and Material properties were given as per standards prescribed by Indian Railways. The major findings are to identify the critical sections of LHB Coach which are subjected to high stresses. From the results of static analysis, we can infer that the prescribed model would withstand the given load condition or it could be optimized. The outcome of this project work may help the LHB coach of railway to go for an optimized design with alternate materials which are light in weight and thus providing better comfort of the commuters.

Design and Analysis of Folding Mechanism for a Horizontal Stabilizer in a Helicopter

H.S. Karthik¹, C. Prithvi².

¹Student  M.Tech Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
²Assistant Professor Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

An Advanced Light Helicopter (ALH) is a multirole and multi-mission helicopter for army, air force, navy, coastguard and civil operations. For the navy, the ALH has to be accommodated inside the hangar in a ship’s deck. The hangar doesn’t accommodate the ALH and for its accommodation inside the hangar, the tail boom and horizontal stabilizer of the ALH is folded. The horizontal stabilizer is split and two machine ribs are placed at the split area where a hinge mechanism is used with a locking pin for the movement of the horizontal stabilizer (moving and nonmoving segment). Two Eye and Fork End combination is used. Fork End is placed at the non-moving segment of the horizontal stabilizer, whereas Eye End is placed at the moving segment. Eye End is rotated with respect to Fork End hinge point. A detailed designing of all mechanisms involved in this context is carried out and analysis of all individual components is done. Suitable ‘Airworthy’ material has to be selected. A mechanism has to be developed in such a way that the locking pin has to be in its engaged condition when the ALH is in positive flight condition.

Influence of Short Carbon Fiber Content on Thermal Properties of Polyethersulfone Composites

Harshavardhan B\textsuperscript{1,}, Ravishankar R\textsuperscript{2,}, Suresha B\textsuperscript{3,}, Srinivas S\textsuperscript{4,}, Arun C. Dixit U\textsuperscript{5,}

\textsuperscript{1,3}Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Mechanical Engineering, Sri Jayachamarajendra College of Engineering, Mysuru
\textsuperscript{4}Product Development Department, Brakes India Private Limited, Nanjangud
\textsuperscript{5}Department of Mechanical Engineering, Vidyavardhaka College of Engineering, Mysuru

ABSTRACT

Heat dissipation plays progressively more significant role in several fields such as high-density gadgets, airplane microelectronics devices, advanced space crafts, thermal power plants, turbo-charger, due to the swiftly increasing thermal loads affects the reliability of components and limits its life span. With high stiffness, strength and low coefficient of thermal expansion (CTE), carbon fiber strengthened polymer composites have been broadly utilized in numerous engineering applications. Therefore, in the current material investigation, thermal characterizations were made on polyethersulfone (PES) material compounded with short carbon fiber (SCF) by four different weight fraction via 0, 10, 20 and 30 wt\%. Specific heat (c\textsubscript{p}) was determined through differential scanning calorimeter (DSC) and thermal conductivity was measured by transient line heater method. Specific heat of PES/SCF composites decreased and conductivity was increased with the higher loading of SCF. Thermal diffusivity was in turn computed by using the relation between specific heat and thermal conductivity. In addition, numerical analysis was performed in Abaqus finite element package to simulate the transient line heater method. Temperature profiles of the composites extracted by numerical simulation matched with that of experimental temperature profile.

*Full paper: Materials Today: Proceedings, 2020*
Thermal Characterization of Polyethersulfone Composites Filled With Self Lubricants

Harshavardhan B\textsuperscript{1,}, Ravishankar R\textsuperscript{2}, Suresha B\textsuperscript{3}, Srinivas S\textsuperscript{4}, Arun C. Dixit U\textsuperscript{5}.

\textsuperscript{1,2}Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Mechanical Engineering, Sri Jayachamarajendra College of Engineering, Mysuru
\textsuperscript{4}Product Development Department, Brakes India Private Limited, Nanjangud
\textsuperscript{5}Department of Mechanical Engineering, Vidyavardhaka College of Engineering, Mysuru

ABSTRACT

As of late, a lot of research has been performed on the thermal degradation of polymer matrix composites since this is a significant issue in the utilization of thermoplastic and thermoset polymers in various kinds of conditions that are exposed to temperature changes. These composite systems performance under various temperatures is a significant boundary to be considered on the grounds that it can, in many cases, decide the upper bound on the temperatures at which a material has reasonable properties. Relative motion between the two contact bodies always results in progressive loss of material from the less hardened surface by various modes of wear. Generally, Normal load establishing the contact, relative velocity, sliding distance and hardness of materials decide the amount of wear. In addition to these, temperature which arises due to friction at the interface of the contact surfaces significantly controls the wear. In order to consider the effect of contact temperature on the adhesive wear of polymeric composites, thermal parameters such as thermal conductivity, diffusivity and heat capacity are required. Therefore, in this work, the abovementioned thermal parameters were determined by flash method for short carbon fiber (SCF) reinforced polyethersulfone (PES) composites filled with two well known self lubricating materials, namely, potassium titanate whisker (PTW) and ultra high molecular weight polyethylene (UHMWPE). Thermal conductivity of SCF reinforced and PTW filled PES composites were improved whereas UHMWPE filled composites showed no significant change in their conductivity. In addition, numerical simulation was performed using the experimental results in Abaqus package. Simulated results were found aligned with experimentation results.

*Full paper: Materials Today: Proceedings, 2020
Microstructure and Mechanical Properties of Flyash Cenospheres Reinforced Copper Composites Produced by Powder Metallurgy Route

Pragnya Pradeep\textsuperscript{1,}, Aravind Rao M Y\textsuperscript{2,}, Seetharamu S\textsuperscript{3,}, Mahesh G Emmi\textsuperscript{4,}

\textsuperscript{1,2}Department of Mechanical Engineering, The National Institute of Engineering Mysore
\textsuperscript{3}Materials Technology Division, Central Power Research Institute, Bengaluru
\textsuperscript{4}Air Force Technical College, Bengaluru

ABSTRACT

Fly ash cenospheres (FCs) was used as reinforcing filler in copper (Cu) matrix to develop lightweight metal matrix composites (FCs-Cu MMCs). FCs/Cu MMCs were successfully synthesized using powder metallurgy route. Experiments C) fora holding time of 30 min, 60 min, and 900\textdegree C, 950\textdegree C, 900\textdegree were conducted with various sintering temperatures (850, 900 min respectively. The influence of varying sintering temperature and holding time on microstructure, density, hardness and compression strength were measured according to ASTM standards. The results clearly demonstrated that the sintering parameters (temperature and holding time) influenced the mechanical properties. The results reveal that addition of FCs into Cu matrix led to the substantial improvement to the mechanical properties of the composites.

Mechanical Behaviour and Tribological Properties of Cenosphere-Copper Composites Using Design of Experiments

P.Pradeep¹, M.Y.Aravind Rao², B.Suresha³, ImranJamadar⁴, S.Seetharamu⁵.

¹,²,³,⁴ Department of Mechanical Engineering, The National Institute of Engineering Mysore
⁵ Materials Technology Division, Central Power Research Institute, Bengaluru

ABSTRACT

Pure copper (Cu) was strengthened with 30, 40, and 50 wt% of fly-ash cenosphere (Csp) particles by fabrication through powder metallurgy route. The effects of Csp particles loading on microstructure, density, hardness, tensile strength and tribological behaviour of Csp/Cu composites were investigated. Dry sliding wear tests were evaluated using a pin-on-disk wear apparatus at diverse loads, sliding velocity and sliding distance. Hardness and tensile strength measurements showed a critical Csp loading of 50 wt% at which a hardness peak and high strength were attained. The design of experimental approach using Taguchi technique was utilized to predict the friction and wear behaviour against variable parameters such as reinforcement loading (A), sliding velocity (B), applied normal load (C), and sliding distance (D). Analysis of variance (Anova) was applied to verify the rationality of the established model. It was perceived that the variable (D) has a significant effect on specific wear rate shadowed by variables (C), (A), and (B) respectively. However, the Anova data on the friction coefficient revealed that the variable (A) has the highest significance on friction coefficient followed by variables (C), (B), and (D) respectively.

*Full paper: Materials Today: Proceedings, 2020
Simulation of Turbine System of a Bagasse Unit for Power Efficiency Using Labview

Mahesh G. Emmi1, Aravindrao M. Yadwad2, Vinay V. Kuppast3, Sampanna M4, B. S. Talikoti5.

1Research Scholar, The National Institute Of Engineering, Mysore,
2Department of Mechanical Engineering, Dean, The National Institute Of Engineering, Mysore
3Dept. of Mechanical Engg, Basaveshwar Engg. College, Bagalkot
4General Manager at Indian cane power limited, Davangare
5Dept. of Mechanical Engg, Pillai College of Engineering, New Panvel 410206, Maharashtra

ABSTRACT

A bagasse unit generally collects the bagasse that remains after juice is extracted from sugarcane. This bagasse can be used for generation of electricity. The turbine system used in the bagasse unit is mainly used for electricity generation. The better the design of the turbine system, the more is the power efficiency of the electricity produced. Simulation of the turbine system ensures that the design of the system is such that optimal amount of output is generated and the efficiency of the system is maximum. Virtually designing such complex systems makes the removal of faults easier, it consumes less amount of time and is less expensive than the traditional methods. Virtual design of turbine systems reduces the failures occurring during operation and also curbs the amount of losses due to maintenance of unexpected failures.

Simulation of Performance of Boiler System for a Bagasse Unit Using Labview

Mahesh G. Emmi¹, Aravindrao M. Yadwad², Vinay V. Kuppasti³, B. S. Talikoti⁴, M. Sampanna⁵.

¹Research Scholar, The National Institute Of Engineering, Mysore,
²Department of Mechanical Engineering, Dean, The National Institute Of Engineering, Mysore
³Dept. of Mechanical Engg, Basaveshwar Engg, College, Bagalkot
⁴Dept. of Mechanical Engg, Pillai College of Engineering, New Panvel 410206, Maharashtra
⁵General Manager at Indian cane power limited, Davangare

ABSTRACT

Cogeneration plants are one of the major power generation sources in this era of industrialization and automation. Bagasse is a by-product generated by the sugar industries on a large scale in India. The cogeneration plants use the bagasse produced by the sugar industries to generate power. Boiler system forms one of the primary components of the cogeneration plant. Designing a virtual model of the boiler system will help to model optimal systems. Simulation of the performance of the boiler system will aid in predictive maintenance as well. In this paper, a virtual model of a boiler system for a bagasse unit is designed in the LabVIEW software package. Such kind of performance analysis aids in better designs of actual models and predictive maintenance, which in turn saves time and reduces unwanted expenditures due to failures.
**The Reinforcing Effect of Graphene on the Mechanical Properties of Carbon-Epoxy Composites**

Hadimani Shivakumar¹, N. M. Renukappa², K. N. Shivakumar³, B. Suresha⁴

¹Department of Electronics and Communication Engineering, Kalpataru Institute of Technology Tiptur
²Department of Electronics and Communication Engineering, JSS Science and Technology University, Mysuru
³Centers for Composite Materials Research, North Carolina A & T State University, Greensboro, NC, USA
⁴Center for Composite Materials Research, The National Institute of Engineering, Mysuru

**ABSTRACT**

Graphene nanoplatelets (GNPs) are novel nanofillers holding attractive characteristics, including vigorous compatibility with majority polymers, outstanding mechanical, thermal, and electrical properties. In this study, the outstanding GNPs filler was reinforced to the epoxy matrix and carbon fabric/epoxy hybrid composite slabs to enrich their mechanical properties. Graphene nanoplatelets of 0.5, 1, 1.5 and 2 weight percentages were integrated into the epoxy and the physico-mechanical (microstructure, density, tensile, flexural and impact strength) properties were investigated. Furthermore, the mechanical properties of unfilled and 1 wt% GNPs filled carbon fabric/epoxy hybrid composite slabs were investigated. Subsequently, noteworthy improvement in the mechanical properties was conquered for the carbon fabric/epoxy hybrid composites.

A Method of Producing Patterned Quartz Slabs

Mahesh Baradabadi\(^1\), K. R. Prakash\(^2\).

\(^1\)PG Student, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
\(^2\)Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

**ABSTRACT**

The paper briefly discloses a method for producing a patterned artificial quartz slabs, includes the application of colored quartz material on to a main pressed quartz film to manufacture a Slab of higher aesthetic characters than natural stones. The disclosed mechanism consists of 3 processes comprising of milling operation, used to curve the pattern path. The Second process is the suction mechanism used to suck the milled quartz material, 3rd process includes an injection mechanism, the mechanism results in the addition of colored quartz material onto the previously carved path. The end product satisfies the modern architectural requirement, surpassing the technical and aesthetic features of natural stone and many other manufactured slabs.

Effect of Carbon Nanotubes Reinforcement on Mechanical Properties of Aramid/Epoxy Hybrid Composites

B.Suresha¹, N.M.Indushekhar², CA.Varun³, D.Sachin⁴, KushPranao⁵.

¹,²,³,⁴,⁵Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Present investigation focuses on the inquiry of effect of incorporation of multi walled carbon nanotubes (MWCNTs) into plain weave aramid fabric reinforced epoxy (AE) composites on its physical and mechanical properties. The MWCNTs were dispersed into the epoxy system at 0.15%, 0.3% and 0.5% by weight. For homogeneous dispersion and better interfacial adhesion, the filler was subjected to ultra-sonication in the epoxy medium. Uniform impregnation of resin mixture into fiber mat and improved fabrication was ensured by subjecting the stacked laminate with uniform pressure of 1 MPa. The laminate coupons according to ASTM standards were subjected to mechanical tests like hardness, tensile, flexural, and impact. Modification of epoxy matrix with MWCNTs could increase the interfacial adhesion between aramid fiber and epoxy matrix. Obtained results indicated that the addition of 0.3 wt% MWCNTs into the AE composite considerably improved the mechanical properties. Finally, it was concluded that MWCNTs hybrid AE composites will provide alternative constructional materials respect to conventional materials.

*Full paper: Materials Today: Proceeding, 2020
Three-Point Bending and Impact Behaviour of Carbon/Epoxy Composites Modified With Titanium Dioxide Nanoparticles

B.R.Lokesh Yadhav¹, H.K.Govindaraju², M.D.Kiran³, B.Suresha⁴.

¹Department of Mechanical Engineering, R.L.Jalappa Institute of Technology, Doddaballapur
²Department of Mechanical Engineering, BMS Institute of Technology and Management, Bengaluru
³Department of Mechanical Engineering, National Institute of Engineering, Mysore

ABSTRACT

Nanofillers can be considered as viable strengthening agent in solid form which can advance the different properties of polymeric materials with minor lessening in the density of composites. Nanofillers are getting model changes the field of material science and polymer based composites. A study on the bending behaviour and impact energy of plain weave bidirectional carbon fabric reinforced epoxy (CE) filled by titanium dioxide (TiO₂) nanoparticles is presented in this paper. Test coupons as per ASTM standards are prepared by simple hand lay-up stacking followed by hot pressing. Mechanical properties for instance flexural strength, modulus and impact energy absorbed are obtained through three-point bend test and Izod impact test following ASTM D790–17 and ASTM D 256–10 (2018) standards. The results showed that the combination of carbon fabric and nano-TiO₂ achieved a significant improvement (around 35%) in impact energy of epoxy material. In terms of mechanical properties, flexural strength increased as the amount of nano-TiO₂ increased, up to a critical point. The outcomes showed that very low loading (up to 1 wt%) of TiO₂ enhances the CE composites resistance from bowing and impact loads. Overall, the nano-TiO₂ is a more cost-effective inorganic filler to effectively improve the flexural properties and impact energy of CE composites. Moreover, the failure mechanism and fractographic features of the three-point bend test failed specimens were examined utilizing the scanning electron microscope.

*Full paper: Materials Today: Proceeding, 2020*
Dynamic Mechanical Analysis and Optimization of Hybrid Carbon-Epoxy Composites Wear Using Taguchi Method

G.S. Divya1, B. Suresha2, H.M. Somashekar3, I.M. Jamadar4.

1,2Department of Mechanical Engineering, The National Institute of Engineering, Mysore
3Dayananda Sagar College of Engineering, Bengaluru
4Dr. Ambedkar Institute of Technology, Bengaluru

ABSTRACT

The purpose of this research work is to explore the potential of nano silicon dioxide (nSiO2) with the carbon fiber reinforced epoxy (CF/Ep) composite for achieving better wear resistance and viscoelasticity. An effort is made to improve the material behavior by modifying epoxy with silane treated nSiO2. Ultrasonication process is used to disperse the nano particles uniformly within the matrix material. Mono CF/Ep composite and hybrid nSiO2-CF/Ep composites are fabricated by vacuum bagging method. Post curing of the composites is carried out effectively. Dry sliding wear tests are conducted using Taguchi technique by considering four levels, three factors namely, filler loading (0, 0.5, 1.5, and 3 wt.%), sliding velocity (0.75, 1.5, 2.25 and 3 m/s) and load (15, 30, 45, and 60 N). Further from the analysis of variance, the impact of each factor and level on specific wear rate (Ks) and coefficient of friction (COF) are examined. The result revealed that the lowest Ks and COF are in 3 wt.% nSiO2 filled CF/Ep hybrid composite. The optimum control factor-level combinations identified from the experiments, for achieving lowest Ks (0.0101×10^-13 m3/Nm) and COF (0.221), are 3 wt.% filler loading, sliding velocity of 0.75 m/s, and an applied load of 60 N. Based on Signal to noise graph, confirmation test is conducted. Worn surface of the composites are analyzed utilizing scanning electron microscope. Damping behavior of the composites is analyzed from room temperature till 160 °C. As the filler content increased, storage modulus (E') and glass transition (Tg) temperature increased. 3 wt.%, nSiO2 filled composite showed higher E' of 18386 MPa and Tg of 87.3°C.

*Full paper: Tribology in Industry, 2020
Optimization of Abrasive Wear Behaviour of Halloysite Nanotubes Filled Carbon Fabric Reinforced Epoxy Hybrid Composites

B Muralidhara1, S P Kumaresh Babu2, G Hemanth3, B Suresha4.

1,2Government Engineering College, K.R.Pet
3Robert Bosch Engineering and Business Solutions Pvt Ltd, Bengaluru
4Department of Mechanical Engineering, The National Institute of Engineering, Mysore

ABSTRACT

This research article presents the role of halloysite nanotubes (HNTs) incorporated carbon fabric/epoxy under a dry sand three-body abrasive wear (D3BW) condition. HNTs filled carbon fabric/epoxy nanocomposites are structured by hand layup assisted by the vacuum bagging process. The experiments were planned using L16 Taguchi array. The load, abrading distance, and filler loading were considered as a controlling factor. Wear volume loss associated in D3BW with two different sand particles size (212 μm and 425 μm) were investigated. Post-wear surface morphology was observed under the scanning electron microscope, and micro-cutting and micro-ploughing were predominant. Both 212 μm and 425 μm sand particles had a similar wear volume loss, but, the composites were wear-resistant towards the 425 μm sand particles. Based on the experimental results, analysis of variance and multi-linear regression models, the load, abrading distance, load + abrading and load + filler loading had considerable impact on the abrasive wear on the composites. However, the filler loading had no definite impact on the abrasive wear behaviour.

*Full paper: Surface topography, Metrology and properties, Vol.8, Issue.No.4, 2020
A Survey on Frontier Based Strategies for Multi Robot Exploration

Arpitha Shankar S I¹, M. Shivakumar², K.R Prakash³.

¹Assistant Professor, Department of Telecommunication Engineering, GSSSIETW, Mysuru
²Principal, GSSSIETW, Mysuru
³Professor and Head, Department of Mechanical Engineering, The National Institute of Engineering, Mysore

ABSTRACT

Nowadays robots become terribly powerful components in industry due to its capability to perform many alternative tasks and operations exactly in short time with high accuracy; growing complexity of multi operations in manufacturing leading to use of multi robot system to do the tasks quicker than a single robot. Multi- Robot system is used in the applications where the time is crucial and lot of coordination activities is to be done in short time and it is difficult to achieve by human beings with high accuracy. Examples of such systems include assembly operations in an automotive industry, surveillance, ordinance disposal, firefighting, relief operations after disaster and agricultural applications. Hence the paper focuses on exploration task of multi robot system; the multi robot systems are capable of searching best path and optimizing itself to achieve minimum time to explore such environment. Exploration task involves localization, path planning, map building and map merging techniques. Many strategies will be used to cover the areas within a minimal time, the paper present different strategies used in such exploration by multi robots.

Smart Dispensing of Ingredients Using VL53LOX & Piezoelectric Polymer Sensor

Dr. Prakash K R¹, Guruprasad V², Dr. Nithin K S³.

¹Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
²Research intern, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
³Assistant Professor, Department of Chemistry, The National Institute of Engineering, Mysuru

ABSTRACT

This paper describes smart dispenser system for automatically dispensing the ingredients for cooking machine using VL53LOX sensor on the cap of the dispensing jar and a piezoelectric polymer gasket sheet at the bottom. The combination of these two sensors enable calibrate itself and provide accurate quantity of dispensing which is very much essential in certain process. Piezoelectric Polymer sensor at the bottom and VL53LOX sensor on the cap communicate the data using IoT. VL53LOX Sensor provides the level of the ingredients present. Piezoelectric polymer gasket sensor provides change in resistance value as the quantity varies in the container. By sensor data fusion an AI engine predicts the exact volume dispensed. The containers periodically “wake-up” and communicate to a base station regarding their inventory status and dispensed quantities and the fill status is automatically updated using the same sensor. The volume is displayed by graphical user interface using geometrical parameters of the container based on user requirements, a mobile app gives simulation of the quantity on your mobile screen.

*Full paper: First International Conference on Future Technologies in Manufacturing, Automation, Design and Energy 28 - 30 December 2020*
Numerical Investigation of Single-Phase Heat Transfer in Converging and Diverging Microchannel

Prajwal Athreya R¹, Tejas J², Venson Mascarenhas³, Srikanth N.S.⁴

¹,²,³UG Scholars, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁴Assistant Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Miniaturization of electronics has been the new trend in recent times. This has resulted in an exponential increase of heat flux and hence demands novel cooling methods. Inadequate cooling results into degraded performance, reduced power and, results in device failure. Microchannel cooling technology, due to its several advantages/challenges has been the central point of many researchers in the field of electronics cooling. The current paper concentrates on the investigation of single-phase heat transfer characteristics in converging and diverging microchannel. The numerical investigation of converging and diverging microchannel has been performed using commercially available solver Ansys Fluent. Microchannels of constant hydraulic diameter were selected with a constant heat flux of 50 kW/m² at the bottom wall. The heat transfer coefficient, Nusselt number, pressure drop and outlet temperature were monitored for the various combinations of converging and diverging microchannels. Also, the results have been compared with a uniform microchannel. The results for diverging microchannel have also been extensively tabulated in the paper. It was also noticed that the pumping power was reduced in diverging microchannels when compared to a straight channel and converging microchannel while having appreciable value of heat transfer coefficient.

*Full paper: 8th International and 47th National Conference on Fluid Mechanics and Fluid Power (FMFP)
December 09-11, 2020, IIT Guwahati, Guwahati-781039, Assam, India
Photocatalytic Degradation of Dyes by Cobalt Ferrite Nanoparticles Synthesized by Sol-Gel Method

M. Madhukara Naik¹, Vinuth M², Karthik K³, Suresha B⁴, Nagaraju G⁵, Sujatha H.R⁶.

¹Department of Studies and Research in Industrial Chemistry, School of Chemical Sciences, Kuvempu University
²Department of Chemistry, NIE Institute of Technology, Mysuru
³School of Physics, Bharathidasan University, Tiruchirappalli
⁴Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁵Department of Chemistry, Siddaganga Institute of Technology, Tumakuru
⁶Department of Chemistry, NIE Institute of Technology, Mysuru

ABSTRACT

Cobalt ferrite (CoFe₂O₄) nanoparticles were prepared by sol-gel method for structural, optical and photocatalytic studies. These nanoparticles were characterized by various physiochemical techniques such as XRD, FTIR, SEM with EDAX, and UV-DRS. Cubic spinel structure with Fd-3m space group has been confirmed by XRD studies. FTIR confirms the vibrational stretching frequencies of tetrahedral (580 cm⁻¹) and octahedral (397 cm⁻¹) sites. SEM images show the agglomerated nature of ferrite nanoparticles and EDAX spectrum confirms the elemental compositions present in the prepared samples. UV-DRS spectrum shows that the CoFe₂O₄ nanoparticles are visible active material. The photocatalytic degradation of methylene blue and Evans blue dye was evaluated under visible light irradiation. The prepared nanoparticles showed good activity for the degradation of dyes which confirms that these nanoparticles can be useful for wastewater treatment.

Role of Graphene Nanoplatelets on Tribological Behaviour of Madhuca Indica oil

Suresha B¹, Hemanth G², Ananthapadmanabha³, Kulkarni G⁴.

¹³⁴Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
²Robert Bosch Engineering and Business Solutions Pvt Ltd, Bangalore

ABSTRACT

This research article outlines the friction and wear behavior of madhuca indica oil (mahua oil) blended with 0.25-1% by weight of graphene nanoplatelets (GNPs) using four-ball tester in accordance with ASTM D-4172 standard. The micro-morphology and wear scar diameter of the rubbed steel ball surfaces were characterized by optical microscopy. The test results were compared with base mahua oil lubricant. The addition of GNPs in the base oil acted as a superior lubricant additive which reduced both the friction coefficient and wear loss in terms of wear scar diameter of steel balls. The loading of very small quantity of GNPs (0.25 wt. %) in mahua oil could be used as effective bio-based lubricant in automotive engines for better mechanical as well as thermal efficiency.

Mechanical and Tribological Properties of Carbon Fabric Reinforced Epoxy Composites With and Without Boron Nitride Filler

Sangamesh Shivaputrapa Pasare¹, Bheemappa Suresha².

¹,²Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Present research examination focuses on the static mechanical properties as well as friction and wear conduct of carbon fabric reinforced epoxy (CF/Ep) composites with micro and Nano-Boron Nitride (BN) filler. BN added carbon fiber strengthened epoxy (BN-CF/Ep) composites were portrayed regarding surface morphology, tensile, flexural, hardness as well friction and wear properties. Mechanical test outcomes revealed that 1.5 Wt.% nano-BN filled CF/Ep composites indicate increase in tensile strength and bending strength compared to micron BN filled CF/Ep composites. CF along with nano-BN improves enormously the wear resistance of Ep despite the fact there is marginal increment in friction coefficient. Further, it was exhibited that 1.5 Wt.% nano-BN into CF/Ep prompts better mechanical properties and predominant wear resistance. Generally speaking, it was presumed that BN filled CF/Ep gracefully and successfully improved morphological, mechanical, as well as friction and wear properties of Ep for various engineered load-bearing applications.

Role of Sic on Mechanical and Tribological Behavior of Mg Metal Matrix Composites Prepared by Powder Metallurgy Route

Pooja¹, Lingappa Rangaraj², Bheemappa Suresha³.

¹²³Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
²Materials Science Division, CSIR-NAL, Bengaluru

ABSTRACT

The present work involves the processing, mechanical and dry sliding wear behavior of silicon carbide (SiC) particles with magnesium (Mg) matrix. The amount of SiC reinforcement was 10 and 20 vol. %. The composites were produced using hot pressing at 5 MPa, 640 °C for 30 min. The density of Mg-SiC10 vol. % and Mg-SiC20 vol. % composites are 1.81 and 1.98 g/cm³, respectively. Microhardness and compressive strength of the composites was increased as the SiC content increases. Dry sliding wear test carried out at different load, sliding distance and sliding velocity having coefficient of friction in the range 0.39-0.53 and specific wear rate of 1.7×10⁻⁶ cm³/N m for Mg-SiC20 composites.

Smart Solar Home System With Solar Forecasting

Anusha Manur¹, Maitreyee Marathe², Ashray Manur³, Abhishek Ramachandra⁴, Shamsundar Subbarao⁵, Giri Venkataramanan⁶.

¹Department of Computer Science, North Carolina State University, Raleigh, NC, USA
²³Department of Electrical & Computer Engineering, University of Wisconsin-Madison, Madison, WI, USA
⁴Department of Electrical Engineering, The National Institute of Engineering, Mysore
⁵Department of Mechanical Engineering, The National Institute of Engineering, Mysore
⁶Department of Electrical & Computer Engineering, University of Wisconsin-Madison

ABSTRACT

Solar home systems (SHSs) have become a popular solution to solve the problem of energy access in areas with no electricity or poor electricity service. However, they face the challenge of daily and seasonal variation in solar irradiance and load usage leading to suboptimal energy use. Solar forecasting techniques are used to solve this problem and are often used in larger systems such as solar farms. In larger commercial systems, solar forecasting involves predicting solar irradiance either in a hour/day-ahead fashion. This technique works well for large systems where the solar power is often exported back to the utility grid. However, with smaller solar systems such as SHSs, the solar energy is often used to charge batteries (which are then used during the night) and the solar output from the panels depends not only on the weather but also the battery utilization. In addition to this challenge, most SHSs lack computing and communication systems making deployment of optimization techniques challenging. This study proposes a smart solar home system and a forecasting methodology which accounts for battery utilization leading to more optimal energy usage. Smart solar home systems have been deployed in real homes and field data is evaluated with the proposed forecasting technique.

*Full paper: IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy, PESGRE 2020*
Vibration Analysis of Railway Wagon Suspension System for Improved Ride Quality Using MATLAB Simulink

C. Prithvi¹, R. Srinidhi², A. Karthik Hebbar³.

¹,³Department of Mechanical Engineering The National Institute of Engineering Mysuru
²Department of Mechanical Engineering Sri Jayachamarajendra College of Engineering Mysuru

ABSTRACT

In this paper, the dynamic response of the Indian railway wagon suspension system is investigated using MATLAB Simulink under step input condition which simulates the irregularities of the track. In the initial part of the work, a linear dynamic model of the Indian railway wagon suspension system was carried out and later mathematical equations are derived from the model constructed. An equivalent Simulink model in accordance with the equations was constructed in MATLAB Simulink. The system is given a step input to simulate the irregularity of the track and the dynamic response such as displacement, velocity and acceleration of the coach, bogie frame and the wheel were found. From the result, it was observed that for the step input, the major vibrations will occur at the coach and the bogie frame and thus causing discomfort to the passengers. In order to reduce these vibration modifications, it is made to the full suspension model with the use of hydraulic actuator controlled by proportional-integral-derivative (PID) controller. It is then simulated using MATLAB Simulink under the same track condition to study the vibration characteristics. The results of the modified suspension system show greater improvements in comparison with the system without PID controller. The improvization with the modified suspension system is suggested to achieve the travel comfort for the passenger.

*Full paper: Operations Management and Systems Engineering, 2020, Page No. 95-112
Strain Sensing and Characterization of Cnfs Wrapped With Polyaniline/Polypyrrole Based Polyester Composites

Ravi Kumar V1, Dr. Prakash K. R2, Dr. Nithin K. S3.

1Assistant Professor (Sr. Grade), Department of Mechanical Engineering, Amrita School of Engineering, Bengaluru
2Professor, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
3Assistant Professor, Department of Chemistry, The National Institute of Engineering, Mysuru

ABSTRACT

Flexible strain sensors are being researched excessively. The primary thoughts of maximizing the interfacial contact/bonding between the additives and the polymer is being achieved through wrapping of carbon nanofibers with polymers and then using them as strain sensors. This causes enhancement in sensing strain of the composite. In this work, we present the novel method that can be used to wrap CNFs with polymers like Polyaniline and polypyrrole. Both polyaniline and polypyrrole have the same pendant group on a different backbone. The results related to dispersion, mechanical properties and strain sensing of this wrapped CNFs is compared to CNFs and are being reported. Hence, due to this enhanced chemical bonding a better strain sensor material is obtained. Also the studies confirmed the wrapping of polymers on the surface of CNFs.

Effect of Peak Current and Peak Voltage on Machined Surface Morphology during WEDM of Tinicu Shape Memory Alloys

Abhinaba Roy¹, S. Narendranath², Alokesh Pramanik³.

¹,²Department of Mechanical Engineering, NITK Surathkal
³School of Civil and Mechanical Engineering, Curtin University, Perth, Western Australia

ABSTRACT

This study considers the effect of wire electro discharge machining (WEDM) parameter peak current (Iₚ) and pulse peak voltage (Vₚ) on the machined surface morphology of TiNiCu shape memory alloys. Various defects of machined surfaces were identified and correlated with parameter values and measured average surface roughness (Rₐ) and average surface depth (R_z). It was found that the nature of the machined surface is highly influenced by the nature of sparking, which is dictated by levels of peak current and peak voltage used during machining. Distinctions between machining parameters resulting in “rough-cut” and “trim-cut” machining are reported along with deviations in output responses, which counters the trend reported in the literature.

*Full paper: Journal of Mechanical Science and Technology, Vol.34, 2020*
Influence of Feeding Techniques in Bottom Tapping Stir Casting Process for Fabrication of Alumina Nano-Filler-Reinforced Aluminium Composites

Prakash S1, Sasikumar R2, Natarajan E3, Suresha B4.

1,2Department of Mechanical Engineering, Selvam College of Technology, Namakkal
3UCSI University, Kuala Lumpur, Malaysia
4Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Stir casting process is a prominent technique for the fabrication of aluminium matrix composites (AlMMCs). Regular feeding, two-step feeding, capsulate feeding, pre-melt feeding and double-layer feeding are different feeding methods used in stir casting technique. In this study, Al7075-MMCs reinforced with nano-sized Al2O3 are manufactured through five different feeding methods. The bonding between the matrix and ceramic interface, agglomeration of the particles and porosity are evaluated through scanning electron microscope. From the micro-structural characterization results, it is observed that double-layer feeding method ensures the better particle distribution and improved bonding between the Al7075 and Al2O3. Alumina particles of 50 nm size, 2.5 wt% are incorporated to the Al7075 matrix. The intensive porosity and high agglomeration are noticed in other methods. It is understood from the results that double-layer feeding technique is a promising route for producing the defect-free Al7075-MMCs. The density, micro-hardness, and tensile strength of the resultant composites are measured according to ASTM standards. Due to homogenous particle distribution, the ultimate tensile strength is increased from 280 to 387 MPa, which is 38% higher than Al7075. The yield strength of the composite is increased from 140 to 198 MPa. The micro-hardness is increased from 661 to 878 MPa.

Thermal Barrier Coatings for Aerospace Applications

R Madhusudhana¹, S Lovesome Benedict S², Sushma S³, L Krishnamurthy⁴, R Gopalkrishne Urs⁵, Sachin D⁶.

¹²³⁴Centre for Nanotechnology, Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
⁵Department of Physics, The National Institute of Engineering, Mysuru
⁶Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Thermal barrier coatings (TBCs) play a significant role in the applications that are unmasked at high temperatures. These TBCs are used in diesel and combustion engines and especially in aerospace gas engines due to their extreme thermal resistant nature. Here the discussion focuses on methods like physical vapour deposition, different plasma-sprayed techniques, GPX that are incorporated to get TBCs and how these techniques influence various problems and properties of TBCs their thickness and composition of materials used are considered that makes way to improve the durability of TBCs.

*Full paper: SHODH SARITA, Vol.7, Issue.No.27 (III), 2020
Studies on the Role of Graphene Nanoplatelets on Mechanical Properties, Dynamic-Mechanical and Thermogravimetric Analysis of Carbon-Epoxy Composites

Muralidhara B1, Babu S.P.K2, Suresha B3.

1,2National Institute of Technology Tiruchirappalli
3Department of Mechanicla Engineering, The National Institute of Engineering, Mysore

ABSTRACT

This research focuses on the tensile properties, dynamic-mechanical and thermogravimetric analysis of carbon fibre-reinforced epoxy (CF/Ep) composites with graphene nanoplatelets (GnP) nanofiller (G-CF/Ep). These composites were portrayed regarding tensile properties, surface morphology, dynamic-mechanical and thermogravimetric analysis. The dynamic-mechanical properties studied were storage modulus, loss modulus, dynamic capacity and glass transition temperature (T_g) through the dynamic-mechanical analyser. The thermogravimetric property studied was weight loss% through the thermogravimetric analyser. The carbon fabric reinforcement along with the GnP-Epoxy matrix improved the tensile properties. Further, it was exhibited that 1.75 wt% GnP into CF/Ep prompts predominant damping capacity and thermal stability. Generally speaking, it was presumed that GnP-filled CF/Ep composites even with very small wt% GnP gracefully and successfully improved tensile, dynamic-mechanical and thermogravimetric properties as well as the morphology of epoxy for various engineered applications.

*Full paper: Journal of The Institution of Engineers (India): Series D, 2020
Design and Development of a Cost-Effective Reloadable Motor for Sounding Rocket

Ravikiran\textsuperscript{1,}, Mohd. Jawad Shariff\textsuperscript{2,}, H. Kaushil\textsuperscript{3,}, S. Likhitha\textsuperscript{4,}, Nikhil Bhootpur\textsuperscript{5,}, Sreejith Mohan\textsuperscript{6,}

\textsuperscript{1,2,3,4,5}Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
\textsuperscript{6}National Institute of Technology Tiruchirappalli

ABSTRACT

A sounding rocket, also known as a research rocket, is an instrument-carrying rocket designed to take measurements and perform scientific experiments during its sub-orbital flight. This paper reports the design and fabrication of a reloadable motor with a reusable nozzle for an experimental sounding rocket. The motor can be retrieved after a flight using a parachute mechanism and hence the name reloadable. A mixture of sugar and Potassium Nitrate in a ratio of 7:13 was used as the solid propellant. The burning rate of the propellant was measured in open atmosphere and found to be 7.22 mm/s. The nozzle which is the functional part of the motor was robustly designed to yield the required thrust load for lifting the rocket. The throat diameter of the nozzle was estimated to be 8 mm corresponding to a thrust load of 688 N which could raise the rocket to an altitude of 1500 ft from the ground level. The time-dependent variation of thrust, pressure and propellant mass flow rate inside the combustion chamber was analyzed using the Meteor software. The pressure, temperature and velocity distribution within the nozzle were estimated through computational analysis using ANSYS fluent. The maximum velocity at the nozzle exit was found to be 2.86 M. Further, the cost-effective analysis of the proposed design was carried out in terms of the fuel and materials used for fabrication of the motor assembly.

Impact Analysis of Knee Damper Assistant System with Fall Detection

Sachin.B

1Department of Mechanical Engineering, Nitte Meenakshi Institute of Technology, Bengaluru

ABSTRACT

Common injury such as osteoarthritis is increasing and it is said to be one of the common reasons for chronic conditions. Total knee replacement is one of the most popular modes of treatment for end-actory and with long waiting lists, other options are explored. Adapting treatment like knee braces could delay surgery. Major articles and research papers support knee brace use and show decreased pain, improved motor function, and improves the quality of life of a patient. One study in 2017 observed patients for the long term and concluded that knee bracing to be more cost-effective and a viable option compared to total knee replacement, and consistent use of knee brace could replace the need for surgery. This project aims to provide a suitable knee brace to prevent any accidental injuries. Adapting modern technology such as airbags and smart materials we can reduce the injury to a significant extent. The developed smart knee brace can be categorized as a personal safety device. These personal safety devices will become an essential need for mankind in the near future.

A Matlab/Simulink Model for the Speed Control of a Two Wheeler When Turning a Curve

Matha Prasad P.S., Ritwik Kaul, K.R. Mrinal

1,2,3Department of Mechanical Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Two wheelers are difficult to control when turning a curve. The stability of a two wheeler (TW) plays an important role in the dynamic conditions. When the rider moves along a circular path, he can control the TW by varying the three major parameters: the steering angle, the roll angle and the speed. A Matlab/Simulink model has been developed with the above mentioned three parameters and the speed of a TW to study about the behavior of the TW when turning a curve. The steering angle and roll angle are the input parameter to calculate the radius and required velocity of the TW. The Matlab/Simulink model is validated with the derived mathematical formulas for the three segments of the TW such as corner entry, corner exit and mid corner. A detailed analysis has been carried out by plotting the various graphs of roll angle, steer angle and speed versus time for the individual segments.

*Full paper: 1st International Conference on Frontiers in Engineering Science and Technology, 2020, Yenepoya Institute of Technology, Moodabidri, Mangalore, Karnataka 574225
Interactive Approach in Improving Rigidity of Lathe Structure

P Madhu¹, Shailesh Rao A².

¹Department of Mechanical Engineering, BNM Institute of Technology, Bengaluru
²Department of Industrial and Production Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

During the machining process, the machine tool structural member experiences different types of forces in its body. These forces must be resisted by the machine structure and in particular the bed and column in a machining center. In case of turning operation, the machine structures undergo bending and twisting in its member, which leads to causing the tool to deflect from its desired position. This results in reduction of set depth of cut at the tool leading to work piece in accuracy, decrease in machine productivity and even cause machine vibrations. Hence it is desired to ensure maximum rigidity at the machine interface for optimum operation. The rigidity is an important factor to evaluate the characteristics of machine tools. One way of decreasing the structural deformations is by increasing the section sizes and or increase wall thicknesses. This causes undesirable increase in weight of the structure and also leads in several trial and error methods for desired optimum operation. In this paper, an alternate method is proposed in which effective deflection at the tool may be decreased by locating shear center of the bed structure near to the machining interface. This helps in minimizing twisting moment and aids in improving rigidity. In this paper, the location of shear center for different geometries having outer section in semi-circular and triangle shape, which defines the cross section of the bed structure, are carried out through analytical method. The shear center locations for these sections are compared with ANSYS for validation. Further, the actual model of the lathe machine is created, wherein the static analysis is carried out to find the distance between the machining interface and shear center. From its analysis part, initially radial force is found for all the section and discussed the importance of these values in machine rigidity.

*Full paper: International Journal on Interactive Design and Manufacturing, 2020
Effect of Shear Center for Different Sections for Improving Rigidity of Lathe Bed

P Madhu¹ , Shailesh Rao A².

¹Department of Mechanical Engineering, BNM Institute of Technology, Bengaluru
²Department of Industrial and Production Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

In the design of any structural member the shear center location is of greater significance for rigidity improvement. In this direction, the determination of geometrical properties of closed cross sectional areas is often necessary in structural analysis. In this work, rectangular, circular and triangular sections used in lathe beds are modified with their geometry and the corresponding shear center locations are found out. The analytical calculation for the location of shear center of rectangular and triangular cross sections is carried out. The analytical calculations for the semicircular section are not carried out due to complexity in its curvature. Further, the finite element analysis of all cross-sections were carried out to determine the location of shear center and validated with the analytical approach. The static deflection for different sections of the lathe bed model is determined by Finite element analysis using ANSYS software. Improvement in the lathe bed rigidity is seen using the shear center method. In case of triangular and rectangular sections, the location of shear center is far away from the tool point position and hence more deflection in the lathe bed model is seen. An optimum section is found to be semicircular section, where the deflection is reduced during static loading. Finally, it can be concluded that the shear center method can be adopted by modifying the geometry of the sections to improve the stability of the machine during its operation.

Inelastic Behavior of En 31 Steel Metallic Surface Subjected to Hard Body

Darshan C J1, Mahendra H S 2, Hemaraju3, Rashmi S N4.

1,3Department of Industrial and Production Engineering, The National Institute of Engineering, Mysuru
2Department of Mechanical Engineering, BGS Institute of Technology, Adhichunchanagiri University, BG Nagara
4Department of Mechanical Engineering, BGS Institute of Technology, Adhichunchanagiri University, BG Nagara

ABSTRACT

In machineries of thermal power plants elements such as coal conveying systems, grinding balls, slurry carrying systems involves transfer of load and displacements. In all these machineries every element is subjected to the hard body such as particles from coal and slurry cause continuous wear results with abrasive wear. Due to this abrasive wear there is inelastic and damage of both the objects was takes place. Since many elements of all these machineries were made from En category steels this study was focused on En 31 steel. In the present study rubber wheel abrader was used to conduct the experiments. 106 microns, 212 microns and 425 microns graded abrader was used for conducting the test. En category steel i.e. En 31 was used as target material for the studies. The sand flow rate of 95 grams/minute was maintained. The weight loss was calculated and found that 0.004, 0.012 and 0.021, for an abrader size of 106 microns following with 0.005, 0.012 and 0.020 & 0.007, 0.022 and 0.023 for an abrader size 425 microns. For all these three tests a normal load of 11.37 N, 35.31 N, and 58.85 N was applied. Scanning electron microscope (SEM) was used to study the morphological analysis. There is light influence on volume loss due to the influence of abrader. Weight loss of the material does not solely depend on increasing in abrader size. Inelastic deformation and wear modes are seen as subject to mechanical properties of the target material. Disfigurement highlights describe the volume loss of the wear.

Department of Electrical & Electronics Engineering
Backstepping Controller with Dual Self-Tuning Filter for Single-Phase Shunt Active Power Filters Under Distorted Grid Voltage Condition

Jayasankar V.N\textsuperscript{1}, Vinatha U\textsuperscript{2}.

\textsuperscript{1}Department of Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Electrical and Electronics Engineering, National Institute of Technology, Surathkal

ABSTRACT

This article presents the design and hardware implementation of an adaptive nonlinear controller for fast, robust, and stable control of single-phase shunt active power filter. The proposed control system consists of two control loops: an inner harmonic current compensation loop and an outer dc-voltage control loop. The inner loop is realized using self-tuning filter based instantaneous power theory (pq theory). The limitations of conventional low-pass filter based fundamental component extraction methods are overcome using self-tuning filter. The outer loop is realized backstepping controller (BSC). The limitations observed in existing dc-link voltage controllers like poor stability margin, steady state error, chattering problem, etc., are overcome by the proposed BSC. The switching loss estimation is introduced in BSC using design estimation rules to enhance the dc-link loss compensation capability. The stability of the system with the proposed controller is studied using Barbalat lemma. A laboratory prototype of BSC based shunt active power filter is implemented. The control algorithm is implemented in a single all on chip field programmable gate array (FPGA). To ensure the effectiveness of the controller in mitigating the harmonic currents and controlling dc-link voltage, the control algorithm is tested under steady state and dynamic conditions.

Brushless Motor Performance Optimization by Eagle Strategy with Firefly and PSO

Appalabathula Venkatesh¹, Pradeepa H², Chidanandappa R³, Shankar Nalinakshan⁴, Jayasankar V.N⁵.

¹Research Scholar, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru
²³Associate Professor, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru
⁴⁵Assistant Professor, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Brushless motors has special place though different motors are available because of its special features like absence in commutation, reduced noise and longer lifetime etc., The experimental parameter tracking of BLDC Motor can be achieved by developing a Reference system and their stability is guaranteed by adopting Lyapunov Stability theorems. But the stability is guaranteed only if the adaptive system is incorporated with the powerful and efficient optimization techniques. In this paper the powerful eagle strategy with Particle Swarm optimization and Firefly algorithms are applied to evaluate the performance of brushless motor Where, Eagle Strategy(ES) with the use of Levy's walk distribution function performs diversified global search and the Particle Swarm Optimization (PSO) and Firefly Algorithm(FFA) performs the efficient intensive local search. The combined operation makes the overall optimization technique as much convenient The simulation results are obtained by using MATLAB Simulink software.

Energy Transmission Control for A Grid-Connected Modern Power System Non-Linear Loads with A Series Multi-Stage Transformer Voltage Reinjection with Controlled Converters

Appalabathula Venkatesh\(^1\), Shankar Nalinakshan\(^2\), Kiran S.S\(^3\), Pradeepa H\(^4\).

\(^1\)Research Scholar, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru  
\(^2\)Assistant Professor, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru  
\(^3\)Department of Electronics and communications Engineering, Lendi Institute of Engineering and Technology  
\(^4\)Associate Professor, Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru

**ABSTRACT**

The effective way of energy transmission plays a key factor in improving the overall transmission systems efficiency. Many methods are proposed to control the reactive power flow, voltage fluctuations and power factor improvement. The proposed converter topology gives a much significant improvement in transmission systems performance which includes multistage transformers control with the controlled converters along with the series active filters. The overall control strategy which involves the Multistage Voltage Re-Injection Transformer Controlled Converters (MSVRITCC) to reinject the voltages into the grid to compensate the voltages and remaining parameters and power flow control. The proposed topology improves the grid security, flexibility in reaching the desired load requirements with grid adaptability and reduces THD values into a significant values and made the control of power conditioning circuit flexible and easy to perform the voltage compensations in grid to load connected applications. The binary control is used to trigger the power converter circuits which made the controlling much simpler.

A Multi-objective Hybrid Algorithm for Planning Electrical Distribution System

Zuhaib Baig¹, Shivakumar S.B², Ananthapadmanabha T³

¹Vidya Vikas Institute of Engineering & Technology Mysore
²Rao Bahadur Y Mahabaleswarappa Engineering College, Bellary
³NIE Institute of Technology, Mysore

ABSTRACT

In the paper a multi-objective Gravitational Search Algorithm (GSA) and Tabu heuristic search for planning electrical distribution system is proposed. The GSA has been minimized the Distribution Generator (DG) investment cost, cost of distribution system losses, operation and maintenance cost of DG with the help of appropriate constraints. So the optimum sizing of DG is planned in the optimum location with reduced cost. Here, the Gravitational Search Algorithm (GSA) accelerates convergence speed with combination of the search strategy of Tabu heuristic search method. Then the proposed multi-objective hybrid algorithm for planning electrical distribution system is implemented in the MATLAB platform and the effectiveness is analyzed by comparing with the other techniques. The comparison results demonstrate the superiority of the proposed approach and confirm its potential to solve the problem.

Optimization of Bio-Based Liquid Transformer Insulator Using Moora Method

Hemanth Gurumurthy¹, Suresha Bheemappa², Rudramuni Chidanandappa³, Pradhyumna Bhat⁴.

¹,² Department of Mechanical Engineering, The National Institute of Engineering, Mysuru
³,⁴ Department of Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This research investigation was performed to seek the bio-based alternative for the liquid insulator in transformers. The current investigation aims to examine the effect of oil rancidity on the dielectric strength of bio-based oils along with the other preliminary examinations like fire point, flash point, and viscosity. Sunflower oil portrayed the notable performance under all the tests that were conducted. The exposure to the conditioned atmosphere uncovered the presence of a huge variation in DBV of bio-based oil affirming that the rancidity of oil degrades the insulating ability of the oil. The multi-objective optimization tool MOORA (Multi-Objective Optimization based on Ratio Analysis) was utilized to optimize and select the best oil sample. Upon considering the outcome of all the tests performed and MOORA, sunflower oil was ranked first.

*Full paper: Electric Power Components and Systems, 2020*
Optimal Location and Capacity of DG Systems in Distribution Network Using Genetic Algorithm

Madhusudhan M¹, Kumar N², Pradeepa H³

¹,²,³Department of Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The assimilation of distributed generators (DG) does play a critical role in modern distribution networks. Due to increasing demand for electrical energy, the DG sources are becoming more significant in distribution systems. The position and size of DG units will have an impact on losses and voltage profile of the distribution system. This work proposes implementing the Genetic Algorithm approach to determine the optimal site as well as the size of DG units in the distribution network to mitigate actual power losses and enhance the voltage profile. The optimal position and optimal capacity of DG unit is computed by GA algorithm and by using three indices namely PLRI, VDI and MORI we determine three solutions one for exclusively reduction in system loss, the second one for improvement of voltage profile and third one for combined benefit in minimization of losses and improved performance of the bus voltages, the proposed method is applied to the IEEE-33 bus test system. The programming is executed in the software MATLAB 2018α.

*Full paper: International Journal of Information Technology (Singapore), 2020*
Analysis of The Transient Stability of A Multi-Machine System With SVC

Srishail K. Bilgundi1, Shivu M2, Pradeepa H3, Likith Kumar M.V4.

1,3Department of Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru
2Data Analyst, Unilog Content SolutionsMysuru
4Department of Electrical and Electronics Engineering, GSSS Institute of Engineering and Technology for Women, Mysuru

ABSTRACT

Interconnection of remote electric power systems with abundant generation quantity and system load is significantly widespread due to the advancement of the power trade among countries and within countries in various regions of the world. In long-distance AC power transmission, as in interconnected electric power systems, attention to be paid for retaining synchronism besides steady system voltages, notably in combination with faults in the system and line switching. The aim of this paper is to examine the ability of FACTS controller for power flow control and to strengthen the transient stability. A two area two machine systems equipped with SVC is considered for this study, Matlab software is used for simulation.
Development of Energy Meter Monitoring System (Emms) for Data Acquisition and Tampering Detection Using Iot

Aishwarya P Kamatagi¹, Rajeshwari B Umadi², Sujit V³.

¹Department of Electrical and Electronics Engineering, The National Institute of Engineering, Mysuru
²Department of Electrical and Electronics Engineering, NIE Institute of Technology, Mysuru
³MPS Division, L&T Technology Services, Mysuru

ABSTRACT

Electricity Crisis has become a serious issue, since the demand of power is increased over its production. One of the major challenges in electricity management is misuse of the power consumption due to electricity theft in public area. Energy Meter Monitoring System (EMMS) comprises of Raspberry Pi board and it mainly focuses on the implementation concept of Internet of Things (IoT) as the underlying framework to achieve real time monitoring of energy meter readings. The main theme is to have a system which can be installed with existing electronic meters, instead of developing a new smart meter. Raspberry pi connected to the meter continuously monitors the data sent by energy meter, read the data and print the actual values of parameters. These actual values of parameters are further communicated along with decimals and appropriate SI units. Go-daddy's web server is developed and its database will store the data from the energy meter in front of its serial number. A multipurpose android application is designed to get the information regarding voltage ratings, current ratings, energy consumption and the meter tampering details which further can be useful to take actions against those customers. Upon providing the serial number of meter in the application, tampering status of energy meter is traced along with the basic parameter values.

Department of Electronics & Communication Engineering
A Literature Review on Analysis of Palm Patterns to Detect Congenital Heart Diseases

Mahesha Y¹, Nagaraju C².

¹Department of Computer Science Engineering, MRIT, Mandya
²Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This paper presents the survey on different techniques which can be used to detect congenital heart disease using palm patterns. The congenital heart disease is one of the heart diseases which starts from birth. Research works are carried out towards detecting congenital heart disease before symptom appears using palm patterns so that it avoids critical health problems in future. Researchers have collected palm prints from normal people who are not suffering from any kind of heart disease and from patients who are suffering from different types of congenital heart diseases. These palm prints are collected from different hospitals. The palm prints are taken using ink and paper method. These palm patterns are analyzed to determine the role of palm pattern while detection of the disease. Few researchers have considered only triradius of palm and most of the researchers have considered palm patterns such as whorl, loop, arch and hypothenar pattern. In case of triradius, researchers have calculated position of axial triradius and it is categorized into three types. In case of whorl, loop and arch, they have considered how often they appear in palm of normal people and patients. Few researchers have analyzed both left and right hands of normal people and patients.

*Full paper: Biomedical Engineering - Applications, Basis and Communications, Vol 32, Issue 2, 2020


1Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru
2PES UniversityBangalore
3JSS Academy of Technical EducationBengaluru

ABSTRACT

As the networks on chips is used for designing the multi-processor system on chips, this platform have been typically guaranteed for hard real time property, and for the use of shared resources in a network. The service guarantees has to be provided by the network with respect to bandwidth and latency for a different communications flow. Thus message passing communications between the processor cores are implemented for the network on chip. The TDM is used for controlling the communications over the structures of router, links and network interface. The two main contribution of area efficient are (i) The TDM schedule with combined asynchronous router and (ii) The micro-architecture of NIs. In concert with the design resulted with the transforming the data in a pipelined manner which means transmitting the data from the local memory of send core to the local memory of the receive core, without using any dynamic attributions, buffering and local synchronization. The router also uses the two phase bundled data hand shake latches based on the mousetrap latch controller and it is extended with the gated mechanism for reducing the energy consumption. Network interface is used for integrating the DMA and the TDM functionalities. The dual ported local memory is used for avoiding buffering, flow controls and synchronization. Thus obtained result is verified with respect to area, power and gates.

*Full paper: Lecture Notes in Electrical Engineering, Vol 569, 2020
Medical Image Compression Scheme Using Number Theoretic Transform

Salila Hegde¹, Rohini Nagapadma².

¹NIE Institute of Technology, Mysuru
²Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

In this paper, a new methodology is proposed for the medical image compression using number theoretic transforms or NTTs. NTTs are the discrete Fourier transforms carried out over finite fields and rings. All the arithmetic operations are carried over a modulo number M. From the review of NTTs and their variants, it is found that NTTs involve only real integers, and the transform is reversible and hence no round-off errors in NTT-based algorithms. Another attractive feature is that NTTs of regular structures are also regular. These factors lay the foundation for the proposed lossless compression scheme of medical images. The variant of NTT known as Fermat number transform (FNT) is used for the proposed compression scheme as it involves less or no multiplications. The results obtained are favorable in terms of compression ratio and reduced number of computations. Further study and research is in progress to optimize the algorithm in terms of computations and hardware implementation of NTTs for real medical images. It is forecasted that with the use of dedicated hardware and optimization of these digital transforms, much higher compression ratio at faster speed may be achieved.

*Full paper: Advances in Intelligent Systems and Computing, Vol. 992, 2020
A Novel Tunable Gain CMOS Buffer Amplifier for Large Resistive Loads

Jayachandran Remya¹, P.C. Subramaniam², K.J. Dhanraj³.

¹,²,³Department of Electronics and Communication Engineering, National Institute of Technology, Calicut

ABSTRACT

An all-OTA analog buffer amplifier configuration capable of driving large resistive loads is presented. The proposed configuration features high input swing, gain tunability, wide-bandwidth, and low design complexity. The concept is validated with simulation results in Cadence Virtuoso using SCL 0.18-μm technology parameters. Using a ±0.9 V power supply, the buffer with a gain of 1, can drive a 1 Vp-p sinusoid into a 50 Ω load with a THD of better than 0.015%, with a 3-dB bandwidth of 1.55 GHz and consumes 9 mW. The proposed configuration is demonstrated with gain values varying from 0.25 V/V to 5 V/V and with different load values 16 Ω to 5.6 kΩ. The voltage gain is tunable over more than a decade with reasonable power levels. With low-gain OTA, the proposed buffer configuration works well without any complex frequency compensation circuit that makes the all-OTA analog buffer amplifier configuration simple compared to the existing buffer amplifiers.

*Full paper: Integration, The VLSI Journal, Vol.77, 2020,
A Generic Real Time Application for CKD Prediction Using Machine Learning

Dr. Nagaraju C1, Varun.B2

1,2Department of Electronics and Communication, The National Institute of Engineering, Mysore

ABSTRACT

Chronic kidney disease (CKD), is the gradual and irrevocable destruction of kidneys. It reduces the potential of humans to stay healthy. The diagnosis of CKD starts with a medical history. Discovery and analysis ought to be done earlier so it will ordinarily shield renal disorder from acquiring a worse condition. Here authors have utilized Machine Learning Techniques into actions for prediction of CKD. Authors examine the presentation of Naive Bayes, K-Nearest Neighbors (KNN) and GFR strategy for stage prediction based on its exactness, accuracy and execution time for CKD forecast. Comparatively Naïve Bayes shows good results than KNN and stage prediction is done at every instance when CKD is predicted.

Self-Stabilizing Spoon for Parkinson’s Ailment

Jaswanth D K\textsuperscript{1,2}, Christopher Lenord J\textsuperscript{2}, Pavan S L\textsuperscript{3}, Nagaraju C\textsuperscript{4}.

\textsuperscript{1,2,3,4}Department of Electronics and Communication, The National institute of Engineering, Mysore

ABSTRACT

There is a substantial increase in the number of people getting affected by Parkinson Disease at the current scenario. Hence there is a critical need of support to such patients, as engineers it is our duty to ensure their needs as fulfilled. This paper basically proposes few models and prototypes that would bring a ray of hope in the patient’s life. Here authors have proposed a supportive solution to this disorder. Basically our model uses a Nano board as the black box to which we provide the inputs and also we ensure the stabilizing in the form of tremor nullifying effect by using gyroscope, accelerometer and light weighted servo motors. In the present methodology self-stabilizing is done using servos using data provided to them by the gyro via a controller. Experimental analysis when carried out on different weight or object as an input on the spoon, designed model clearly depicts the decrease in the peak of tremor. The flexibility in the design basically refers to the all in one holder which is incorporated in the apex of the prototype, which aids the patient to not only use it is as a spoon, but also can be used to operate a key or any other objects by easily fitting it to the self-stabilizing device.

*Full paper: International Journal of Engineering and Manufacturing, Vol. 10 Issue.No. 05, 2020*
Procuring Data Security Using Cryptography and Steganography in IOT

Dr. Anjanappa C¹, Shreyas N².

¹,²Department of Electronics and Communication, The National institute of Engineering, Mysore

ABSTRACT

Internet of Things (IOT) is an arrangement of interrelated figuring gadget. Every thing is given a remarkable identifier and the capacity to naturally move information over network. The covering up of these information is a difficult attempted; security difficulties can be restricted with cryptography and Steganography techniques. These strategies are significant when exchange with client confirmation and information protection. In the propelled work, the elliptic Galois cryptography convention is presented and questioned. In this convention, a cryptography strategy is utilized to scramble private information that originated from various clinical and different sources. After, Steganography strategy is have to install the scrambled information into a low multifaceted nature Picture. The proposed work additionally utilizes an advancement calculation called Adaptive Firefly to advance the determination of spread squares inside the image. Rely upon the outcomes, various boundaries are assessed and loaded up with the current procedures. At last, the information that is covered up in the image is get back and is then unscrambled.

Energy Efficiency Analysis of Collaborative Compressive Sensing Scheme in Cognitive Radio Networks

Rajalekshmi Kishore¹, Sanjeev Gurugopinath², Sami Muhaidat³, Paschalis C. Sofotasios⁴, Mehrdad Dianati⁵, Naofal Al-Dhahir⁶.

¹BITS Pilani (K. K. Birla Goa Campus), Goa
²Department of Electronics and Communication Engineering, PES University, Bangalore
³,⁴Center for Cyber-Physical Systems, Khalifa University, Abu Dhabi
⁵Warwick Manufacturing Group, University of Warwick, Coventry, U.K
⁶University of Texas at Dallas, Dallas, USA

ABSTRACT

In this paper, we investigate the energy efficiency of conventional collaborative compressive sensing (CCCS) scheme, focusing on balancing the tradeoff between energy efficiency and detection accuracy in cognitive radio environment. In particular, we derive the achievable throughput, energy consumption and energy efficiency of the CCCS scheme, and then formulate an optimization problem to determine the optimal values of parameters which maximize the energy efficiency of the CCCS scheme. The maximization of energy efficiency is proposed as a multi-variable, non-convex optimization problem, and we provide approximations to reduce it to a convex optimization problem. We highlight that errors due to these approximations are negligible. Subsequently, we analytically characterize the tradeoff between dimensionality reduction and collaborative sensing performance of the CCCS scheme, i.e., the implicit tradeoff between energy saving and detection accuracy. It is shown that the resulting loss due to compression can be recovered through collaboration, which improves the overall energy efficiency of the system.

Indoor Mapping and Navigation

Vishwanath M K¹, Sudhanshu Sharma², Syed H³, T. S. Sukruth⁴, Thirumallesh⁵

¹,²,³,⁴,⁵Department of Electronics and Communication, The National institute of Engineering, Mysore

ABSTRACT

Now a days indoor mapping and navigation is an important issue and day by day its necessity is increasing. In recent times the concept of indoor mapping has gained great popularity. In this project, we present an indoor mapping and navigation system. The proposed indoor mapping and navigation system consists of a circuit made up of arduino UNO and tweeters as transmitters and our mobile phones as receivers. The different arduino UNO circuits will generate different frequencies corresponding to different rooms and because the mobile phone is so ubiquitous these days, it is the perfect receiver and users can use our application to recognize the ‘required’ room/shop. The android application has three basic modules which form the basis for receiving the frequency and displaying it. Towards the end, the project discusses the working of the prototype of the system that proves the correctness of the proposed method.
A Comprehensive Survey on Recent Advancements in Cognitive Radio-Based Internet of Things

Rajalekshmi Kishore¹, Sanjeev Gurugopinath².

¹Department of Electronics and Communication, The National institute of Engineering, Mysore
²Department of Electronics and Communication Engineering, PES University, Bangalore

ABSTRACT

The recent research studies on the internet-of-things (IoT) predict that the conventional IoT system without cognition will just be a burden on existing network infrastructure. In this article, we present a comprehensive survey on the recent research advancements in cognitive radio (CR)-based IoT (CR-IoT) framework. First, we provide a detailed discussion on the need to employ CR framework for IoT. Towards this end, we discuss in detail the challenges associated with the conventional IoT paradigm on the communication technology. This also includes several interdisciplinary requirements, such as technical challenges, security, hardware, standard, and business challenges that are the key factors for the deployment of CR-IoT systems. Next, integration of emerging techniques such as blockchain and machine learning with CR-IoT, and the associated advantages are discussed. Finally, we brief on the research challenges and future research directions in a CR-based IoT system.

High Performance Digital Logic Circuit Realization Using Differential Cascode Voltage Switch Logic (DCVSL)

S. S. Kavitha¹, Narasimha Kaulgud²

¹²Department of Electronics and Communication, The National institute of Engineering, Mysore

ABSTRACT

Most of dual-rail CMOS circuits are loosely based around differential cascade voltage logic switch. DCVSL provides dual-rail logic gates that have latching characteristics built into circuits itself. In CVSL logic output results are held until inputs induce a change, so that there is no loss of data, thereby saving energy and power. In today’s digital application low power has become a key factor in high-speed computations. The proposed work gives an insight into the working of CVSL and the proposed method, showing a reduced number of gates, and thereby reducing area and power constraints. In this paper, exclusive detailed use of pass gate logic structure to put back the nMOS logic structure in conventional DCVSL circuit along with the implementation of adders are provided. The proposed circuit designs and results are compared and implemented using a cadence software tool and for quantum circuits QCAD tools are used. The study shows the optimization in case of power, area and speed achieved in comparison with conventional circuits.

Remote Monitoring With Voice Command Control and Image Analysis

Shashank Hegd\textsuperscript{1}, Roopa K\textsuperscript{2}, Prabhulingesh K\textsuperscript{3}, Rohith Pandith\textsuperscript{4}

\textsuperscript{1,2,3,4}Department of Electronics and Communication, The National Institute of Engineering, Mysore

ABSTRACT

This paper describes a Remote Monitoring System (RMS) for border areas. This is implemented by providing voice commands through an android smart - phone. The system uses a speech – to - text converter and sends these commands to a Raspberry Pi 3B+, at a Remote Site (RS), which is used to monitor the area in its vicinity. The Raspberry Pi is interfaced to a Movable Monitoring Unit (MMU). The MMU at the RS is connected to a PiCamera and a gas sensor. The persons at the remote site are identified through image analysis by the controller for the video captured by PiCamera. The video stream is sent to the Monitoring Centre (MC). The gas sensor output and camera feed are sent to the android smart - phone for continuously monitoring the RS. The gas sensor output is used to detect the presence of any poisonous gas at the RS. The android smart phone and the computer are available at the MC. This system makes use of an MQTT (Message Queuing Telemetry Transport) protocol and can be used for any applications requiring remote monitoring.

Assessment of Hydrophobicity of Silicone and Fiber Reinforced Filled Epoxy Composites under Contamination

Santhy P. Kuruvilla¹, N. M. Renukappa², R. Mythri³, J. Sundara Rajan⁴.

¹,²,³Department of Electronics and Communication, JSS Science and Technology University, Mysore
⁴Insulation Engineering and Academic Counsellor, Bangalore

ABSTRACT

This paper discusses the effect of different contaminants on the contact angle of silicone and glass reinforced epoxy composites. Using a combination of fillers consisting of silica, alumina, alumina trihydrate, magnesium oxide and calcium carbonate, the surface wetting characteristics of three different epoxy composites is investigated in this work. The contact angle of the materials is studied with different contaminants individually applied and with the application of AC or DC stress. Surface energy parameters are estimated to account for the variations in the contact angle. The effect of dry heat on the contact angle is also investigated. The study shows that silicone rubber retains its hydrophobicity with different contaminants except for sea water under electrical stress. In case of the epoxy composites, the fillers help to enhance the contact angle and impart different surface wetting properties under contamination with the application of electrical stress.

*Full paper: IEEE Transactions on Dielectrics and Electrical Insulation, Vol.27, Issue No. 2, 2020
Data Extraction with Signal Comparison for Forest Logging Prevention

Rohith Pandith M V¹, Shashank Hegde², Prabhulingesh K³, Srishanth S Amin⁴

¹,²,³,⁴Department of Electronics and Communication, The National institute of Engineering, Mysore

**ABSTRACT**

Due to an increase in deforestation nowadays, it has immensely impacted our ecosystem which is in turn causing global warming and major effects on biodiversity in our ecosystem. The idea of our paper is to prevent tree logging by extracting sound of logging machine from sensors placed at specific ranges by performing cross correlation and other signal processing techniques between test signals obtained from the sensor and pre-fed signal at the nearest office of interest and hence avoiding tree logging activity by alerting respective authorities.

Reconfigurable Circuits Based on Single Gate Reconfigurable Field Effect Transistors

Remya Jayachandran¹, Rama S Komaragiri², P C Subramaniam³.

¹,³Department of Electronics and Communication Engineering, National Institute of Technology, Calicut
²Department of Electronics and Communication, Bennett University, Noida

ABSTRACT

Design and simulation of reconfigurable circuits using a single gate reconfigurable field-effect transistor (SG-RFET) are presented. The device characteristics of SG-RFET is benchmarked against the silicon gate-all-around FET (GAAFET) with same gate length. Reconfigurable circuits- inverter, current mirror, ring oscillator using SG-RFET device are validated with simulation results in Sentaurus technology computer-aided design (TCAD) tool. Simple design, low path delay and reduced routing complexity make SG-RFET a potential candidate compared to the existing transistors.

*Full paper: IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT), Bangalore, India, 2020, pp. 1-5*
Department of Computer Science & Engineering
To Defeat DDOS Attacks in Cloud Computing Environment Using Software Defined Networking (SDN)

Yuvaraju B.N1, Narender M2

1,2Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

At present cloud computing environment, DDoS attacks have become a weapon for the illegitimate user’s as well as for the cyber terrorists. These attacks have the capability to disrupt large scale network infrastructure. Despite the various traditional DDoS mitigation techniques that exist present, DDoS attacks are rapidly growing in volume, frequency, and severity. This entitles for advance network architecture to represent the requirements of the present security challenge. Software-defined networking (SDN) is the new cloud-based networking paradigm which is rapidly gaining attention to the researchers to address the need of today’s data-centers—considering of functionalities of SDN-based platform, the proposed survey study providing comprehensive knowledge on prior SDN-based DDoS attack detection and mitigation strategies. This paper classifies solution strategies based on DDoS detection and mitigation techniques. Also, discussing current technologies to defend the DDoS attacks followed by future research direction to address the certain challenges identified in the research gap from existing studies. This paper is meant to brief about the existing system and practical approaches to solving such problems.

*Full paper: Advances in Intelligent Systems and Computing, Vol. 1224, 2020*
Preemptive Modelling towards Classifying Vulnerability of Ddos attack in SDN Environment

Narender M1, Yuvaraju B.N2.

1,2Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Software-Defined Networking (SDN) has become an essential networking concept towards escalating the networking capabilities that are highly demanded future internet system, which is immensely distributed in nature. Owing to the novel concept in the field of network, it is still shrouded with security problems. It is also found that the Distributed Denial-of-Service (DDoS) attack is one of the prominent problems in the SDN environment. After reviewing existing research solutions towards resisting DDoS attack in SDN, it is found that still there are many open-end issues. Therefore, these issues are identified and are addressed in this paper in the form of a preemptive model of security. Different from existing approaches, this model is capable of identifying any malicious activity that leads to a DDoS attack by performing a correct classification of attack strategy using a machine learning approach. The paper also discusses the applicability of best classifiers using machine learning that is effective against DDoS attack.

A Novel Approach for the Run-Time Reconfiguration of Heterogeneous Applications in a Smart Home Monitoring System

Rekha K.S\textsuperscript{1}, Kulkarni A.D\textsuperscript{2}, Phaneendra H.D\textsuperscript{3}

\textsuperscript{1,3}Department of Computer Science Engineering, The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Electrical & Electronics Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The Run-time Reconfiguration is implemented in many of the applications like Home Automation, Structural Health Monitoring Systems, Intrusion Detection Systems, Fire Detection Systems etc. It is required to dynamically reconfigure the applications based on the changing needs. Since all these applications runs on different networks, there is a demand to run the heterogeneous applications on the same network. The objective of this paper is to develop an adaptive model for run-time reconfigurations of Heterogeneous applications in a Smart Home Monitoring System using Wireless Sensor Networks and Internet Of Things. The intelligent mechanism would dynamically reconfigure itself and run only the required application. The proposed system saves the power and memory consumption.

*Full paper: Lecture Notes in Networks and Systems, Vol.98, 2020
ABSTRACT

Wireless Sensor Network (WSN) has been studied for more than a decades that resulted in evolution of the significant applications towards assisting in sensing physical information from human inaccesible area. It was also observed from existing system that energy attribute is the root cause of majority of the problems associated with WSN that also gives rise to various operational reliability issue. Therefore, the prime goal of the proposed study is to present a novel predictive optimization approach of data fusion in order to jointly address the problems associated with energy efficiency and reliable operation of sensor nodes in WSN. An analytical research approach is carried out in order to ensure that a time-based synchronization scheme contributes to offer an evolutionary approach towards significant energy optimization. A simulation-based benchmarking analysis is carried out to find that proposed system offers good energy-efficient performance in comparison to existing approaches.

An Analysis of Query Performance: Mongodb N Sql

Harshitha R¹, Vidya Raj C².

¹Student, MTech-Information Technology, The National Institute of Engineering, Mysuru
²Professor, Dept. of CS&E, The National Institute of Engineering, Mysuru

ABSTRACT

As the internet technology evolves, the data set gets boom, currently it is challenging to handle the Big Data. Complexity and huge data set are the main reasonsto come up with MongoDB. Many departments, warehouses and corporate companies are switching from SQL to NoSQL. In this paper, we are using MongoDB - a NoSQL database and MySQL - a SQL database. The NoSQL database provides the best and faster performance for the large volume of data, it is highly scalable and mainly eliminatesthe duplication of data. This paper aims to provides the detailed performance analysis along with mapping of MongoDB with SQL, advantages and a study of comparisons of CRUD operations. The outcome shows us the MongoDB givers better results and is dynamic.

ABSTRACT

This paper presents how the testing can be done on high volume data. It is done to check the data volume handled by the database. For testing we use a testing framework that uses a programming interface to the application to validate the behavior under test called API driven testing. The database is stretched to a threshold point by adding a large amount of data to it and then the system is tested for its response. REST Application Programming Interface (REST API) is a set of programming instructions for accessing a web-based software application or a set of commands used by an individual program to communicate with one another directly and use each other's functions to get information and that uses HTTP requests to GET, PUT, POST and DELETE data. CI/CD Pipeline implementation or the Continuous Integration/Continuous Deployment software is the backbone of the modern DevOps environment. The requirement of Continuous Integration & Continuous Deployment skills in various job roles such as Data Engineer, Cloud Architect, Data Scientist, etc. CI/CD bridges the gap between development and operations teams by automating build, test and deployment of applications. In this paper, we will know how the volume testing is done using automation testing.
Computational Methods for Automated Mitosis Detection in Histopathology Images: A Review

TojoMathew¹, Jyoti R.Kini², JenyRajan³.

¹Department of Computer Science Engineering, The National Institute of Engineering, Mysuru
²Department of Pathology, Kasturba Medical College, Mangalore
³Department of Computer Science and Engineering, National Institute of Technology Karnataka, Surathkal

ABSTRACT

Mitosis detection is an important step in pathology procedures in the context of cancer diagnosis and prognosis. Prevalent process for this task is by manually observing Hematoxylin and Eosin (H & E) stained histopathology sections on glass slides through a microscope by trained pathologists. This conventional approach is tedious, error-prone, and has shown high inter-observer variability. With the advancement of computational technologies, automating mitosis detection by the use of image processing algorithms has attracted significant research interest. In the past decade, several methods appeared in the literature, addressing this problem and they have shown encouraging incremental progress towards a clinically usable solution. Mitosis count is an important parameter in grading of breast cancer and glioma, unlike other cancer types. Driven by the availability of multiple public datasets and open contests, most of the methods in literature address mitosis detection in breast cancer images. This paper is a comprehensive review of the methods published in the area of automated mitotic cell detection in H & E stained histopathology images of breast cancer in the last 10 years. We also discuss the current trends and future prospects of this clinically relevant task, augmenting humanity's fight against cancer.

Hybrid Otsu Segmentation and Thresholding of Medical Images with Separability Factor

Suhas.S1, C.R. Venugopal2.

1Department of Computer Science Engineering, The National Institute of Engineering, Mysuru
2Department of Electronics and Communication Engineering, Sri Jayachamarajendra College of Engineering, Mysore

ABSTRACT

The most important part of medical image processing is image segmentation. Image segmentation is a procedure for extracting the region of interest (ROI) through an automatic or semi-automatic process. Many image segmentation methods have been used in medical applications to segment tissues and body organs. Some of the applications consist of border detection in angiograms of coronary, surgical planning; simulation of surgeries, tumor detection and segmentation, brain development study, functional mapping, blood cells automated classification, mass detection in mammograms, image registration, heart segmentation and analysis of cardiac images, etc. The Otsu method is a popular non-parametric method in medical image segmentation. This paper describes a way of medical image segmentation using optimized Otsu method based on thresholding algorithm. In proposed algorithm, the experimental results show that the new optimized method dramatically increases the separability factor in medical image segmentation while ensuring the final image segmentation quality.

Smart Pharmaceutical Refrigerator Using IoT

Abhishek R¹, Srikanth S², Prajwal G³, Anirudh R⁴, Dr. H. D. Phaneendra⁵.

¹²³⁴⁵Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The objective of this project is to build a system which can monitor the proper storage and stock availability of medicines. Nowadays most of the pharmaceutical stores have refrigerators to store some vaccines. When the stock inside the refrigerator gets exhausted the chemist might not be aware of it which may lead to delay in order of the stock. There are chances where the chemist may place a vaccine in the wrong compartment. Currently there are no systems in place which can notify users to replenish their medical supplies based on their purchase history. There is no existing solution which overcomes the above-mentioned problems.

Improving User Experience in ServiceNow Platform

Anusha R¹, Dr. Phaneendra H D².

¹Student, M.Tech-Information Technology, Department of CS&E, The National Institute of Engineering, Mysuru
²Professor, Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Information Technology Infrastructure Library (ITIL) is widely used framework for IT Service management (ITSM). The framework choosing is mainly depends on the needs of the business and industry specification, which is important to generate the productive outcomes.

Automated Parking Facility

MahimaN1, Meghana M C2, Mubashira Khanum3, Pragna S Pani4, Dr. Shabana Sultana5.

1,2,3,4,5Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Over the years, there has been lot of changes that has taken place which affects human life. Due to increase in the number of the vehicles in cities have led to major problems such as traffic, pollution, etc. One such problem that is the reason for traffic and disturbance is the parking problem. People usually park their vehicle in an indiscipline manner which leads to informality. Also people usually waste their time and efforts for searching proper space to park their vehicle. The aim of this paper is to resolve this issue related to parking. IoT based system named Automated Parking is implemented which involves sensors for detection of free spaces and LCD's for display purpose. RFID tag for payment purpose. This system allows the user to get the nearest free slot for parking which avoids the wastage of the time and also avoids traffic.

Technology behind Tax: Application of .NET Technology in Taxation

Niha Fathima R\textsuperscript{1}, Shabana Sultana\textsuperscript{2}

\textsuperscript{1,2}Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The purpose of this research is to study the application of modern technology in the field of Taxation. Tax is a major factor influencing the growth of any country. In this paper we study the application of .NET technology in the field of Taxation process in order to automate the process and to build an application which is used to prepare, review and process partner tax documents. This paper discusses the principles behind the Foundation for Windows Presentation (WPF) and its application in tax technology.

Secure and Decentralized Smart Elections

Rajat Gupta¹, Bipul Jha², Atul Kumar Shukla³, Aryan Raj⁴, Dr. Shabana Sultana⁵.

¹,²,³,⁴,⁵Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

This main aim of this paper is to develop a Secure and decentralized smart election system using blockchain technology. Over the last few years the traditional election processes have come under a lot of scrutiny whether they are secure or not. They are not fully secure as it is easy to attack the places where elections are being held which is called ‘booth capturing’. It also threatens privacy of voters. In recent years the attack on the current election process has been widespread and there is demand to make it more secure and more transparent. For decades Electronic voting systems have been a topic of interest, as there is a need for alternative processes to carry out an election. The main goal is to minimize the cost of conducting an election, while maintaining the election standards with respect to security and privacy, while having the voters an option of voting from any place, with any device. However, there remain challenges to achieve widespread adoption of such systems especially with respect to protecting them from any potential faults, reducing election frauds and attacks on election results.

AMMDAS: Multi-Modular Generative Masks Processing Architecture with Adaptive Wide Field-of-View Modeling Strategy

Venkata Subbaiah Desanamukula¹, Premith Kumar Chilukuri², Pushkal Padala³, Preethi Padala⁴, Prasad Reddy Pvgd⁵.

¹,²,³Department of CS&SE, Andhra University College of Engineering (A), Visakhapatnam
³Department of Computer Science Engineering, The National Institute of Engineering, Mysuru
⁴Department of Computer Science Engineering, National Institute of Technology, Mangaluru

ABSTRACT

The usage of transportation systems is inevitable; any assistance module which can catalyze the flow involved in transportation systems, parallelly improving the reliability of processes involved is a boon for day-to-day human lives. This paper introduces a novel, cost-effective, and highly responsive Post-active Driving Assistance System, which is “Adaptive-Mask-Modelling Driving Assistance System” with intuitive wide field-of-view modeling architecture. The proposed system is a vision-based approach, which processes a panoramic front view (stitched from temporal synchronous left, right stereo camera feed) & simple monocular-rear view to generate robust & reliable proximity triggers along with co-relative navigation suggestions. The proposed system generates robust objects, adaptive field-of-view masks using FRCNN+Resnet-101_FPN, DSED neural-networks, and are later processed and mutually analyzed at respective stages to trigger proximity alerts and frame reliable navigation suggestions. The proposed DSED network is an Encoder-Decoder-Convolutional-Neural-Network to estimate lane-offset parameters which are responsible for adaptive modeling of field-of-view range (157°-210°) during live inference. Proposed stages, deep-neural-networks, and implemented algorithms, modules are state-of-the-art and achieved outstanding performance with minimal loss(L[p, t], \( \delta \), \( \text{L}_{Total} \)) values during benchmarking analysis on our custom-built, KITTI, MS-COCO, Pascal-VOC, Make-3D datasets. The proposed assistance-system is tested on our custom-built, multiple public datasets to generalize its reliability and robustness under multiple wild conditions, input traffic scenarios & locations.

Real-Time Object Detection and Face Recognition System to Assist the Visually Impaired

Anish Aralikatti¹, Jayanth Appalla², Kushal S³, Naveen G S⁴, Lokesh S⁵, Jayasri B S⁶.

¹,²,³,⁴,⁵,⁶Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

The application system presented here is for use in an Android based mobile phone by the visually impaired for detecting objects in their vicinity, which will help them move around safely, without crashing into objects. The detection of objects is done from a real time video taken from the mobile phone camera. People and objects are detected from this video using OpenCV, YOLO and FaceNet. If a human is detected, the system identifies the person. His identity will then be converted into audio and presented to the user. Similarly, objects detected in the vicinity will be presented in audio format to the user.

Permissioned Blockchain Based Public Procurement System

J J Deshpande¹, M Gowda², M Dixit³, M S Khubbar⁴, B S Jayasri⁵, S Lokesh⁶.

¹,²,³,⁴,⁵,⁶Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Hundreds of public procurement projects are undertaken every day all over the country. The tenders for these projects are given to the winning contractor in an auction-like setting which have massive security issues. After a contractor wins a tender, the specifics of the progress of the work done are rarely properly monitored. The details of the finances spent on the project can be easily manipulated. To enable integrity, non-repudiation and immutability to the data requires the desirable technology to support the above requirements. Hence, the proposed system uses blockchain technology to provide transparency and trust to all parties involved in the network. The entire system consists of two modules such as the Tender Bidding system and Tender Monitoring system using a multi-organization blockchain network in the Hyperledger Fabric. The whole bidding process is improved by creating a decentralized descending auction system that will carry it out fairly and transparently. The Tender Monitoring system employs a custom endorsement policy to attain 100% consensus for attesting every transaction made regarding the progress of the project so that vital steps are ratified and recorded with evidence supporting their integrity. The main aspects of the system, its many components, deployment and drawbacks are viewed.

Detection and Classification of Diseased Mangoes

Akshay Koushik H1, Ritanya B Bharadwaj2, Ram Prasad E Naik3, Ramesh G4, Yogesh M.J5, Sana Habeeb6.

1,2,3,4,5,6Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Fruits are an important source of nutrition for the human body. Due to the lack of maintenance and fungus, fruit diseases cause a huge loss in the yield. Mango is one of the important fruits consumed worldwide, and it is susceptible to diseases that can affect the quality and quantity. Manual inspection is tiresome, time-consuming, labor-intensive, and inefficient. In this paper, an image classification technique is used to identify different diseases in mangoes and separate them from the healthy ones. Image augmentation is carried out on initial images to synthetically increase the dataset size followed by cleaning and preprocessing the images. One-Hot encoding on the labels is carried out, and they are fed into the convolutional neural network which classifies the mango images into various classes. Our proposed model has been experimentally verified and validated for the best results and provides an accuracy of 93% - 94%.

*Full paper: International Conference on Computer Science and Its Application in Agriculture, ICOSICA 2020, Page No. 1-8 (SCOPUS)
Secure Communication for Intelligent Enterprises

Koduru Suresh¹, Pushkal Padala², Prasad Reddy P³.

¹Department of SAP LABS India Private Limited, Bangalore
²Department of Computer Science Engineering, The National Institute of Engineering, Mysuru
³Department of CSSE Andhra University, Visakapatnam, Andhra Pradesh

ABSTRACT

The emerging rapid increase in the connectivity of computer networks and their usage has drawn the attention of organizations and data science researchers towards a secure data storage architecture, where it can be protected from unauthorized entities. In this paper a novel methodology "Image Encryption with Modified Diffie Hellman" (IEMDH) is designed and developed to address the suitability of encryption algorithms for low powered devices and to offer a better security than existing approaches to contribute towards the Intelligent Enterprise security and sustainability. Here, the symmetric AES algorithm and Modified Diffie Hellman (MDH) algorithms are combined to enhance the overall security and it also eliminates the key exchange drawback in symmetric key techniques. Later, a performance evaluation is carried out between the proposed IEMDH approach and IERSA (Image Encryption with RSA algorithm) to check the suitability on low power devices.

Workload and SLA Violation Prediction in Cloud Computing

R Anitha¹,², C. Vidyaraj²

¹,²Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Recently, cloud computing has come up as an evolving technology in various real-time computing field and widely adopted in several real-time computing systems. Due to its advantages of pay-as-you go services where users need not consider other factors such as hardware and platforms. Due to increasing demand of these applications, providing efficient resource and managing these resources is a crucial task because wastages of resources can lead towards the economic loss to the users and service providers. In order to deal with these issues, we focus on the workload prediction and SLA violation prediction approach for improving the overall performance. According to the proposed model, we develop a workload prediction model using clustering approach where similar workload patterns are grouped together to reduce the overhead and later SLA violation scheme is applied which is used for reducing the violations using Naïve Bayes classification approach. Finally, comparative experimental study is carried out which shows that the proposed approach archives better performance when compared with the state-of-art techniques.

Performance Evaluation of TCP Variants for IoT Built on Visible Light Communications

B R Vatsala¹, Dr. C Vidya Raj².

¹,²Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Internet of Things is the most prominent technology in the field of research. IoT protocols have to be carefully designed to meet the limited resource constraints of the system. One of the limitations in IoT environment is restriction in data storage, hence large data flows generated from IoT applications must be transferred quickly with suitable flow control and reliability. TCP is the preferred transport layer protocol for this. We build IoT on Visible Light Communication physical medium which is a promising technology with high bandwidth and evaluate performance of TCP variants with reference to goodput, packet delivery ratio and congestion window size in both error free and error prone scenarios.

*Full paper: International Conference on Data Sciences, Machine Learning and Applications, 06-12-2020, Pune, Maharashtra
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Department of Information Science & Engineering
Towards Handling Incremental Load for Anomalies in Near Real Time Data Warehouse

Mohammed Muddasir N1, Raghuveer K2, Dayanand R3.

1Department of Information Science Engineering, VVCE, Mysuru
2Department of Information Science Engineering, The National Institute of Engineering, Mysuru
3Technical Director, India

ABSTRACT

Refreshment anomalies occur in a data warehousing environment while performing Extract Transform and Load (ETL) to get the data for analysis from sources. There could be several reasons for the anomalies like not able to capture the delta on time, system time out, duplicate entries due to outer join operations and many more. Once anomalies are detected the compensation operation is executed to get the data that was missing into the data warehouse. In this work we would like to analyze scenario where it is necessary to perform incremental loads based on priority in an ongoing data warehouse maintenance work. The work proposes a novel approach to decide on when to perform ETL so that refreshment anomalies do not occur and to maintain integrity of data such that analytics queries always provide right information to the analyst. Two novelties have been discussed in this work one is to have a threshold before compensation of updates and two is while performing compensation updates prioritize the query with less freshness interval to have more time limits for the updates to be completed.

*Full paper: WSEAS Transactions on Systems and Control, Vol.15, 2020*
A Novel Approach to Handle Huge Data for Refreshment Anomalies in Near Real-Time ETL Applications

Mohammed Muddasir N\textsuperscript{1}, Raghuveer K\textsuperscript{2}

\textsuperscript{1}Department of Information Science Engineering, VVCE, Mysuru
\textsuperscript{2}Department of Information Science Engineering, The National Institute of Engineering, Mysuru

**ABSTRACT**

Real-time analysis of data is the new trend to get useful insights in very less time spend on data preprocessing. Analysis of data requires the movement of data from various heterogeneous/homogenous sources to a common place known as the data warehouse. Data source for data warehouse is the transaction processing systems. Movement of data from the transactional database to the data warehouse is done using the process of extract, transform, and load (ETL). ETL previously was done during of peak hours like a night load or on weekends. The requirement of real-time analysis demands the ETL to be fast and not wait for off-peak hours. This leads to the concept of near real-time ETL, and here techniques are employed to identify the potential changed data at the transaction database and move it to the analysis database with a very minimal delay. This movement of data in real time from multiple sources in an incremental form could lead to anomalies in the data warehouse. This work discusses the various causes of anomalies and solutions to overcome them. Our main contribution is the application of loading data into temporary tables for reducing query execution time in case of overcoming refreshment anomalies.

*Full paper: Advances in Intelligent Systems and Computing, Vol. 1154, 2020*
Sports Navigator - One Platform for All Sports Intelligence Using ML (Player Recommender)

Srinath R¹, NagaSwetha Devarakonda², Arun Biradar³.

¹Associate Professor, Department of Information Science Engineering, The National Institute of Engineering, Mysuru
²Managing Partner, Entelika Consulting and IT Services, Mysuru
³Professor & Head, Dept of CS&E, EWIT, Bengaluru

ABSTRACT

We have seen some significant technical advancement in the field of Big Data and Machine learning over the past few years and its use cases implementation has spread across various regions. One such use case is its utilization in the sports industry. People are becoming more and more professional and want to improve their games from all avenues. There is also a significant increase in the money spent by parents and sports person. However, there is no one platform which creates a digital footprint of each player so a player can be tracked from his early participation in games till he starts playing professional games. We propose a platform which will collect data from all the videos played by players and create a digital footprint of each of the players and games. This technology will help to create a better digital forum for all players even Coaches and help them improve their games. This paper particularly cover player recommendation to the team.

The Guiding Traits for Recruitment of a Key Player in Soccer

Srinath R1, Shilpa Biradar 2, NagaSwetha Devarakonda3, Arun Biradar4.

1Department of Information Science Engineering, Research Scholar, The National Institute of Engineering, Mysuru
2Department of Information Science Engineering, Dr AIT, Bengaluru
3Entelika Consulting and IT Services, Mysuru
4 Department of CS&E, EWIT, Bengaluru

ABSTRACT

The main aim of any team in a soccer game is to win. Every player of the team, whether he is a goalkeeper, full-back, Defender, Sweeper, midfield, striker etc, his objective is see that they give their best and make the team to win all games all seasons. As per the any Club or Coach, victory can happen only with good teamwork, i.e. teamwork will make the dream work. All this can happen only with best team. So selection of players for different positions plays a very important role. This paper gives a glimpse of different characteristics that a recruiter can look at while selecting a key player ie Goal Keeper. Furthermore fifa19 dataset is considered for evaluating the attributes chosen. In addition, we also depict the relationships between the attributes.

*Full paper: International Conference on AI, Robotics and Automation part of Global Technology Forum (GTF 2020)
Department of
P. G. Studies (MCA)

Asha N1., Raghavendra Rao G2.

1Department of MCA, The National Institute of Engineering, Mysuru
2Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Aiming at the huge energy consumption issues, this paper proposes a novel strategy for aggregation of Virtual Machine (VM)s using future resource usage inference. With the rapid and enormous development in the area of cloud computing, datacenters, a major part of cloud infrastructure swallows large amount of electrical energy and leads to increased cost and CO2 emissions. In this direction, consolidation of VMs also referred as aggregation in our work anticipates resource usage in the near future within each host. Based on this work, a model is proposed which identifies a source host machine that is either Excess-Provisioned (EP) or Less-Provisioned (LP), a target host machine for accommodating the VMs selected from the above machines. Our experiments show through a rigorous analysis with the peer works in existence, minimization in the number of active hosts.

*Full paper: Lecture Notes in Electrical Engineering, Vol. 643, 2020
A Novel Approach for Music Recommendation System Using Matrix Factorization Technique

Ananth G.S¹, Raghuveer K².

¹Department of MCA, The National Institute of Engineering, Mysuru
²Department of Information Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

A recommender system provides personalized content to its users to handle the ever expanding information overload, thus improving customer relationship management. Music is a subject used widely across the world in different aspects of life. Music recommender systems help users to listen to the right choice of music. With the advent of mobile devices and Internet, access to different music resources is easily available. In this paper, we provide music recommendations to the Million Song Dataset using the TuriCreate’s core ML library and with a focus on two methods of collaborative filtering techniques: user-based and item-based recommendations. Results are deduced exploring numerous metrics to measure the similarity of users and items such as cosine metric, Pearson correlation, latent matrix factorization and others. A comparison of different evaluation metrics is carried out to check for the effectiveness of the recommender system.

*Full paper: Advances in Intelligent Systems and Computing, Vol.1085, 2020
ABSTRACT

Many traffic injuries and deaths are caused by the drowsiness of drivers during driving. Existing drowsiness detection schemes are not accurate due to various reasons. To resolve this problem, accurate driver drowsiness has been developed using an electrocardiogram values. The proposed system predicts the fatigue status of driving person using ECG values. Datasets are interpreted by algorithms Naïve Bayes, KNearest Neighbor, Decision Tree and ECLAT. The system adds test data and uploaded data both are compared and predict the result is in graphical representation with displaying percentage, where showing percentage Naïve Bayes 93.34%, K-Nearest Neighor 91.34%, Decision Tree 91.3%, and ECLAT 95.34%. Here showing ECLAT algorithm is more efficient than Naïve Bayes, K-Nearest Neighor, Decision Tree algorithms. Thus, in our system we are correlating ECG to Rate the Quality of Fatigueness in Drowsy Driving to comparing pictorial representation to ensure public transport safety.

Predicting HRV Accuracy to Measure Drowsy Status for Smart Traffic

Sangeetha S M1, K R Sumana2, Dr H D Phaneendra3.

1PG Student, The National Institute of Engineering, Mysuru
2Department of MCA, The National Institute of Engineering, Mysuru
3Department of Computer Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

Driver drowsiness detection is a key technology that can prevent fatal road accidents caused by drowsy driving. The present work proposes a driver drowsiness detection algorithm based on heart rate variability (HRV) analysis and validates the proposed method by comparing with electroencephalography (EEG)-based sleep scoring. Changes in sleep condition affect the autonomic nervous system and then HRV, which is defined as an RR Interval (RRI) fluctuation on an electrocardiogram trace. Eight HRV features are monitored for detecting changes in HRV by using multivariate statistical process control, which is a well known anomaly detection method. Existing System are restricted in its properties of implementation such as highly controlled laboratory environment, the limited number of participants. Accordingly, more studies are required to confirm our results by using wellmatched groups of participants in a real driving environment. The proposed system forecast the drowsy condition in the driver based on the blood pressure, blood proteins. Datasets are compared with the algorithms SIFT, K-Mean, Apriori, ECLAT to analyze the drowsiness and result will be shown as pictorial representation with the percentage of drowsy status for processing with individual algorithms like SIFT(70%), KMean(60%), Apriori(85%), ECLAT(92%) . Thus the system will avoid the chances of fatal road accidents.

Fico Authentication Suite and Fico Identity Proofing

Chethan K.G1, K.R Sumana2, Rajesh Venkatesan3

1,2Department of MCA, The National Institute of Engineering, Mysuru
3Fair and Isaac Corporation Bangalore

ABSTRACT

The FICO Authentication Suite provides the capability that can be easily deployed or integrated with the FICO’s credit, risk, fraud, financial crime and customer engagement solutions that ensures the end-end protection across the customer life cycle. The layered and the risk-based controls ensures the consistent user experience and establishes the manual authentication for the customers to ensure that they communicate with the trusted and also the appropriate organization. The risk-based approach is used to provide protection and user experience, providing easy-to-use, integrated security across the customer lifecycle. It provides the. Better enrolment to the registered customers in an easy and efficient way.

IoT Based Security System for Supporting Parentalship

Keerthivasan K1, K R Sumana2.

1,2Department of MCA, The National Institute of Engineering, Mysuru

ABSTRACT

The proposed system “IoT Based Security System for Supporting Parentalship” aims to provide security to the women and child by using modern, reliable techniques. It can be used to locating missing or lost children and also tracking the child movements outside from the home. The system can also be used to locate women who are in danger. We have combined GPS with one of the basic service of a smart phone which is GSM more specifically SMS in a system. Our proposed model contains pulse sensor which measures the heart beat rate and temperature sensor which measure the body temperature in a regular basis. This system includes panic button. In case of emergency the person will press the panic button, the emergency message will send to the parent number. The sensed values are sent to cloud, the parent can access it using a link provided. The complete system is implemented using Arduino nano, node mcu and arduino promini. I used c programming for interface all the sensor and other hardware devices. This device is portable, hence it is easy to carry from one place to other.

A Novel and Hybrid Approach of an Indian Demographic Movie Recommender System

Ananth G S1, K. Raghuveer2, Dayananda R3, Kashyap R4.

1,4Department of MCA, The National Institute of Engineering, Mysuru
2Department of Information Science Engineering, The National Institute of Engineering, Mysuru
3CEO, Kitchen 365, Mysuru

ABSTRACT

India is a demographic democratic country having a population of nearing 140 crores and with different people of various religions, communicating numerous languages, wearing different varieties of clothes. India is also a cacophony of languages, with more than 1500 films being produced every year in its 20+ languages. Recommender systems give personalized outputs in the form of the information being processed. But unfortunately, there is very little personalization done or the data available for this voluminous demographic attribute possessed by India. For example, though there are different platforms like Amazon prime videos, Netflix, tickets booked through www.bookmyshow.com/ to watch movies but not restricted to just Hindi and English (the two official languages of India)—there is little concentration towards the demographic data of Indian languages. In this paper, we present a novel way of creating an Indian Demographic Movie Recommender System (IDMRS) making full utilization of the various demographic attributes available. IDMRS is a system capable of filtering and providing personalization to users in five regional south Indian languages. This system makes use of various characteristics and demographic attributes, such as age, gender and occupational details for the generation of recommendations. Also, a curated dataset, similar to MovieLens dataset, is evolved with this system and is evaluated with various performance metrics.

SDN Design Dependent on an Open System Administration Establishment

Namratha G K¹, Pavan Kumar R B²

¹,²Department of MCA, The National Institute of Engineering, Mysuru

ABSTRACT

Software Defined Network is another and fascinating method for organizes the executives. This paper determines the architecture of Software Defined Network (SDN). In view of an Open System administration prologue to SDN, it grows the standards of SDN and applies them to building segments and interfaces.

A Movie and Book Recommender System Using Surprise Recommendation

Ananth G S\textsuperscript{1}, Raghuveer K\textsuperscript{2}

\textsuperscript{1}Department of MCA, The National Institute of Engineering, Mysuru
\textsuperscript{2}Department of Information Science Engineering, The National Institute of Engineering, Mysuru

ABSTRACT

With viable amounts of global Internet users and their online shopping spree, the world has led towards an astonishing and exponential digital data growth. It is of at most importance that this data has to be properly consumed and utilized when it comes to providing personalized content to both users and service providers. This is where the role of a Recommender System comes into active participation. These systems being user-centric are used to provide information that suits to the needs and interest of a user. In this paper, two types of Recommender systems are proposed. The first one is a Movie recommender and the second a Book recommender. For the movie recommender, the MovieLens dataset is used and the personalized Book content is obtained applying various prediction algorithms available in Surprise Recommendation kit. We make use of the Books-crossing dataset that has the book relevant information along with its ratings. We use the collaborative and content-based filtering techniques for obtaining recommendations and the systems are also evaluated using different metrics like RMSE, test time and the error factor.

*Full paper: International Conference on Innovative Advancements in Engineering and Technology, Jaipur, National University, Jaipur, 2020
Department of Basic Sciences
Synthesis, Characterization, Crystal Structure and Theoretical Simulation of Novel Ethyl 2-(7-Hydroxy-4-Methyl-2-Oxo-2h-Chromen-3-Yl) Acetate

Mahesha\textsuperscript{1}, Razak N.S.A\textsuperscript{2}, Jamalis J\textsuperscript{3}, M.V.Deepa Urs\textsuperscript{4}, Gowda N.S.L\textsuperscript{5}, Reddy K.R\textsuperscript{6}, Lokanath N.K\textsuperscript{7}, Naveen S\textsuperscript{8},

\textsuperscript{1}\textsuperscript{7}Department of Studies in Physics, Manasagangotri, University of, Mysuru
\textsuperscript{2}\textsuperscript{3}Department of Chemistry, Faculty of Science, University Teknologi Malaysia, Mysuru
\textsuperscript{4}Department of Physics, The National Institute of Engineering, Mysuru
\textsuperscript{5}Department of Chemistry, Vidyavardhaka College of Engineering, Mysuru
\textsuperscript{6}School of Chemical & Biomolecular Engineering, The University of Sydney
\textsuperscript{8}Department of Physics, Faculty of Engineering & Technology, Jain (Deemed-to-be University), Bangalore

ABSTRACT

Novel coumarin derivative, ethyl 2-(7-hydroxy-4-methyl-2-oxo-2H-chromen-3-yl)acetate has been synthesized by Pechmann condensation reaction and the single crystals of the compound were obtained by slow evaporation technique using ethanol as crystallization solvent. The compound C\textsubscript{28}H\textsubscript{28}O\textsubscript{10} was spectroscopically characterized using \textsuperscript{1}H NMR, \textsuperscript{13}C NMR and IR techniques. Finally single crystal X-ray diffraction studies revealed the molecular structure conformation of the coumarin derivative. The compound crystallized in the orthorhombic crystal system with \textit{P2_12_2_1} space group. The crystal structure of C\textsubscript{28}H\textsubscript{28}O\textsubscript{10} is stabilized by various intra and inter (O--H...O and C--H...O) intermolecular hydrogen bond interactions. The existence and nature of various intermolecular interactions are quantified by the 3-D molecular Hirshfeld surface and 2-D fingerprint plot analysis. Further, the DFT calculations were performed to optimize structural coordinates and the minima point on the potential energy surface is confirmed by the frequency calculation. The optimized structural parameters showed very good correlation with the single crystal XRD results. Frontier molecular orbitals (HOMO-LUMO), their energy gap and associated reactive parameters were determined to understand the properties of the molecule.

*Full paper: Chemical Data Collections, Vol.28, 2020
Effective Atomic Number for Compton Scattering: A Benchmark Tool to Characterize Materials

Sankarshan B.M¹, Athrey C.D², Umesh T.K³.

¹Department of Physics, The National Institute of Engineering, Mysuru
²Department of Physics, Indian Institute of Technology Madras
³DoS in Physics, University of Mysore, Manasagangotri, Mysuru

ABSTRACT

Compton scattering is a very useful tool to probe the material properties. Traditional techniques such as energy dispersive spectroscopy (EDS) lead to (i) a choice of small size (amount) of the sample resulting in altering the pristine form of the sample, (ii) an ambiguity while marking the closely lying K-shell and L-shell peaks of different elements. It is felt that this can be overcome through the determination of effective atomic number (Zeff) which can yield a fair idea of the content of the material supplementing the EDS information. In the present work, we have made an attempt to determine Zeff from Compton scattering with the angles beyond 90° which has an advantage of placing both the radiation source and the detector on the same side of the medium making it possible to analyze the samples such as those of archaeological importance which are usually accessible only from one side. A goniometer assembly using 59.54keV gamma rays emitted by a 7.4GBq Am isotope and a high purity germanium detector were employed. The values of the Zeff have been verified with that of the Auto-Zeff program values obtained by making use of the composition information from the EDS data. The present work points to the fact that Zeff of archaeological samples is a handy, confirmatory onsite tool for their non-destructive evaluation.

The Reaction of Arylmethyl Isocyanides and Arylmethylamines with Xanthate Esters: A Facile and Unexpected Synthesis of Carbamothioates

Rajeev N1, Swaroop T.R2, Alrawashdeh A.P3, Rahman S4, Alodhayb A5, Anil S.M6, Kiran K.R7, Chandra8, Georgiou P.E9, Rangappa K.S10, Sadashiva M.P11.

1,2,6,7,10,11 Department of Studies in Chemistry, University of Mysore, Manasagangotri, Mysuru
3,4,9 Department of Chemistry, Memorial University of Newfoundland, St. John’s, Newfoundland
5 Aramco Laboratory for Applied Sensing Research, King Abdullah Institute for Nanotechnology, King Saudi
5 Surface, and Interface Sciences, Department of Physics and Astronomy, College of Science, King Saudi
8 Department of Physics, The National Institute of Engineering, Mysuru

ABSTRACT

An unexpected formation of carbamothioates by a sodium hydride-mediated reaction of arylmethyl isocyanides with xanthate esters in DMF is reported. The products thus obtained were compared with the carbamothioates obtained by the sodium hydride-mediated condensation of the corresponding benzylamines and xanthate esters in DMF. To account for these unexpected reactions, a mechanism is proposed in which the key steps are supported by quantum chemical calculations.

Synthesis of Piperidine Conjugated Dihydroquinazolin-4(1h)-ones and Their Antiproliferative Activity, Molecular Docking Studies and DFT Calculations

Narasimhamurthy K.H1, Chandra2, Swaroop T.R3, Jagadish S4, Rangappa K.S5.

1,3Department of Studies in Organic Chemistry, Manasagangotri University of Mysore, Mysuru
2Department of Physics, The National Institute of Engineering, Mysuru
4Department of Studies in Biochemistry, Manasagangotri, University of Mysore, Mysuru
5Department of Studies in Chemistry, Manasagangotri, University of Mysore, Mysuru

ABSTRACT

Background: Xanthatin, fluoropyrimidine and thienopyrimidine, pyrazolopyrimidine, pyrimidine carboxamides, and SKLB1002 are reported as VEGFR2 tyrosine kinase inhibitors. Recently, many studies related to different heterocycles conjugated with dihydroquinazolinones are known to have very good biological activities. In this study, we are intended to explore the cytotoxic studies of piperidine conjugated dihydroquinazolinones against colorectal/colon cancer cell lines and along with molecular docking studies and DFT calculations.

Methods: The colorectal/colon cell lines HCT116 and A549 cell lines were treated with these compounds and cytotoxic activities were evaluated by MTT dye uptake method. We performed molecular modelling for compound 3d using the Auto Dock software. The binding of compound 3d with target proteins was studied with the collection of experimentally determined PDB database. Optimized geometry by DFT calculations was performed with B3LYP/6-31G (d) basis set.

Results: Piperidine-conjugated dihydroquinazolinone analogues displayed anticancer activity. Particularly, the compound 3d with electron-withdrawing substituents on a phenyl ring showed significant cytotoxicity against HCT116 and A549 cell lines. Molecular docking studies proved that the compound 3d has good fitting by forming hydrogen bonds with amino acid residues at the active sites of VEGFR2. The HOMO, LUMO, their energies and UV visible spectrum were predicted using DFT calculations.

Conclusion: Four piperidine-conjugated dihydroquinazolinones were synthesized and evaluated against colorectal and colon cancer cell lines. Compound 3d significantly inhibited the growth of HCT116 and A549. Molecular docking studies displayed good fitting of compound 3d by forming different H-bonds with the amino acid at the active sites of the VEGFR2 target. Using a theoretical approach, we optimized HOMO and LUMO plots for the compound 3d.

*Full paper: Letters in Drug Design and Discovery, Vol.17, Issue.1, 2020
Crystal Structure, Hirshfeld Surface and Frontier Molecular Orbital Analyses of N-[2-(Trifluoromethyl) Phenyl] Succinamic Acid

Dr. Suchetan P. A1, Lokanath K Neratur2, S. Naveen3, Krishna Murthy Potla4, M. V. Deepa Urs5.

1Department of Chemistry, Tumkur University
2Department of Physics University of Mysore
3Department of Physics Jain University, Bengaluru
4Department of Chemistry Bapatla Engineering College, Bapatla
5Department of Physics, The National Institute of Engineering, Mysuru

ABSTRACT

The ortho-CF3 substituent and the N-H bond are in syn-conformation within the title molecule. In the amide and acid functionalities, the carbonyl groups are directed in opposite directions to each other and their related-CH2 groups. Syn conformation is observed for the acid functionality, where the carbonyl C=O and hydroxyl O-H bonds are directed in the same direction. Three planar fragments comprise of the molecule: the aromatic ring (A), the core portion -N(H)-C(=O)-C(H2)-C(H2)(B) and -C(H2)-C(=O)-OH(C). The dihedral angle between a pair of fragments being 48.6(4)° (A and B), 81.6(4)° (B and C) and 70.5(5)° (A and C). N-H•••O hydrogen bonds bind the molecules forming C(4) chains in the crystal, and the neighbouring anti-parallel chains are bound by O-H•••O hydrogen bonds resulting in a chair shaped ribbon of one-dimensional nature. The Hirshfeld surface study was carried out, including fingerprint plots. Studies have shown that interactions with O•••H / H•••O (27.4%), H•••H (27.3%) and H•••F / F•••H (20.2%) substantially add to the surface. Theoretically, the highest occupied molecular orbital (HOMO), lowest unoccupied molecular orbital (LUMO) and various global reactivity descriptors were also computed by the Density Functional Theory (DFT / B3LYP) approach with a 6-311G(d, p) basis set in the ground state on the geometrically optimized structure in the gas phase.

Influence of Graphene Nanoplatelets on Tribological Properties of Short Carbon Fibre Reinforced Pa-66/Tce Composites

M.V.Deepa Urs¹, B.Suresha², G.Hemanth³, GirirajKulkarni⁴, M.R.Shiva Charan⁵.

¹²Department of Physics, The National Institute of Engineering, Mysore
²Department of Mechanical Engineering, The National Institute of Engineering, Mysore
⁵Robert Bosch Engineering and Business Solutions Pvt Ltd, Bengaluru

ABSTRACT

Graphene nanoplatelets (GNPs) modified thermoplastic-polymer based composite structures can be used as lightweight, damping, high strength, and tribo-elements in food processing machinery where traditional single materials become unproductive. In the present research work, novel GNPs modified polyamide 66/thermoplastic copolyester elastomer (PA 66/TCE) composite reinforced with short carbon fibres were developed. The possible structural changes of the materials by Fourier transformed infrared (FTIR) technique and the wear performance of the fabricated composites were investigated in adhesive wear and abrasive wear modes. Adhesive wear test was carried out at 1000, 3000, and 5000 m sliding distances and 50 N applied load and at 2 ms⁻¹ sliding velocity. In case of abrasive wear, tests have been conducted at 300, 450, and 600 m abrading distances and at an applied normal load of 20 N using 425 µm silica sand particles as abrasives. For the GNPs modified PA 66/TCE hybrid composites used in this investigation, the friction coefficient increases with an increase in sliding distance and the specific wear rate decreased with an increase in sliding distance. Furthermore, superior wear performance was observed in 3 wt% GNPs modified PA 66/TCE hybrid composite. However, under three-body abrasion, the specific wear rate decreases with increase in abrading distance and the superior abrasion resistance were found in 1 wt% GNPs modified PA 66/TCE hybrid composites. Finally, the microscopy indicated significant differences in the wear mechanisms in each adhesive and abrasive wear modes.

*Full paper: Materials Today: Proceedings, 2020
Influence of Fillers on Mechanical Behaviour of Carbon Fiber/Vinyl Ester Hybrid Composites

B.Suresha¹, M.V.Deepa Urs², H.N.Venkatesh³, H.R.Vishwanath⁴, E.Ganesh⁵.

¹,³,⁴,⁵Centre for Composite Materials Research, The National Institute of Engineering, Mysuru
²Department of Physics, The National Institute of Engineering, Mysuru

ABSTRACT

In this experimental work, vinyl ester resin was reinforced with high strength carbon fiber (CV) and the mechanical properties were further improved by incorporating SiC/graphite particles. Overall, the enhancements of both the hardness and strengths of CV composites with SiC/graphite were successfully achieved by fabricating composites using hand lay-up stacking followed by hot pressing. Mechanical tests demonstrate that, the tensile and flexural strengths/moduli of CV improved by increasing SiC/graphite from 2 to 6 wt%. The mechanical performances of CV/graphite hybrid composites were found to be supreme with the incorporation of 6 wt% of graphite particles. Meantime, the use of higher surface area and rigid flake kind graphite particles considerably showed improvement in the overall mechanical performance of CV hybrid composites. Furthermore, the CV/SiC hybrid composites show superior hardness. The utmost increment of hardness was found for the CV composite with 6 wt% SiC. The information bestowed during this paper is accustomed to develop load bearing hybrid composites for structural applications.

*Full paper: Materials Today: Proceedings, 2020*
Effective Atomic Number and Effective Electron Density of Some Composite Materials of Industrial Interest For Compton Scattering

Prasanna Kumar S1, Sankarshan B M2, Umesh T K3.

1Department of Physics, JSS Academy of Technical Education, Mylasandra, Bengaluru
2Department of Physics, The National Institute of Engineering, Mysuru
3University of Mysore, Manasagangothri

ABSTRACT

Effective atomic number and effective electron densities of commercially available composite materials such as Brass, Solder lead and Steel wool are determined in the gamma energy range 280keV to 1115keV by using their differential incoherent scattering cross sections measured in a goniometer assembly which employ an ORTEC model 23210 gamma-x high purity germanium detector (HpGe). The data were recorded on a personal computer based MCA in the angular region 500 -1100 at three incident gamma ray energies 279.1keV, 661.6keV and 1115.5keV using 203Hg, 137Cs and 65Zn gamma sources. In the present investigation the effect atomic number was found to be independent of both angular grid and energy range of present interest. The results of the effective atomic number Zeff and the effective electron densities Neff, so obtained are first of their kind at these energies and are expected to play a vital role in a variety of applications of Radiation Physics, Condensed matter Physics, Space Sciences, Medical imaging, Compton scattering imaging and so on.

Effective Atomic Number and Electron Density of Stones of Constructional Importance in Shielding Applications for 133Ba Gamma Rays

Athrey C D1, Bharath G C2, Sankarshan B M3, Prasanna kumar S4, Umesh T K5.

1,2Department of Studies in Physics University of Mysore, Manasagangotri, Mysuru
Department of Physics, Indian Institute of Technology Madras, Chennai
Department of Education in Science and Mathematics, Regional Institute of Education, Manasagangotri, Mysuru
3Department of Physics, The National Institute of Engineering, Mysuru
4Department of Physics, JSS Academy of Technical Education, Mylasandra, Bengaluru
5University of Mysore, Manasagangotri

ABSTRACT

Effective atomic number ($Z_{\text{eff}}$) and electron density ($n_{\text{cl}}$) are vital parameters in quantifying the interaction characteristics of materials with gamma rays. These find applications in the field of nuclear engineering radiography, reactor shielding, oncology etc. It is known that several types of stones are used in the construction of a cement concrete based reactor shielding space in a radiation lab. The $Z_{\text{eff}}$ and $n_{\text{cl}}$ can throw light on their relative suitability for this purpose. With this end in view we have determined these parameters of some stones for $^{133}$Ba gamma rays by making use of their total attenuation cross sections ($\sigma$). “$\sigma$” were measured in a narrow beam good geometry setup with a high resolution hyper pure germanium (HpGe) detector. The data on the composition of these samples have been obtained by Energy dispersive X-ray spectroscopy (EDS). The experimental values and the theoretical values of $Z_{\text{eff}}$ and $n_{\text{cl}}$ so obtained were found to agree within the range of experimental errors. These results are first of their kind for the samples of present interest. Possible conclusions are drawn based on the present study.

*Full paper: International Conference on Advances in Materials, Ceramics & engineering Sciences (AMCES – 2020), Page.No. 214
Cost-Effective And Green Approach for The Synthesis of Zinc Ferrite Nanoparticles Using Aegle Marmelos Extract As A Fuel: Catalytic, Electrochemical, and Microbial Applications

Lakshmi Ranganatha V¹, Pramila S², Nagaraju G³, Udayabhanu⁴, Surendra B.S⁵, Mallikarjunaswamy C⁶.

¹Department of Chemistry, The National Institute of Engineering, Mysuru
²Department of Chemistry, JSS College of Arts, Commerce and Science, Mysuru
³Department of Chemistry, Siddaganga Institute of Technology, Tumakuru
⁵Department of Chemistry, East West Institute of Technology, Bengaluru

ABSTRACT

Today, due to industrialization and urbanization, the world is facing serious water shortage and environmental alarms. The reusability of polluted water could be a promising approach for the sustainable wastewater management strategy. In the view, the present work compiles the synthesis of zinc ferrite (ZnFe₂O₄) nanoparticles by a simple, economic, and eco-friendly route. The investigation of structural properties, thermal properties, and optical properties was carried out successfully by standard characterization techniques. The X-ray diffraction patterns confirmed the spinel-cubic lattice with Fd-3m space group for all the samples. The presence of vibrational frequency modes of Zn–O and Fe–O was ensured by FTIR spectra. The nano-size, morphology, atomic percentage, and some agglomeration of the nanoparticles were revealed by SEM–EDX and TEM images. The bandgap values were calculated from UV–Visible analysis data, and found to be 2.36 eV. The distribution of pore size by BJH method and BET surface area was evaluated by Nitrogen adsorption–desorption isotherms, and is found to be 19.74 m²/g. The thermogravimetric and differential thermal analysis affirmed percentage of weight loss and phase formation. The photocatalytic activity of methylene blue was evaluated under visible light and the removal efficiency of 96% and nano-catalyst shows active reusability. The cyclic voltammetry and electrochemical impedance spectroscopy (EIS) were used for the study of electrochemical properties of nanoparticles. Further, the antimicrobial activity of the nanoparticles was investigated using Gram-positive, Gram-negative bacteria and some selected fungi strains. The obtained results revealed that the newly synthesized ZnFe₂O₄ can act as potential photocatalyst, electrochemical sensor, and antimicrobial agent.

*Full paper: Journal of Materials Science: Materials in Electronics Vol. 31, Issue No. 20, 2020*
Pharmacotherapy of Covid-19: A Perspective of Pathogenicity and Life Cycle

Shashank M Patil¹, Chandana Kumari V B¹, Prithvi S Shirahatti², Sujay S¹, Tejaswini M¹,
Lakshmi Ranganatha V³, Mallikarjunaswamy C⁴, Jayanthi M K⁵, Ramith Ramu¹.

¹Department of Biotechnology and Bioinformatics, School of Life Sciences, JSS Academy of Higher Education and Research (JSS AHER) Mysuru
²Department of Biotechnology, Teresian College, Mysuru
³Department of Chemistry, The National Institute of Engineering, Mysuru
⁴Department of Chemistry, JSS College of Arts, Commerce and Science, Mysuru
⁵Department of Pharmacology, JSS Medical College, JSS Academy of Higher Education and Research (JSS AHER) Mysuru

ABSTRACT

The world has witnessed COVID-19 or SARS-CoV-2 as one of the most hazardous viral outbreak in the history of mankind. Since its emergence in December 2020, it has been affecting the global health with no reported pharmacotherapeutic agent that can neutralize its substantial pathogenicity and escalation around the world. This is attributed to its remarkable molecular pathways followed in course of its life cycle, which is completed in and around the host cell. With the usage of these evolved mechanisms, the virus can effectively invade and replicate in the host cell. The complete analysis of life cycle has resulted in reporting of some molecular targets, which can be neutralised with the usage of pharmacotherapeutic agents. These agents tend to bind to their targets to inactivate them. This review focusses on those targets as well as the potent drugs that currently have been employed to reduce the viral load, in the perspective of its life cycle and pathogenicity. Alongside the drugs that are currently being used, we also report potent drugs that are yet to clear the clinical investigation.

Direct Brain Targeted Nanostructured Lipid Carriers for Sustained Release of Schizophrenic Drug: Formulation, Characterization and Pharmacokinetic Studies

Praveen Sivadasu¹, Devagowda Vishakante Gowda¹, Nithin Kundachira Subramani², Bhavya Malgur Vishweshwariah³, Sachhidananda Shivanna³, Siddaramaiah Hatna³

¹Department of Pharmaceutics, JSS College of Pharmacy, JSSAHER, Mysuru
²Department of Chemistry, The National Institute of Engineering, Mysuru
³Department of Polymer science and Technology, Sri Jayachamarajendra College of Engineering, Mysuru

ABSTRACT

Background: Systemic drug delivery in schizophrenia is a major challenge, owing to the Blood-brain Barrier (BBB) and P-glycoprotein related effects. Consequently, herein an attempt is made to systemically deliver the most desirable schizophrenia drug, Quetiapine Fumarate (QF) via non-invasive intranasal route using Nanostructured Lipid Carrier (NLC) approach. Materials and Methods: The desired QF loaded NLCs were developed using central composite statistical design and the developed formulations were monitored for improving QF bioavailability and their brain targeting efficacies. Results: The optimized formulation displayed a 2-fold increase (compared to virgin QF) in ex-vivo nasal diffusion at the 6th hr, with no sign of structural damage (upon histopathological examinations). While, QF blood-brain ratio showed 10-fold increase for NLCs administered through nasal route (in comparison to intravenous route), thereby supporting prolonged retention of QF at the site of action. Similarly, the concentration of QF (in the brain) delivered via nasal route exhibited 4-fold increment at all-time points thereby supporting a potential nose to brain transport and effective bypassing of BBB. Conclusion: The results obtained infers that non-invasive intranasal route can be used as a potential alternative to conventional treatment options towards efficient management of schizophrenia.

*Full paper: Indian Journal of Pharmaceutical Education and Research, Vol. 54, Issue No. 1, 2020, Page No. 73-84
Facile Microwave-Assisted Green Synthesis of Zno Nanoparticles: Application to Photodegradation, Antibacterial and Antioxidant

Mallikarjunaswamy C1, Lakshmi Ranganatha V2, Ramith Ramu3, Udayabhanu4, Nagaraju G5.

1Department of Chemistry, JSS College of Arts, Commerce and Science, Mysuru
2Department of Chemistry, The National Institute of Engineering, Mysuru
3Department of Water and Health Sciences, Faculty of Life Sciences, JSS Academy of Higher Education and Research, Mysuru
4,5Department of Chemistry, Siddaganga Institute of Technology, Tumakuru

ABSTRACT

The present study reports the effective synthesis of zinc oxide nanoparticles (ZnO Nps) by microwave irradiation method using Indian bael (Aegle marmelos) juice as fuel. The synthesized nanostructures were characterized by X-ray diffraction, FT-IR, scanning electron microscope, transmission electron microscope, Raman Spectroscopy, photoluminescence and ultraviolet (UV)–visible studies. At room temperature, photoluminescence spectrum showed the excitation wavelength at 370 nm and emission peaks at 388 and 468 nm corresponding to Zn vacancies and O vacancies, respectively. Further, the effectiveness of the synthesized zinc oxide nanoparticles was tested for methylene blue dye degradation under UV irradiation. The dye removal efficiency of nanoparticles was 96% after 35 min of UV (λ = 617 nm) irradiation. The ZnO nanoparticles were subjected to antimicrobial activity against different strains. The current synthetic work pledges to provide some new visions into the design of nanomaterial for multifunctional long-term applications for cleanup and biomedical applications.

Covid-19 Infection: The Prospects of Pharmacotherapy


1,2,4,5,8Department of Biotechnology and Bioinformatics, School of Life Sciences, JSS Academy of Higher Education and Research, Mysuru,
3Department of Biotechnology, Teresian College, Mysuru
6Department of Chemistry, The National Institute of Engineering, Mysuru
7Department of Pharmacology, JSS Medical College, JSS Academy of Higher Education and Research, Mysuru

ABSTRACT

The disastrous outbreak of coronavirus disease 2019 (COVID-19) has triggered the investigation of several therapeutic options following the redundancy of specific drugs against it. The virus possesses advanced molecular mechanisms to effectively invade the host cell compared to its counterparts. It results in a seamless and coherent infection and transmission, attributing to its enhanced pathogenicity. The drugs that are currently being employed against COVID-19 inhibit the viral load in different stages of infection, including host cell–virus interaction, viral entry into the host cell, and viral replication inside the host including genome replication and polypeptide chain production. This commentary emphasizes the pharmacotherapeutic options available from the perspective of viral life cycle and pathogenicity.

Facile Microwave Assisted Green Synthesis of Zno Nanoparticles: Application to Photodegradation, Antibacterial and Antioxidant

C. Mallikarjunaswamy1, V. Lakshmi Ranganatha2, Ramith Ramu3, Udayabhanu4, G. Nagaraju5.

1Department of Chemistry, JSS College of Arts, Commerce and Science, Ooty Road, Mysuru
2Department of Chemistry, The National Institute of Engineering, Mysuru
3Division of Biotechnology and Bioinformatics, Department of Water and Health Sciences, Faculty of Life Sciences, JSS Academy of Higher Education and Research, SS Nagar, Mysuru
4,5Department of Chemistry, Siddaganga Institute of Technology, Tumakuru

ABSTRACT

The present study reports the effective synthesis of zinc oxide nanoparticles (ZnO Nps) by microwave irradiation method using Indian bael (Aegle marmelos) juice as fuel. The synthesized nanostructures were characterized by X-ray diffraction, FT-IR, scanning electron microscope, transmission electron microscope, Raman Spectroscopy, photoluminescence and ultraviolet (UV)-visible studies. At room temperature, photoluminescence spectrum showed the excitation wavelength at 370 nm and emission peaks at 388 and 468 nm corresponding to Zn vacancies and O vacancies, respectively. Further, the effectiveness of the synthesized zinc oxide nanoparticles was tested for methylene blue dye degradation under UV irradiation. The dye removal efficiency of nanoparticles was 96% after 35 min of UV (λ = 617 nm) irradiation. The ZnO nanoparticles were subjected to antimicrobial activity against different strains. The current synthetic work pledges to provide some new visions into the design of nanomaterial for multifunctional long-term applications for cleanup and biomedical applications.

*Full paper: Journal of Materials Science: Materials in Electronics, Vol.31, 2020
Green Synthesis of BiVO₄ Nanoparticles by Microwave Method Using Aegle Marmelos Juice as a Fuel: Photocatalytic and Antimicrobial Study

S. Pramila¹, G. Nagaraju², C. Mallikarjunaswamy³, K.C. Latha⁴, S. Chandan⁵, Ramith Ramu⁶, V. Rashmi⁷, V. Lakshmi Ranganatha⁸

¹Department of Chemistry, JSS College of Arts, Commerce and Science, Ooty Road, Mysuru
²Department of Chemistry, Siddaganga Institute of Technology, Tumakuru
⁴University Grants Commission, South West, Bangalore
⁵,⁶,⁷Department of Biotechnology and Bioinformatics, School of Life Sciences, JSS Academy of Higher Education and Research (JSS AHER) Mysuru
⁸Department of Chemistry, The National Institute of Engineering, Mysuru

ABSTRACT

As a part of the non-hazardous way of synthesizing nanomaterials, herein we report the synthesis of BiVO₄ nanoparticles by the aid of Aegle marmelos juice as a fuel. This method employed a simple, effective, and low-cost microwave irradiation technique. Further, the physical properties of synthesized nanoparticles were fully characterized by using X-ray diffraction (XRD), Fourier Transform-Infrared spectroscopy (FTIR), Besides, the surface morphology of the same nanoparticles was also confirmed by using Scanning Electron Microscopy (SEM). Furthermore, metal nanoparticles are the prominent photocatalysts for the degradation of organic pollutants, in this vision photocatalytic activities of BiVO₄ was also evaluated by studying decolorization of methylene blue dye under UV irradiation. As well the results revealed that BiVO₄ showed higher photocatalytic activity due to elevated generation of charge carriers by UV irradiation. Besides, BiVO₄ was also examined for the application of antimicrobial studies and the synthesized samples showed prominent results against all the tested strains.

Partition Energy of Some Trees and Their Generalized Complements

Sampathkumar E¹, Roopa S.V², Vidya K.A³, Sriraj M.A⁴.

¹Department of Studies in Mathematics, University of Mysuru
²Department of Mathematics, The National Institute of Engineering, Mysuru
³Department of Mathematics, Dayananda Sagar Institutions, Bangalore
⁴Department of Mathematics, Vidya Vardhaka College Of Engineering, Mysuru

ABSTRACT

Let G = (V, E) be a graph and P k = {V1, V2, .. , V k } be a partition of V. The k-partition energy of a graph G with respect to partition P k is denoted by EP k (G) and is defined as the sum of the absolute values of k-partition eigenvalues of G. In this paper we obtain partition energy of some trees and their generalized complements with respect to equal degree partition. In addition, we develop a matlab program to obtain partition energy of a graph and its generalized complements with respect to a given partition.

Computation of Topological Indices of Polystyrene

Indumathi R.S1, Kanna M.R.R2, Mamta D3.

1Department of Mathematics, MIT Mysore,
2Department of Mathematics, Sri D D Urs Government First Grade College, Hunsur
3Department of Mathematics, The National Institute of Engineering, Mysuru

ABSTRACT

In this document, we determined some standard topological indices of Polystyrene.

The structures of Chemical compounds are described by topological indices. These are the molecular descriptors which are useful in calculating certain physical and chemical properties applied for boiling tip, enthalpy of vaporization, firmness etc. Polystyrene is a polymer that is malleable and simple to process. It has many applications in electronic/electrical and medical fields.

All molecular graphs considered here are Simple graphs, connected, finite and (m, n) graph, which has m edges and n vertices.

One of the degree based molecular descriptor is ABC index, which was found by Estrada et al. [2] and it can be applied for modelling or thermodynamic properties of organic compounds and stability of branched alkanes.

For more results observe manuscripts [3, 5, 4]

An Analogy of a Network to an ElectroHydrodynamic Fluid Flow to Analyze the Energy Required for Transmitting a Packet in a Network Susceptible to Multiple Failures

Harsha S\textsuperscript{1}, Shubha Nagaraj\textsuperscript{2}

\textsuperscript{1}Department of Information Science and Engineering, Jyothy Institute of Technology, Bengaluru.
\textsuperscript{2}Department of Mathematics, The National Institute of Engineering, Mysuru.

ABSTRACT

Computer networks have become pervasive to human life and now, people are inseparable from connectivity. The world’s networking communities have been constantly raising the bar of standards to provide the best possible service to their users. Every packet drop is treated as a blunder and a gameender by the companies. Standards lead to organizations that govern the service rules and policies, penalize the companies heavily if packets are lost, connections are severed mid-conversation. This makes the companies spare no expense into developing smarter and faster rerouting methods, packet retransmission protocols. The observation of these systems leadsto believe that the system is modeled after an electrohydrodynamic fluid flow through a charged medium. In this paper the analogy and the analysis of the energy spent for rerouting packets in case of node failure, is presented in its complete mathematical form.

On New Bounds for Energy of Graphs

R S Indumathi\(^1\), G Sridhar\(^2\), M R Rajesh Kanna\(^3\), D Mamta\(^4\).

}\(^1\)Department of Mathematics, MIT Mysore
\(^2,3\)Department of Mathematics, Sri D D Urs Government First Grade College, Hunsur
\(^4\)Department of Mathematics, The National Institute of Engineering, Mysuru

ABSTRACT

The term energy was first coined by I. Gutman in chemistry, while finding the total electron energy of conjugated carbon compounds. In 1971 McClelland obtained both lower and upper bounds for electron energy. In this paper we established new bounds for energy of graphs and it also contain bound for the largest eigenvalue and the absolute smallest eigenvalue.

*Full paper: Ramanujan Journal Vol. 9 Issue No.12, 2020*
On Ramanujan’s Incomplete Elliptic Integral Identities

E. N. Bhuvan

Department of Mathematics, The National Institute of Engineering, (Autonomous under VTU), Mysuru

ABSTRACT

In his lost notebook, S. Ramanujan recorded incomplete elliptic integral identities of the first kind. In this paper, we give new proofs to Ramanujan’s incomplete elliptic integrals of the first kind for level 5 using the parameter \( k(q) = R(q)R^2(q^2) \), where \( R(q) \) is Rogers-Ramanujan continued fraction. Also, we construct new identities for level 5 similar to ones found in Ramanujan’s work. Further, we prove related identities of level 7, using theta function identities.
