



Proceedings  
of  
International Conference  
on

**RECENT INNOVATIONS IN SCIENCE & TECHNOLOGY**  
[ RIST - 2017 ]

25<sup>th</sup> March 2017  
Marthandam, India.

**Organized by**



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**Proceedings of  
International Conference  
on  
Recent Innovations in Science & Technology  
(RIST – 2017)  
Marthandam, India.  
25<sup>th</sup> March, 2017**



Venue: John Plaza, Marthandam, India

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### **Message**

I take great pleasure in inviting you all to the One day International Conference on “**Recent Innovations in Science & Technology - RIST 2017**” on 25 March 2017, Saturday organized by TRANSIST Online (An International Journal) in association with Jawahar Engineering College, Trivandrum, India. It is really delightful to receive an overwhelming response from the academicians, researchers, engineers and scientists in the domain of interest from national and international level. It delights the organizing committee to receive a large number of contributions from young and senior scientists in the broad areas of mechanical, computer science, electrical and electronics, electronics and communication engineering etc. conferences like this are very much important as it provides the participants an opportunity of interacting with the researchers from all over and be familiar with some of the recent researches going on and provides an environment wherein knowledge from various disciplines is shared and knowledge gaining. All papers received for the conference is rigorously reviewed by a panel of expert members. I would also thank the authors for revising their papers, addressing the reviewer comments and suggestions.



Dr. J. V. Muruga Lal Jeyan  
Organizing Chair, RIST-2017  
Associate Editor, TRANSIST Online

### **Message**

I am very happy to note that TRANSIST Online is organizing an International Conference on “**Recent Innovations in Science & Technology - RIST 2017**” on March 25, 2017 at Marthandam, India. What is more, the response is immediate and overwhelming; researchers and students from various institutions have elevated our image by sending their technical papers for the conference. To linger in the folds of sweet memories long afterwards, we have attempted to capture the deliberations in the proceedings. We hope the deliberations of the present conference will be finding a way out of this doom and gloom. The luminaries of the subject drawn from the industry and academic would juxtapose for wisdom and practise. We take this opportunity to thank all the organising and advisory committee members for their support to conduct the conference.

Mr. GaneshRam Rajagopal  
Project Manager – CAE Tools Development  
Ford Technology India Ltd.  
Chennai

### **Message**

Its indeed a great pleasure to be a part of this One day International Conference on “Recent Innovations in Science & Technology - RIST 2017” on 25 March 2017 at Marthandam, organized by TRANSIST. I hope that this conference will bridge the gap between the academicians and industrial requirements in the latest trends in manufacturing, design, modelling and automation etc. This conference will be a platform to discuss the important topics needed at the moment. This conference will be the place, where young research scholars, academicians, industrial persons and budding engineers will present their findings and research. In congratulate the organizing committee members for arranging this kind of conference and participants from various places attending this conference.

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## **Optimization – A tool for engineers**

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Optimization is the process of obtaining better output with the available resources either maximizing or minimizing the responses. Maximizing the responses include higher profit, higher utilization of machine availability, higher metal removal rate and higher efficiency etc. minimizing the responses include lower surface roughness, lower operating cost, lower wear rate, lower cutting forces and lower errors. Optimization problem are of several types, as provided in order of increasing difficulty for the solution methods such as Linear and Quadratic Programming Problems, Quadratic Constraints and Conic Optimization Problems, Integer and Constraint Programming Problems, Smooth Nonlinear Optimization Problems and Non-smooth Optimization Problems. The main aim of these methods is to provide local maxima or minima or a global maxima or minima depending on the need and problem definition.

The first step in optimization is formulation of objective function. A objective function is a function of certain variable, which maximizes the benefits or minimizes the efforts. The next step is choosing an unconstrained or constrained problem. A constraint is a set of hurdles or limitations in achieving the objective. Constraints may be of exact constraints (equality constraints) or functional constraints (inequality constraints). The next step is to apply the boundary conditions. Boundary conditions specify the boundaries of the selected input variables in the defining the optimization problem. These conditions qualify the values of the variables in a certain region within which the search for the optimal solution is permitted. The formulation of mathematical model from the relevant data available is carried out as: Selecting the decision variable, setting the objective function, identifying the design constraints, declaring the conditions of variables and summarizing the results.

Other cases in engineering where optimization is necessary do not involve a real system, but a model of a real system. This is the case of optimization techniques of simulated systems and of some computer codes that are very expensive to run. Consider a process as a black box, which means that the purpose of a process model is to describe the behaviour of the process only based on the observable inputs and outputs. In process optimization and Design of Experiments (DOE), the inputs correspond to variables we can control during an experiment. The outputs of the process correspond to variables we wish to modify by varying the controllable factors, referred as the process responses.

The complete space where experiments can in principle be conducted is referred to as the region of operation or region of operability. In addition to the region of operation we have the region of interest, which the experimenter actually wishes to explore. The optimization techniques, that optimizes the process variables are Taguchi's technique, which uses Taguchi's Design of Experiment (DoE) for designing the experiment and applying Signal-to-

Noise (S/N) ratio for analysing the outputs based on Higher-the-better or Lower-the-better concept. Response surface methodology (RSM) is another optimization technique which uses response surface for optimization. The difference between Taguchi's technique and RSM is the former is suitable for single objective optimization and the latter is suitable for multi-objective optimization. But Taguchi's technique can be couple with other multi-objective optimization approaches like Grey Relational Analysis (GRA) and Principal component Analysis (PCA) for multi-objective optimization of output responses.

Another set of optimization algorithms, which are called as Non-traditional optimization techniques such as Genetic algorithm (GA), Simulated annealing (SA), Non-dominated sorting genetic algorithm (NSGA), Particle Swarm optimization (PSO), Firefly Algorithm (FA) etc. These algorithms mimic the behaviour of human genes, heat treatment process, bird flocking, food search of fireflies etc. These algorithms search for the optimal condition in the design space bounded by the variable values. The global maxima or minima are the optimized value for the given problem.

## **An encouragement towards digital India**

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The Digital India program is a leading program of the Government of India with a dream to renovate India into a digitally empowered society and knowledge economy. The expedition of e-Governance initiatives in India took a broader dimension in the mid 90s for wider sectoral applications with importance on citizen-centric services. Later on, many States/UTs started various e-Governance projects. Though these e-Governance projects were citizen-centric, they could make lesser than the desired impact. The government of India launched National e-Governance Plan (NeGP) in 2006. 31 Mission Mode Projects covering various domains were initiated. Despite the successful implementation of many e-Governance projects across the country, e-Governance as a whole has not been able to make the desired impact and fulfill all its objectives.

It has been felt that a lot more push is required to guarantee e-Governance in the country promote inclusive growth that covers electronic services, products, devices and job opportunities. Moreover, electronic manufacturing in the country needs to be strengthened. In order to transform the entire ecosystem of public services through the use of information technology, the Government of India has launched the Digital India program with the vision to transform India into a digitally empowered society and knowledge economy.

Digital India consists of three core components. These include:

- The construction of digital infrastructure
- Distribution of services digitally
- Digital knowledge

Some of the facilities which will be provided through this initiative are Digital Locker, e-education, e-health, e-sign and national scholarship portal. As the part of Digital India, Indian government prearranged to launch Botnet cleaning centers.

The dream of Digital India program aims at the inclusive growth in areas of electronic services, products, manufacturing and job opportunities etc. It is centered on three key areas -

- Digital Infrastructure as an Efficacy to Every Citizen
- Power & Facilities on Demand and
- Digital Enablement of Citizens

With the above dream, the Digital India program aims to provide Broadband Highways, Universal Access to Mobile Connectivity, Public Internet Access Programme, E-Governance: Reforming Government through Technology, eKranti - Electronic Delivery of Services, Information for All, Electronics Manufacturing: Target Net Zero Imports, IT for Jobs and Early Harvest Programmes.

Policy initiatives have also been undertaken (by DeitY) in the e- Governance domain like e-Kranti Framework, Policy on Adoption of Open Source Software for Government of India, Framework for Adoption of Open Source Software in e-Governance Systems, Policy on Open Application Programming Interfaces (APIs) for Government of India, E-mail Policy of Government of India, Policy on Use of IT Resources of Government of India, Policy on Collaborative Application Development by Opening the Source Code of Government Applications, Application Development & Re-Engineering Guidelines for Cloud-Ready Applications. Some other developments include:

- BPO Policy has been approved to create BPO centers in different North Eastern states and also in smaller / mofussil towns of other states.
- Electronics Development Fund (EDF) Policy aims to promote Innovation, R&D, and Product Development and to create a resource pool of IP within the country to create a self-sustaining eco-system of Venture Funds.
- National Centre for Flexible Electronics (NCFlexE) is an initiative of Government of India to promote research and innovation in the emerging area of Flexible Electronics.
- Centre of Excellence on Internet of Things (IoT) is a joint initiative of Department of Electronics & Information Technology (DeitY), ERNET and NASSCOM.

The estimated impact of Digital India by 2019 would be cross-cutting, ranging from broadband connectivity in all Panchayats, Wi-fi in schools and universities and Public Wi-Fi hotspots. The program will generate a huge number of IT, Telecom and Electronics jobs, both directly and indirectly. The success of this program will make India Digitally empowered and the leader in usage of IT in the delivery of services related to various domains such as health, education, agriculture, banking, etc.

hexacube India proudly supports digital India Program of the country.



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## **Control of drives for orthopedic assistive limb**

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Prosthesis is a part of the bio-mechanics field, the science of fusing electro-mechanical devices with human muscles, skeleton, nervous systems, etc. Nowadays people are suffering from lower limb disabilities due to the attacks of diseases like polio, paralysis, stroke and accidents. The individual afflicted in this way requires a supporting device which can support severe weakness of lower limb muscles. Such a supporting device which helps users to do their daily activities smart should have provisions for knee and hip locking and unlocking. Also the supporting device should be simple, cost effective and easily implementable.

Human locomotion cycle in medical terms called as gait cycle is a process in which synchronous movements of flexion of the knee, plantar flexion of the ankle and foot as well as biphasic forward propulsion of center of gravity of the human body occurs during walking at moderate speeds. The lower limbs are adapted for stability and that is achieved at most of the major joints of the lower limb rather than the motion in the form of muscle expansion and contraction. The prosthetic limbs are incredibly precious to amputees as it can improve mobility and help them stay independently.

Human gait modelling consists of studying the biomechanics of human lower limbs movement and enumerates the factors governing the functionality of the limbs. Gait analysis is important in various fields like robotics, biomechanics and rehabilitation engineering. In medical practice, there is no suitable application based on artificial intelligence (AI) for controlling the actuators of prosthesis or for predicting the locomotion angles of the prosthesis. In clinical practice, the frequently used method for studying gait behaviour is by analyzing the joint angles as well as the time phase cycles of gait.

Some of the gait analysis techniques are using video cameras, optoelectronic systems, electro-myography, force, inertial systems and gyroscopes. The motion vision-based system uses video camera to capture images or video from long distances and is the most preferred technique for analyzing human gait. The use of video recording for gait analysis can be performed with or without markers on the subject. 2D motion analysis requires only one camera positioned perpendicular to the plane of movement whereas 3D motion analysis system requires more than one camera and the images are captured from the video when people are walking, then the angular variations of knee, hip, back and foot is obtained through image processing technology.

The prosthetic limbs used in the medical field are incorporated with high precision controllers. So it is vital to recognize the parameters needed for designing the controller of the prosthetic device. Suitable controllers like P, PI and PID can be incorporated in the

control system drive for driving the knee and hip in the desired position. The controller should exhibit least error with good stability in order to achieve good response. So an assistive limb compensates the human locomotion affliction and thereby improves the characteristics of the afflicted human locomotion by making it closer to the natural movements. The dynamic characteristics of such devices need to compensate the affliction in a customized way. The most desirable characteristics of the compensating assistive limb are the ones which provide the appropriate compensation to the appropriate amount of affliction.

## **Experimental investigation on concentrated photovoltaic cell with an automatic dual axis solar tracking system**

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### **Abstract**

The performance of concentrated photovoltaic cell with an automatic dual axis solar tracking system experimentally investigated for Indian hot and humid climatic condition. The concentration ratio of concentrator was 40. The experimental system mainly consists of a solar panel with dimension of 16\*16 cm<sup>2</sup> and area of solar cell is 15\*15 cm<sup>2</sup>. The mono-crystalline silicon solar cell was used to harvest the electrical energy. Light dependent registers (LDRs) are used for designing the dual axis of solar tracking system. The PV cell yield the power output about 2.7 W, when the cell temperature below of 45°C.

**Keywords** – Solar tracking system, Light dependent registers (LDRs), Photo Voltaic cell

## **Application of cashew nut shell oil as fuel additive in diesel engine**

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### **Abstract**

The initial surge of biofuels was driven by the concerns regarding energy security, environmental pollution, global warming and rising fossil fuel prices. However in terms of sustainability perspective, bio fuels offers the advantages like energy security, reduction of greenhouse gases and reduced air pollution and have some risks like intensive use of resources, mono cultures, reduced biodiversity. In this paper, we studied the possibilities of using the cashew nut shell oil as an alternate fuel in a single cylinder, water cooled, direct injection diesel engine. Engine performance characteristics such as brake thermal efficiency, specific fuel consumption, exhaust gas temperature and emission characteristics such as carbon monoxide, unburnt hydrocarbons, oxides of nitrogen, carbon dioxide and smoke opacity were found for neat diesel and cashew nut shell oil blends. The test showed that cashew nut shell oil blends with diesel could be conveniently used as a diesel substitute in a diesel engine.

**Keywords:** Diesel engine, Cashew nut shell oil, additive.

## **Dry sliding wear behaviour of surface modified AZ61 Magnesium alloy**

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### **Abstract**

For aerospace and automotive industries, the need of the hour is light alloys, which encompass magnesium, aluminium and titanium-based materials to reduce weight and to improve the performance and fuel efficiency with improved properties. These materials are chosen, due to their high strength to weight ratio, low density etc. Recently, magnesium and magnesium alloys have attracted much attention as potential replacement to aluminium based materials due to their biodegradability in bio-environment and their excellent mechanical properties such as high strength and an elastic modulus. In this work, using Laser cladding technique, surface of AZ61 magnesium alloy is modified by reinforcing with nano TiO<sub>2</sub> (10 to 20nm) particles. Nano TiO<sub>2</sub> is added in three different proportions viz., 5%, 10% and 15% weight on to the surface of AZ61 using Nd:YAG laser. Using SEM image, distribution of particles in the magnesium alloy matrix is studied. Wear behaviour of the surface modified AZ61 material is studied by varying the speed, axial load and % reinforcement in pin-on-disc apparatus. Response Surface Methodology approach is used for designing the experiment and for multi-objective optimization of output responses such as; wear rate, coefficient of friction and frictional force. A second order regression model is developed to predict the output responses.

**Keywords:** AZ61 Mg alloy, Laser cladding, wear resistance, pin-on-disc.

## **Effects of process parameters on friction stir welding of AA1100 and AA6082 alloys**

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### **Abstract**

In this study, microstructure and mechanical characterization of friction stir welded dissimilar AA1100 and AA6082 Aluminium alloys joints were examined. Welding specimens with dimensions of 4 x 150 x 300 mm were joined in butt position. A tool made up of high alloy steel with a conical cylindrical tool tip profile was used. A shoulder diameter, probe diameter and pin length of 25 mm, 15 mm and 3.7 mm respectively. Microstructure, hardness test, tensile test, was performed. Grain refinement was observed in all three layers across the nugget zone with smaller

grains in AA1100 and AA6082 layers. All the obtained joints fractured in the Fusion zone on the AA1100 and AA6082 side during tensile testing, three different speeds parameters used are 1200, 1400 and 1600 rpm among these 1600 rpm provides good tensile strength. The highest joint strength was obtained when welding was conducted with highest welding speed. It was found that the hardness of the dissimilar joints attained intermittent hardness value of AA1100 and AA6082.

**Keywords:** Friction Stir Welding, Rotational Speed, Tensile Strength, Hardness.

### **Fuel Extraction from Waste Plastics by Using Pyrolysis Process**

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#### **Abstract**

This paper contains the information about the waste plastics are converted into valuable fuel. Nowadays plastic replacement is big challenge for the government and the deficiency of fuel spikes every year. Thus, the two universal problems such as problems of waste plastic and problems of fuel shortage are being tackled simultaneously. Here, the process of converting waste plastic into value added fuels is explained as a viable solution for recycling of plastics. By using pyrolysis process the fuel is extracted from plastic wastes.

**Keywords:** Pyrolysis, Plastic Waste, Flash Point, Fire Point, Viscosity.

### **Design and analysis of mono leaf spring glass fiber reinforced polymer composite for light duty vehicles**

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#### **Abstract**

Looking to the present situation of Automobile industry, Weight reduction of an automobile is a major area of concern to the manufacturer. Generally Leaf spring is used for the suspension characteristics and having 10 to 20% of the unsprung weight. Thus a reduction in weight of the spring will improve efficiency of the vehicle. These springs are generally made of steel material which is having more weight. In order to reduce weight, instead of steel leaf spring, composite material leaf spring is proposed in this work. In this paper we described the design and analysis of mono leaf spring glass fiber reinforced polymer composite. The objective is to compare the stresses and weight saving of composite leaf spring with that of steel leaf

spring. The design constraint is stiffness. ANSYS is used for Static structural analysis. Fatigue analysis for analyzing life cycles is performed on nCode. The results obtained for glass fiber reinforced polymer composite was compared with the steel leaf spring.

**Keywords:** Composite material, leaf spring, glass fiber.

## **Effect of pH on biogas production through anaerobic digestion of food waste**

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### **Abstract**

Food waste (FW) is organic material discharged from various sources including food processing plants, domestic and commercial kitchens, cafeterias and restaurants. According to Food and Agriculture Organisation, nearly 1.3 billion tonnes of foods including fresh vegetables, fruits, meat, bakery and dairy products are lost along the food supply chain. The amount of FW has been projected to increase in the next 25 years due to economic and population growth, mainly in Asian countries. The aim of the present study was to utilize the food waste for biogas production through anaerobic digestion process. A series of laboratory experiments were carried out in anaerobic batch reactors of 1000 mL volume with a hydraulic retention time of 30 days. The effect of pH on biogas production was investigated in the lab scale reactors and the daily biogas production, cumulative biogas production, methane and carbon dioxide composition were measured. The experimental results show that, biogas produced and degradation efficiency was substantially higher for the reactor with pH 7 compared to other pH values.

**Keywords:** Anaerobic digestion, food waste, biogas.

## **Studies on inverse diffusion flames**

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### **Abstract**

Experiments were conducted on Inverse diffusion flame (IDF) burner. The burner is having central air jet and 12 fuel ports arranged circumferentially around the central air jet. The free flame structures have been observed by varying the parameters like air Reynolds number and overall equivalence ratio. The equivalence ratio was varied from lean to rich conditions. The

base flame, neck and free flame structure has been observed. Better mixing of air and fuel occurred at the higher Reynolds number because of higher the suction created in the air jet. The soot formation reduced as Reynolds number increased.

**Keywords:** Inverse diffusion flame, free flame shapes, LPG/air combustion.

## **Design and fabrication of inbuilt pneumatic jack for four wheeler**

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### **Abstract**

With increasing levels of technology efforts being put to increase the comfort and safety. This study is based on pneumatics which deals with the study and application of pressurized air to produce mechanical motion. In the present study, an inbuilt pneumatic jack was designed and fabricated with lifting and safety arrangements for a four wheeler. This pneumatic jack can be attached to automobile vehicle on front and rear part of the chassis. The jack will be powered by the battery. During puncture or some repairs, we can operate the pneumatic jack by pressing a single button and the jack which is fitted in the vehicle will lift itself. This fabricated model consists of a small size reciprocating air compressor which is driven by the battery used in four wheeler, an air tank to store the compressed air, and a pneumatic control valve which regulates the air flow and double acting cylinder used as a jack which performs lifting.

**Keywords:** Pneumatic jack, four wheeler.

## **Mechanical Characterization of Laser Cladded surface modified AZ61 Magnesium alloy**

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### **Abstract**

Light alloys, which encompass magnesium, aluminium and titanium-based materials, are the materials of choice for transport applications (such as aerospace, automotive and light rail) because of their low-density and high strength-to-weight ratio. Recently, magnesium and magnesium alloys have attracted much attention as potential biodegradable bone implant materials and stent materials due to their biodegradability in bio-environment and their excellent

mechanical properties such as high strength and an elastic modulus close to that of bone. In this work, surface modification of Magnesium alloy AZ61, reinforced with nano Al<sub>2</sub>O<sub>3</sub> (10 to 20nm) particles is carried out using laser cladding technique. Nano Al<sub>2</sub>O<sub>3</sub> is added in three different proportions viz., 5%, 10% and 15% weight. Nd:YAG Laser cladding approach is used to reinforce the nano ceramic particle in the surface of AZ61 alloy. After performing the surface modification process, the distribution of particles in the magnesium alloy matrix is studied by SEM analysis. Properties such as, micro-hardness, corrosion resistance and wear behaviour of the parent AZ61 Mg alloy and nano particle reinforced surface modified AZ61 Mg alloy are studied and compared. From the results, it is found that the mechanical properties, wear resistance and corrosion resistance increases considerably with the surface modified AZ61 magnesium alloy.

**Keywords:** AZ61 Mg alloy, Laser cladding, corrosion resistance, wear resistance.

## **Performance and emission characteristics of a low heat rejection diesel engine fueled with rapeseed oil biodiesel**

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### **Abstract**

The present study is about the experimental investigation of performance and emission characteristics of a low heat rejection (LHR) diesel engine coated fueled with various blends of rapeseed oil biodiesel. Partially stabilized zirconia (PSZ) is coated with 0.5 mm thickness inside the combustion chamber of the engine. The engine was fueled with biodiesel blends prepared from non-edible rapeseed oil through transesterification process. The experiments were carried out in a 4-stroke, single cylinder, direct injection diesel engine fuelled with neat diesel, biodiesel and diesel-biodiesel blends. Performance parameters such as brake thermal efficiency, specific fuel consumption, exhaust gas temperature and emission parameters such as HC, CO, NO<sub>x</sub> and smoke opacity were measured and quantified for various combinations of fuels at different loads. The results obtained with respect to various load and fuel combinations were post processed and graphically presented. It is seen from the results that, the B25biodiesel-diesel fuel combination has shown closer performance and emission characteristics with neat diesel. Compared to base



(uncoated) engine, LHR engine showed improved performance with biodiesel operation. The exhaust emissions were also decreased with thermal barrier coating compared with base engine.

**Keywords:** LHR Engine, rapeseed oil, zirconia coating, biodiesel.

## **Design and fabrication of solar air dryer**

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### **Abstract**

Solar drying is the most common method used to preserve agricultural products in most tropical and subtropical countries. While drying the products in open sun, they were unprotected from rain, wind borne dirt and dust, infestation by insects, rodents and other animal. Because of these reasons, the products may be seriously degraded to the extent that sometimes become inedible and the resulted loss of food quality in the dried Products may have adverse economic effects on domestics and international markets. Some of the problems associated with open-air sun drying can be solved through the use of a solar dryer which comprises of collector, a drying chamber and sometimes a chimney. In this paper, an indirect, active-type, environmentally friendly, low-cost solar dryer was designed to dry various agricultural products. The dryer was built by locally available, biologically degradable, low-cost materials. The dryer consists of solar flat plate air heater with three layers of insulation, drying chamber and a fan with a regulator to induce required air flow in the system. From our experimental analysis, we found that the dryer fabricated exhibits sufficient ability to dry food items reasonably rapidly to a safe moisture level and simultaneously it ensures a superior quality of the dried product.

**Keywords:** Solar energy, air dryer, agriculture products.

## **Proposal for an Autogenous Pressurisation System**

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### **Abstract**

Liquid-propellant rocket engines use a liquid propellant combination of a fuel and an oxidiser. These may either be liquid at room temperature, but most often are gasses that have been cooled

to cryogenic temperatures and stored as liquids. Liquid-propellant rockets require a high flow rate of fuel and oxidiser into the combustion chamber from their respective storage tanks to maintain steady combustion, and this is normally accomplished through one of two primary means. Larger rockets generally use a pump-fed system where a turbine is powered from the combustion of fuel in a secondary combustion chamber and drives two pumps that feed the fuel and oxidiser through injectors, and into the combustion chamber. Smaller rockets use a pressure fed system which pressurises the fuel and oxidiser tanks with an inert gas, normally helium, stored in a separate tank and this gas pressure forces the propellant into the combustion chamber. A proposal is being made to make the pressurisation system autogenous with an impeller driven system for moving an internal tank 'cap' to reduce the volume of the tank, maintaining the pressurised feed and utilising the products of combustion and the propellant itself to equalise tank pressure to prevent tank failure.

Keywords: Liquid-propellant rocket engine, Autogenous Pressurisation System.

## **Utilization of anaerobic sequential batch reactors for the bio-sulfidogenic process: A critical analysis**

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### **Abstract**

The sulfate-rich wastewaters from mining processes and other industrial activities such as tanneries and petrochemical operations have been found to contribute consistently to the total wastewater generation. A technology for the treatment of sulfate-rich wastewaters which has received increasing attention over the past two decades is the anaerobic biological reduction of sulfate using sulfate reducing bacteria. The biological remediation of sulfate-rich wastewaters has been studied extensively using a variety of reactor configurations such as stirred tank, fluidized-bed, up-flow anaerobic sludge bed and membrane reactors. Nowadays, anaerobic sequencing batch reactor has become more promising in the wastewater treatment due to its advantages such as flexibility in operation and control. Hence this study evaluated the application of Anaerobic Sequential Batch Reactor for the biological treatment of sulfate-rich wastewaters through a critical analysis of the literature.

**Keywords:** Sulfate-rich wastewaters; Sulfate reducing bacteria; Anaerobic Sequential Batch Reactor

## **Performance analysis of a ceramic plate-fin heat exchanger**

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### **Abstract**

In this present study, a three dimensional mathematical model was developed for determining the heat transfer characteristics of a plate-fin heat exchanger (PFHE). Numerical analysis was carried out for a fin made up of ceramic material having fin thickness. The working fluids used in the study were Sulfur trioxide, Dioxide, Oxygen and water vapor. Fluid flow, heat transfer, pressure drop and priorities like Nusselt number and Friction factor were studied using computational fluid dynamics. The numerical results were compared with the analytical result and they are found to be reasonable agreement.

**Keywords:** Heat exchanger, ceramic plate fins, Nusselt number, friction factor.

## **Design and Fabrication of compressed air car**

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### **Abstract**

Compressed air attracted the scientists and engineers because of renewable and non-polluting nature. Efforts are being made by many researchers and manufacturers to adopt the compressed air vehicle technology in all respects for its earliest use by the mankind. In the present study, a compressed air powered car was designed and fabricated. The engine was modified from 4-working stroke (suction, compression, power and exhaust) to 2-working stroke engine (power and exhaust) by modification of cam-gear system. Though some of the renewable energy sources like solar energy, bio fuels are currently in practice, we focused on pneumatic technology because pneumatic applications are wide all over the world. The basic components and other equipment are easily available and the fabrication is not so tough. The basic principle involved in this concept is that compressed air is capable enough to provide sufficient thrust which in turn can propel the car.

**Keywords:** Air vehicle, compressed air, 2 stroke engine.

## **Design and analysis of high speed Race Car**

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### **Abstract**

Formula Student Racing competitions are held at various Formula SAE circuits globally. Designing and fabricating cars to such competitions by the students common nowadays. This present study aims at the design aspects and the analysis insights of the high race car, according to the specifications of 2014 Formula SAE rule book. The work focuses on the important design parameters around the driver and the quantitative predictions of different dimensions and mechanical parameters, using the given information and relevant approximations. As the car travel at the high speed, the protection has been designed to the car in such a way that stresses are minimum and the performance is maximum. Finite element method is used for the analysis and the validations of the FEM result are given using the H-type space step convergence methods.

**Keywords:** SAE, high speed race car, FEM analysis.

## **Design and analysis of in-line three cylinder engine by using primary balancing method**

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### **Abstract**

The inline-three cylinder engine or straight- three cylinder engine is an inside combustion engine with all three cylinders mounted in an exceedingly line or plane on the housing. The objective of the project is a way to develop and design the engine components like piston, connecting rod, crankshaft and flywheel and it is assembly are to be designed by using primary balancing method. Lower numbers of cylinders on an engine results in higher torsional vibrations. One measure of engine torsional vibrations is engine cyclic speed irregularity. Higher torsional vibrations can limit engine operation at lower speeds. So the higher torsional vibration can be controlled by changing firing order of the crankshaft and also adding and removing mass at any area of the engine components. Here increasing the flywheel mass to reduce speed irregularity during engine operation. Hence, the project deals with the structural analysis doing various

ceramic based metal matrix composite materials. The engine components design by using SOLIDWORKS software and Analysis by using ANSYS WORKBENCH software.

**Keywords:** Primary balancing, Solidworks, Ansys.

## **Performance improvement of solar water heater using parabolic collector**

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### **Abstract**

A parabolic trough solar collector uses a mirror in the shape of a parabolic cylinder to reflect and concentrate sun radiations towards a receiver tube located at the focus line of the parabolic cylinder. The receiver absorbs the incoming radiations and transforms them into thermal energy, the latter being transported and collected by a fluid medium circulating within the receiver tube. This method of concentrated solar collection has the advantage of high efficiency and low cost, and can be used either for thermal energy collection, for generating electricity or for both, therefore it is an important way to exploit solar energy directly.

**Keywords:** Solar energy, water heater, parabolic collector.

## **Solar heating system using PCM as thermal energy storage**

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### **Abstract**

The sun provides an abundant source of renewable energy (thermal energy). There are different methods of solar energy storage technologies are available and were classified into categories according to capacity and discharge. The use of a latent heat storage system using phase change materials (PCMs) is an effective way of storing thermal energy and has the advantages of high-energy storage density and the isothermal nature of the storage process. PCMs have been widely used in latent heat thermal-storage systems for heat pumps, solar engineering, and spacecraft thermal control applications. The uses of PCMs for heating and cooling applications for buildings have been investigated within the past decade. There are large numbers of PCMs that melt and solidify at a wide range of temperatures, making them attractive in a number of applications. This paper also summarizes the investigation and analysis of the available thermal

energy storage systems incorporating PCMs for use in different applications like Preserving food, Air conditioning, & etc.

**Keywords:** Solar energy, heating system, phase change material.

## **Design and analysis of a car incorporated with spoiler by using computational fluid dynamics**

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### **Abstract**

Aerodynamics plays a vital role in engine performance and efficiency of the vehicle, for that designer should consider two things in mind, the aerodynamic shape of the vehicle and the aerodynamic forced experienced by the vehicle while it is in motion. To get maximum performance of the vehicle we need to know the aerodynamics forces acting on the vehicle and how to utilize those forces for increasing the performance and stability. In this paper the drag reduction for a vehicle is analyzed by over the rear area. In the order to achieve the stability and drag reduction spoiler is fixed on the rear area of vehicle at rear area for various drift Angle. For stabilizing the vehicle we need to find at which angle various the vehicle producers less drag and more down force for stability have. To carry out this project two car models namely Toyoto and swift are considered. The specification and a dimensions of the car where taken from literature. The designing of Toyota and swift car have been designed with and without spoiler in Solid Works software and analyzed by Ansys fluent software.

**Keywords:** Toyoto and swift car model, spoilers, CFD Analysis.

## **Design fabrication and analysis of solar air conditioning system using PCM**

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### **Abstract**

Now a day, normally 99% of air conditioning was running by electricity and toxic or flammable gases, such as ammonia, methyl chloride, or propane that could result in fatal accidents when

they leaked. Due to this environmental effect as well as the continuous usage leads to harmful effect. So now I am going to use an Air Conditioning System with PCMs capsules inside the storage tank to store thermal energy. Within the past decade uses of PCMs for heating and cooling applications for buildings, space heating and for water heating have been investigated. Experiment is carried out for the investigation and analysis of thermal energy storage incorporating with PCM for use in solar air conditioning system. Storing heat energy with the help of phase Change materials (PCMs) and utilizing this energy to air conditioning for domestic purposes during the day and night time. During the day time the battery are charged by means of solar energy with solar panel. During the night time the atmospheric temperature is less than that of daytime temperature, using blower system cold air is passes through the PCM tank. The system consist of heat and cool absorbing unit consisting of PCM (Hydrated salts HS24), and the PCMs are absorb the heat (cold) in it. During the day time, again run the blower system supplies the hot air from inside the building to the PCMs tank. Then the PCMs are absorbing the heat (hot) and release the heat (cold) to the atmosphere (building). Our ultimate aim is to maintain the room temperature at normally 29°C at all-time using Hydrated Salt (HS24).

**Keywords:** Solar energy, air conditioning, phase change material.

## **Conversion of plastic wastes into liquid fuels**

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### **Abstract**

Various technologies are being developed to overcome the drawback of plastics. Though work has been done to make futuristic biodegradable plastics, there have not been many conclusive steps towards cleaning up the existing problem. Recycling waste plastics into reusable plastic products is a conventional strategy followed to address this issue for years. However this technique has not given impressive results as cleaning and segregation of waste plastics was found difficult. Over a 100 million tones of plastics are produced annually worldwide, and the used products have become a common feature at overflowing bins. Plastics is placed in a landfill, it becomes a carbon sink, Incineration, blast furnace, gasification are not much appreciated solution to the problem, as toxic gases are produced and their cost of production is quite high. Pyrolysis of waste plastics into fuel is one of the best means of conserving valuable petroleum resources in addition to protect the environment. This process involves catalytic degradation of waste plastic into fuel range hydrocarbon i.e. petrol, diesel and kerosene etc. A catalytic cracking process in which waste plastic were cracked at very high temperature, the resulting gases were condensed to recover liquid fuels. Type of plastics also effect the rate of conversion of into fuel

and the results of this process are found to be better than other alternate methods which are used for the disposal of waste plastic.

**Key words:** Waste plastics, thermal degradation, pyrolysis, catalyst degradation.

## **Performance and emission characteristics of biodiesel engine with and without coating of TiO<sub>2</sub> on piston head**

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### **Abstract**

A Single cylinder diesel engine is tested in order to study its performance characteristics. In the present study a piston head coated with TiO<sub>2</sub> is used without changing its dimension. The piston head coating used is termed as thermal barrier coating. The different bio-diesel such as mahua champaca are used as fuels using these fuels. The performance of the engine is compared with and without the use of coating. The performance characteristics and emission level are given most importance in this work. The study revealed that the engine with biodiesel an fuel and with coated piston head, there is an enhancement in the performance and emissions levels of the engine.

**Keywords:** Diesel engine, TiO<sub>2</sub> coating, mahua oil, champaca oil.

## **Electro Pneumatic Trainer (Electrical Control)**

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### **Abstract**

Electro pneumatics is successfully used in many areas of industrial automation. Production, assembly and packaging systems worldwide are driven by electro pneumatic control systems. The change in requirements together with technical advances has had a considerable impact on the appearance of controls. In the signal control section, the relay has increasingly been replaced by the programmable logic controller in order to meet the growing demand for more flexibility. Modern electro pneumatic controls also implement new concepts in the power section to meet the needs of modern industrial practice. Examples of this are the valve terminal, bus networking and proportional pneumatics. In



introducing this topic, this project first looks at the structure and mode of operation of the components used for setting up an electro pneumatic control. The following chapters then look at the approach to project planning and the implementation of electro pneumatic controls using fully worked examples. Finally, we had a positive approach towards our project and by looking towards the trends and developments in electro pneumatics this work was completed which would be a path shown by us towards the development of electro pneumatics trainer kits. Our work was based on controllers and relays but not on Programmable logic controller (PLC), but we would rather say that if neglecting the cost of P.L.C, this kit could also be controlled from remote places also and better controlled signals could also be delivered if we had used P.L.C. Our circuits are based on 24 V direct current (DC) and working pressure was 0.15 MPa to 0.8Mpa. We had found that by considering this very working pressure the valves/cylinders behave in a good manner rather than creating a hammering effect by using more air pressure.

**Key words:** Pneumatics, PLC, automation.

## **Performance, emission and combustion characteristics of low heat rejection diesel engine operated by waste plastic oil and diesel fuel blends**

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### **Abstract**

Plastics have become indispensable material in the modern world and the applications in the industrial field are continuously increasing. The properties of the oil derived from waste plastics were analyzed and found that it has properties similar to the diesel. Waste Plastic Oil blends in diesel with LHR was tested as a fuel in a D.I diesel engine and its performance characteristics were analyzed and compared with diesel fuel operation. It is observed that the engine could operate with waste Plastic oil various blends diesel low heat rejection such as used as fuel in diesel engines. Oxides of nitrogen (NO<sub>x</sub>) were higher by about 25% and carbon monoxide (CO) increased by 5% for waste plastic oil operation compared to diesel fuel (DF) operation. Hydrocarbon was higher about by 15% smoke increased by 40% at full load with plastic oil compared to DF. Engine fueled with waste Plastic oil exhibits higher thermal efficiency up to 80% of full load and exhaust gas temperature was higher at all loads compared to DF operation.

**Keywords:** Waste plastic oil, LHR, combustion, performance, diesel.

## **Performance analysis of low temperature combustion by using biodiesel in C.I. Engine**

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### **Abstract**

The level of pollutants such as NO<sub>x</sub>, particulate present in the exhaust of the diesel engine is high. The present study is mainly aimed at reducing this level by way of using bio-diesel as fuel. In the present study low temperature combustion method (LTC) is employed using exhaust gas recirculation technique (EGR). The work is carried out in two ways one with EGR and the other without EGR. Different percentage of exhaust is used for conducting experiments. It is inferred from the study that the pollutant level in the exhaust is significantly reduced and in addition to it, the efficiency of the engine is also increased.

**Keywords:** Diesel engine, exhaust gas recirculation, biodiesel, low temperature combustion.

## **Peristaltic transport of a couple stress fluid in a tapered asymmetric channel: Application to embryo transport in uterine cavity or application to ureteral**

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### **Abstract**

Peristaltic flow of a couple stress fluid in the tapered asymmetric channel is investigated under long wavelength and low Reynolds number assumptions. The tapered asymmetric channel is caused due to the peristaltic wave train on the walls of non-uniform channel having different amplitudes and phases. Exact solutions for the stream function, axial velocity and pressure gradient have been determined. Numerical computations have also been carried out for analyzing the pumping characteristics with different values of flow parameters. It has been found that the peristaltic pumping decreases with an increase in non-uniform parameter and rheological parameter. Further, our results are found to be very in a very good agreement with Srivastava and Srivastava when the absence of asymmetric nature of the channel and couple stress fluid parameter.

**Keywords:** Peristaltic Transport; Couple-Stress Fluid; Tapered asymmetric channel

## **Experimental and CFD study of pressure drop and heat transfer of a rectangle mini channel in laminar regime**

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### **Abstract**

In the present study experimental and CFD study of fluid flow and heat transfer analysis is rectangular mini channels were studied in laminar region. The study was conducted in a rectangular mini channel of hydraulic diameter 2.4mm (3mm\*2mm\*150mm). Numerical solution were obtained by solving appropriate governing equations and results were validated with experimental study. Fluid flow domain was discretized into finite volume elements and is solved using Ansys fluent 15. It was found that the conventional Navier Stokes equation and energy equation holds well for smaller cross sections also. The Nusselt number calculated increases with increase in Reynolds number. There was significant increase in heat transfer coefficient but at the cost of increased pressure drop.

**Keywords:** CFD, heat transfer, pressure drop.

## **Development and characterisation of aluminium-fly ash-SiC composite using stir casting method**

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### **Abstract**

Now a day's aluminium has trending into engineer's friendly material. It used Metal Matrix Composite(MMC) possess significantly improved properties including high specific strength, specific modulus, damping capacity and good wear resistance compared to reinforced alloys. There has been to be increase the mechanical behavior. This project deals with the fabrication and mechanical investigation of aluminium alloy, fly-ash, silicon carbide and magnesium metal matrix composites. Samples (Al 90%,fly-ash 5%,SiC 3%,Mg 2%),( Al 85%,fly-ash 10%,SiC 3%,Mg 2%) and (Al 80%,fly-ash 15%,SiC 3%,Mg 2%) are all mixed can be prepared by stir

casting method. After solidification, the samples are prepared and tested to find the various mechanical properties like tensile, flexural, impact and hardness.

Keywords: Composite material, aluminium fly ash, stir casting.

## **Review on exhaust heat recovery systems in diesel engine**

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### **Abstract**

Exhaust heat recovery system converts the thermal losses in the exhaust zone in engines into energy for work. This technology also reduces exhaust emission from engines. This review paper extends the classification of various methodologies on EHR in diesel engine. In spite of their indigenous benefit for various technologies, it has some limitation over applications to different context. From the current researches the variation in usage of exhaust heat from the diesel engine is evaluated and compared to find which methodology is suitable to attain high efficiency in thermal recovery for power generation. Finally a novel method of an EHR system is proposed to increase high percentage of heat recovery from the exhaust gas in diesel engines.

**Keywords:** Exhaust heat recovery system, diesel engine.

## **Wastewater treatment by batch and continuous stirred tank reactor (CSTR)**

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### **Abstract**

The adsorption has been used for the industrial wastewater treatment, the batch and continuous studies were done. The aim of this study is to enlarge a new adsorption reactor to continuous removal of the organic contaminants by Continuous Stirred Tank Reactor (CSTR). The adsorbent used was the granular activated carbon. By the batch studies, the equilibrium and kinetic parameters have been evaluated. Langmuir isotherm was been represented for equilibrium data and the 'unified approach model' which recently developed was been used to represent the kinetic data. The CSTR performance was studied and found that the CSTR

operates as an ideal CSTR. Effect of adsorbent dosage rate, initial concentration of dye and contact time on the dye removal efficiency in CSTR has been investigated.

**Keywords:** Wastewater treatment, Granular activated carbon, Dye wastewater, Continuous Stirred Tank Reactor.

### **Performance and emission study of low heat rejection engine by using bio-diesel (Champacca oil)**

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#### **Abstract**

An investigation is carried out on a single cylinder four stroke diesel engine in order to evaluate its performance. Its difference parts of the engines namely piston, cylinder and valves are collected with alumina the coating thickness used in 0.3 mm. The main purpose of this present work is to increase the efficiency of the engine and reduce the pollutions like NO<sub>x</sub> and particulate matter. This was achieved by employing low heat rejection method by providing the engine parts with alumina coating the engine tested using the fuels diesel and bio – diesel (i.e. champacca oil). A comparison is made between these two cases and effects of without coating on the performance of the engine are studied and analysis low heat rejection. Improved efficiency of the engine and reduced exhaust pollution were attained as a result of the study performances.

**Keywords:** Diesel engine, low heat rejection, biodiesel.

### **Study on microbial fuel cell system for power generation from dairy wastewater treatment using carbon cloth as electrodes**

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#### **Abstract**

Increasing human activities are consuming the natural energy sources leading to the depletion of fossil fuels. The present day energy scenario in India and around the globe is precarious. The need for alternate fuel has made us to initiate extensive research in identifying a potential, cheap and renewable source for energy production. Microbial fuel cells (MFCs) are being developed by

greater efforts since they are envisaged to be a promising wastewater treatment technology with direct recovery of electric energy. It is a bioreactor that converts chemical energy present in the bonds of organic compounds into electric energy, through the reactions of microorganisms. Double chamber MFC setup was fabricated using acrylic material. Carbon coated carbon cloth were used as anode and cathode material. Nafion 117 was used as proton exchange membrane. Mixed culture of anaerobic bacteria were isolated from dairy wastewater and used for this study. Bacterial strains were made to grown in anode material by inoculating organisms in the anode material. Anode compartment was maintained at anaerobic condition by purging with nitrogen gas twice a day. The entire setup was kept in stirrer at 200rpm for maintaining mass transfer throughout the system and to prevent the formation of sludge at the bottom. COD and BOD concentrations were reduced by 90% and 82% respectively. Maximum current density of 786mA/m<sup>2</sup> and power density of 698mW/m<sup>2</sup> were produced. Small portion of the biofilm was scratched from the electrode surface after emptying the MFC. SEM image revealed typical bacterial growth on the surface of anode electrode. A close examination revealed that there were different predominant bacterial morphologies on the electrode.

**Keywords:** MFC, BOD, COD, power generation.

## **Design and analysis of composite absorber part attach with spur gear for abnormal load condition**

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### **Abstract**

This thesis describes a new model of composite absorber part attach with spur gear for abnormal load conditions. In power transmission of gears, the spur gear creates noise and vibration in machine and also work abnormal load condition it causes loss of efficiency, low power transmission, frictionless etc. Such that the composite absorber part being designed to overcome the problem. The composite part act as vibration absorber and noise absorber. They attach in gear to avoid the problems occurs in normal gear. The following invention is a special type of gear designed and evaluated to satisfy both the normal and abnormal conditions such as high torque. The composite gear has composite gear teeth which consist of one or more metal gear teeth portions sandwiched between two thermoplastic gear teeth portions. The thermoplastic gear teeth portions extend outwardly from the metal gear teeth portions so that the thermoplastic teeth portions absorb loads under normal operating conditions. Under abnormal conditions such as when an abrupt stop occurs, the thermoplastic portions of the gear teeth are compressed and the

higher torque forces resulting from the abnormal condition are absorbed by the metal gear teeth portions.

**Keywords:** Composite absorber plate, spur gear, vibrations.

## **Design and analysis of articulated robot arm**

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### **Abstract**

Nowadays robots play a vital role in all the activities in human life including industrial needs. In modern industrial manufacturing process consists of precise and fastest proceedings. Human operations are needed to perform a variety of tasks in a robotic system such as setup, programming, trouble shooting, maintenance and error handling activities. Hazardous conditions exist when human operators intervene into the robotic work zones. The ultimate aim of the project is to design and analysis of articulated robot arm for industrial applications when robot workspace occupation is minimized and also gets higher efficiency.

**Keywords:** Robotics, mechatronics articulated robot arm.

## **Drying characteristics, kinetics, energy consumption and quality of turmeric slices using different drying methods**

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### **Abstract**

Drying is one of the important unit operations in the production of turmeric powder. Drying mainly aims at reducing the moisture content in the sample thereby preventing the post contamination and helps in long time storage. Turmeric as whole is a spice, medicine, additive with various nutritional, antiseptic and coloring properties. Importance of turmeric in numerous applications led to study the drying kinetics which certainly affects the quality of the product. Energy consumed for drying also becomes a major consideration in economic basis. This study investigates the drying characteristics, kinetics, energy consumption and quality of turmeric slices using two drying methods namely, conventional air drying at 60<sup>0</sup>C and microwave drying at various power levels (160 W, 250 W, and 400 W). Eight thin layer drying models were used to

analyze the drying kinetics of the turmeric slices. Both the drying methods had their significant effect on the parameters studied. Long drying time on the average of 1740 minutes was taken to dry the sample in conventional tray dryer to reach the desired moisture content of 5- 10% dry basis. On the other hand, lesser drying times of 14, 7.5 and 4.5 minutes in the microwave dryer at 160 W, 250 W and 400 W respectively. Midilli–Kucuk model best suited the both drying methods. Conventional drying exhibited a constant drying rate period in the drying curve, whereas microwave drying lie in the falling rate period. Energy used for microwave drying was less compared to the conventional drying, whereas dryer efficiency was found to be higher compared to conventional drying. Color of the product also found to be better in microwave drying. Based on the drying rate, time, color and energy consumption microwave drying at power level of 400 W would be best suited for drying of turmeric slices.

**Keywords:** Microwave drying, conventional drying, energy consumption, drying rate, drying kinetics.

## **The performance assessment of new refrigeration mixture (HC blend ) in order to replace R134A(HFC) by hydrocarbon mixture as refrigerants in domestic refrigerator**

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### **Abstract**

Domestic refrigerator designed to work with R-134a was used as a test unit to assess the possibility of using hydrocarbons and their blends as refrigerants. Pure butane, isobutene and mixture of propane, butane and isobutene were used as refrigerants. The performance of the refrigerator using hydrocarbons as refrigerant was investigated and compared with the performance of refrigerator when R-134a was used as refrigerant. The effect of condenser temperature and evaporator temperature on COP, refrigerating effect, condenser duty was investigated. The energy consumption of the refrigerator during experiment with hydrocarbons and R-134a was measured. The results show that the compressor consumed 3% and 2% less energy than that of HFC-134a at 28°C ambient temperature when iso-butane and butane was used as refrigerants respectively. The energy consumption COP of hydrocarbons and their blends shows that as hydrocarbons can be refrigerant in the domestic refrigerator. The COP and other result obtained in this experiment show a positive indication of using hydrocarbon of refrigerator.

**Keywords:** Refrigeration, R134A, hydrocarbon mixture.



## **Decolorization of Color from Synthetic Dye Effluent Using Packed Bed Adsorption Column**

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### **Abstract**

A variety of synthetic dye effluents released by the textile industry pose a threat to environmental safety problem. Dyes are compounds with complex aromatic structure that is widely used to bring color to other substances. In this work focused treating of synthetic textile wastewater containing dyes by using a packed bed adsorption column. Packed bed columns are preferred due to its advantages like easy handling, suitable for large scale operation, high mass transfer rates and uniformity. In this study different adsorbents suitable for considering as packing material is over viewed. The adsorption isotherms, kinetics and design of packed column, specifically for removal of synthetic dyes from waste water are presented.

**Keywords:** Wastewater treatment, Adsorption, Activated carbon, Packed-bed column

## **Utilisation of waste automotive engine oil as alternative fuel for heating application**

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### **Abstract**

Large quantities of lubricating oils are used in our automobiles, farm machinery and industrial processes; creating the need to address the issue of what to do with them when their useful life is over. Recycling of used engine oil products allows this non-renewable resource to be used many times reducing energy requirements but leads to many a potential environmental problems as the recycled oil does not meet the ILSAC, SAE or API standards for want of required additives and hence leads to faster wear and tear of engine components leading to greater environmental pollutions. An attempt is made to utilize the used engine lubricating oil from automobiles and design a furnace for heating applications viz. heat treatment and non-ferrous metals melting in foundries which can provide higher heat energy than that being achieved using solid fuels. Many design iterations were undertaken and finally the objective of utilizing the heat energy was

achieved by combustion of the oil with air in a single throttle swirl burner. The design was conceptualized to melt aluminium which is undertaken in foundries which are available in large numbers at Belgaum. Complete Design of the parts, Plotting assembly, sub-assembly drawings and fabrication of the burner has been undertaken and finally the used engine oil has been successfully burnt in the furnace to melt aluminium.

**Keywords:** Used Engine Oil, Oil Burner, Batch Furnace, Combustion.

## **Experimental analysis and optimization of heat treatment parameters of Al6061 alloy for improved mechanical properties**

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### **Abstract**

This paper investigates the heat treatment behaviour of Al6061 aluminium alloy experimentally and optimizing the parameters using different optimization methods. Mechanical properties such as tensile strength, hardness and impact strength are optimized using Taguchi's technique, Grey relational analysis and by combining them both as a hybrid technique. The input parameters identified are aging temperature, time period of heat treatment and medium of cooling. Experiments are designed using Taguchi's Design of Experiments, a suitable L<sub>9</sub> orthogonal array is selected. Analysis of Variance (ANOVA), a statistical tool is applied to study the most significant parameters. The optimized conditions achieved are temperature of 450°C, forced air as quenching medium and time period of 30 min for all the three techniques. ANOVA result shows that the error percentage gets reduced with hybrid technique. At the outset it is observed that the performance can be well studied by using hybrid technique than that of the individual techniques.

**Keywords:** Aluminum alloy, heat treatment, Taguchi's technique, ANOVA, Grey relational analysis.

## **Secure communication in IoT using 5G in presence of eavesdroppers at uncertain locations**

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### **Abstract**

The problem of secure routing in wireless multi-hop networks is still largely an open problem due to broadcast nature of radio propagation. In this paper, we focused on secure transmission by introducing the relay concepts in IoT network, in presence of uncertainty of eavesdropper location. Now-a-days the physical layer security provides most promising approach in wireless communication. The randomize-and-forward relay strategy provides better secure communication compare to decode and forward relay strategy. During analysis, we considered a single antenna scenario, where all the devices in the network are equipped with the single antenna. We derived the secrecy outage probability expression for two hop communication and the results obtained reveals that proper utilization of relay transmission can enhance the secrecy throughput and extend the secure coverage range.

**Keywords:** IoT, 5G, physical-layer security, relay, secrecy outage probability, RF strategy

## **Real time health monitoring system**

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### **Abstract**

Ubiquitous Health Care (UHC) can fulfill the promise of delivering health care services at any time, any location. It makes early detection of chronic diseases possible and hence improves the quality of life. Real time health monitoring system automatically records five physiological parameters of the human body: temperature, respiration rate, blood pressure, pulse rate and electromyography (EMG) at the same time. Our system aims at providing a continuous health monitoring for a bedridden person at remote locations. The system follows a three tier architecture which consists of sensor level, personnel server and a medical server. The program developed reads and automatically saves the sensor readings in a database. The results can be later interpreted by comparing with known normal values and thus offers the possibility for a primary health status diagnosis by specialized personnel. The interfacing circuit takes the data received from the sensors by an interfacing circuit and provides it with signal conditioning and display in a webpage which is visible in both patients's and doctor's

system simultaneously. The collected databases can be used as EMR (Electronic Medical Records) and the readings from the sensors are uploaded automatically to the database. In case of any abnormal physiological condition, the system itself provides an ambulatory service. This not only alert caregivers about the potentially life threatening events but also allows the physiologic input data to control directly connected life supporting devices and also makes human life more comfortable and safe. Thus this system is a blessing for bedridden persons who cannot be monitored 24\*7.

**Keywords:** UHC, EMG, WBAN, WHMS, PDA ZigBee.

## **Effective Utilization of Shell Scripts for Scheduled Failsafe File and Database Backups in Linux-based Web Servers**

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### **Abstract**

Due to the increased rate in internet based virus attacks, the need for backup plays a vital role in IT field. Not all servers come with this facility and hence the programmers are in need of a reliable solution for performing backups. In addition, the backup process needs to be scheduled in a regular interval which is also essential. This article presents the solution for both the requirements. The backup process is done using shell scripts which archives files using tarball compression and the my-SQL database tables are archived using sql.gz compression methods. The shell script performs sequential operations of each command and the report of execution is displayed or sent through email to the administrator. The backup process has been automated with time schedules using Cron jobs integrated with cPanel of the web server.

**Keywords:** Shell script, MySQL backup, crontab, bash, SSH.

## **Smart lights**

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### **Abstract**

The main considerations in the present field technologies are automation, power consumption and cost effectiveness. Automation is intended to reduce manpower with the help of intelligent systems. Power saving is the main consideration for ever as the sources of power

are getting diminished due to various environmental reasons. The main aim of the project is to save power automatically instead of doing manually which is accomplished by the use of LED lamps. Smart bulbs can wirelessly connect with phone Apps and this App adds to the smartness of the system. The system cares for the requirements of the user providing them with superior light technology- better visibility, control of light direction resulting in a more pleasant and comfortable atmosphere. Here we propose an energy efficient indoor light monitoring and control system that can monitor the ambient environment and handle indoor lights more efficiently. The proposed system consists of a transceiver (Bluetooth module) to send and receive the sensor values which serves as the input to the controller module. The lamps continuously monitor the intensity of the surrounding light and also the occupancy of the region of concern by using the sensors connected to it, and based on that intensity, the microcontroller unit (Atmega328) takes decisions regarding the brightness of the lamps. Unlike the normal lights which have only two states i.e. ON and OFF, Smart Lights are capable of giving all brightness levels ranging between the ON and OFF states. An external input circuit is also provided in case we need to control the system manually. In order to make the system more user-friendly, we make use of an android application (using MIT App Inventor) for controlling the brightness of the lamp as easily as we adjust the brightness of our mobile screen.

**Keywords:** Smart lights; power saving; LED lamps; automation.

## **Blood vessel segmentation using SOSVM for fundus images**

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### **Abstract**

In this work, we present an extensive description and evaluation of our method for blood vessel segmentation in fundus images based on a region growing method. Age-related macular degeneration, glaucoma and diabetic retinopathy is a chronic eye disease that leads to Vision loss. As it cannot be cured, detecting the disease in time is important. Customary segmentation priors like a Potts model or total variation usually fail once handling skinny and elongated structures. The major problem in detection is that, there does not exist a great difference both in color and intensity, so segmentation and edge detection becomes tougher. We overcome this issue by employing a segmentation is done using based region growing method for edge detection and the Parameters of the strategy square measure learned mechanically using a structured output support vector machine, a supervised technique wide used for structured prediction during a variety of machine learning applications.

**Keywords:** Blood vessel segmentation, fundus imaging, region growing method, optic disc detection, structured output support vector machine or SVM.

## **Class-III SLM and PTS scheme based on variance of correlation analysis of PAPR and alternative OFDM signal sequences**

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### **Abstract**

Selected mapping (SLM) is a well-known peak to average power ratio (PAPR) reduction technique for orthogonal frequency division multiplexing (OFDM) systems. Recently, a low-complexity SLM scheme, called Class-III SLM scheme, was proposed, which performs only one inverse fast Fourier transform (IFFT) to generate alternative OFDM signal sequences. By randomly selecting the cyclic shift and rotation values, Class-III SLM scheme can generate up to  $N^3$  alternative OFDM signal sequences, where  $N$  is the IFFT size. However, all  $N^3$  alternative OFDM signal sequences do not achieve good PAPR reduction performances. Therefore, an efficient selection method of good rotation and cyclic shift values is needed, which results in good PAPR reduction performance. In this paper, a selection method of cyclic shift values is proposed, which is optimal in terms of minimizing the variance of correlation values between alternative OFDM signal sequences. And also, developing the PAPR reduction by using the partial transmit sequence (PTS) method.

**Keywords:** Class-III selected mapping (SLM), correlation, orthogonal frequency division multiplexing (OFDM), peak-to average power ratio (PAPR).

## **Thermal model of single slope passive solar still with phase change material**

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### **Abstract**

In this study a mathematical model is used to predict the performance of the solar still using the phase change material to enhance the thermal enhancement of the solar still. Experimental study on the thermal efficiency of solar still using phase change material like lauric acid and calcium chloride hexahydrate, shows that thermal efficiency increase about 14 % more in calcium chloride hexa hydrate and 13% more in lauric acid than then we are using conventional solar still. A mathematical model is develop, which is used to find the temperature of glass cover, water and the basin for predicting the theoretical value in order to match with the experimental result. The result shows the good agreement between the

theoretical value and experimental results. Enhancing the heat transfer is the major role in order to increase the productivity of water from solar desalination still.

**Keywords:** Solar energy, desalination, solar still, PCM

## **Performance of secured communication in OFDMA based cognitive radio networks**

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### **Abstract**

To propose a secure cooperative communications theme for MIMO orthogonal frequency division multiple accesses (OFDMA) based cognitive radio networks wherever a primary base station (PBS) needs to transmit information to some distant primary users (Pus) within the presence of a collection of passive eavesdroppers. In this model, the transmission is performed in two consecutive slots; within the initial time slot, PBS transmits whereas secondary users (Sus) and therefore the eavesdroppers listen. Within the second slot, Sus transmit whereas PUs, secondary base station (SBS), and therefore the eavesdroppers listen. In planned model, (Sus) area unit allowed to use the accredited spectrum of PUs as long as they assist PUs to satisfy their secrecy rate demand. I have a tendency to assume a frame based mostly transmission wherever every frame is split into two consecutive time slots of equal period. And proposed scheme multiple input multiple output (MIMO) technology with cognitive network provides more secure and efficient communication than that of the conventional scheme.

**Keywords:** Cognitive radio network, cooperative communication, eavesdropper

## **A novel method of wireless electric power transfer by using three coils for battery charging application**

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### **Abstract**

Wireless Power Transfer (WPT) is becoming a popular technology. The two-coil structure is the most widely used for magnetic resonant coupling. Improved three coils for the energy transfer are much efficient. The three coils which we are using are source coil, receiving coil and transmitter coil. With the simplified model, the condition for a three coil structure

obtaining higher energy efficiency over its two-coil is derived. Since the three coils is using in my project work, the efficiency can increase. Here the receiving and sending end coil are in magnetic field coupling in order to improve the distance to cover the network. In most WPT systems, a tuning inductor is connected in series with the coupling interface for circuit compensation and power transfer capability enhancement. Z-impedance will provide compensation and it also has the voltage boost capability as a Z-source inverter. Analysis shows that the WPT system with higher energy efficiency within a wider range of loads can be achieved.

**Keywords:** Wireless power transfer, battery charging, magnetic resonant.

## **Design and implementation of power and speed efficient adders**

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Engineering, Pathamuttom, Kerala, India*

### **Abstract**

In realizing modern Very Large Scale Integration (VLSI) circuits, low-power and high-speed are the two predominant factors which need to be considered. There reliability exists a trade-off between the design parameters such as speed, power consumption, and area. Adders are the most comprehensively used components in many circuits and they are building block arithmetic block of the Central Processing Unit (CPU) and Digital Signal Processing (DSP), therefore its execution and power optimization is of at most importance. This paper proposes design of fast adders using two new dynamic logics named D3L (Data Driven Dynamic Logic) and sp-D3L (split pre-charge – Data Driven Dynamic Logic). Examination of two circuits, D3L and SP-D3L made by using Cadence Virtuoso. Power Delay Product (PDP) is calculated for both these logics.

**Keywords:** Data Driven Dynamic logic, Split path Data Driven Dynamic, pull-up network (PUN), pull-down network (PDN), power delay product.

## **Parametric kernel estimation for license plate image deblurring**

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### **Abstract**

License plate plays a key role in identifying the over-speed vehicle or the ones involved in hit-and-run accidents. Even though the surveillance camera captures the snapshot of



trouble-maker vehicle, the motion of vehicle during the exposure time would cause the blur of snapshot image with low resolution and can be unrecognizable by human. In this paper, we have proposed a novel approach on the identification of linear uniform motion blur kernel using sparse representation and that can be characterized by two parameters: angle and length. By analyzing the sparse representation coefficients of the captured image, Coarse-to-fine framework can be done for determining the angle of the kernel corresponds to the genuine motion angle. Then, we estimate the length of the motion kernel with Fourier transform followed by Radon transform. Our proposed scheme can handle large motion blur even when the license plate is unrecognizable by human.

**Keywords:** Blur kernel estimation, sparse representation, image deconvolution, blind image deblurring.

## **Power efficient channel estimation and signal detection on downlink using MIMO-OFDM technique**

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### **Abstract**

The channel estimation (CE) and multi-user detection (MUD) has become a crucial part of iterative receivers. It requires high power for receiving a transmitted signal for multiple user. To overcome this problem we proposed a MIMO-OFDM system. Orthogonal frequency division multiplexing (OFDM) has drawn substantial research interests during the past decade and has been deemed as the key component of future wireless communication systems to mitigate inter symbol interference and enhance system capacity. channel estimation and multi-user detection scheme is proposed for multi-user multi-input multiple output (MIMO) aided orthogonal frequency-division multiplexing (OFDM) systems. By using a new joint blind CFO and channel estimation method for OFDM system with multi-antenna receiver, which gradually improves the accuracy of the channel estimation and the multi user detection. This method supports fully loaded systems and is valid for multiple user with low power consumption by using OAT methodology. The simulation results demonstrate that the proposed channel estimator is capable of approaching the Cramer-Rao lower bound.

**Keywords:** Bit error rate (BER), channel estimation, carrier frequency offset (CFO), Cramer–Rao lower bound (CRLB), Inter carrier interference (ICI), multiple input multiple output (MIMO), minimum mean square error (MMSE ), over the air test method(OTA), orthogonal frequency division multiplexing (OFDM).

## **Intelligent energy meter with power theft detection**

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### **Abstract**

The data collection of energy distribution for billing and monitoring of the distribution system are very important part in the research of energy visualization and analysis. In the conventional method, a meter reader who authorized by the Electricity department visited the customer's house and note down the consumed energy units and calculates the usage charge. In this method problems may arise due to errors caused by meter reader and it is time consuming also. Automation of electricity billing system is the solution to this problem. This paper proposes a method to automate the electric billing system. It can be achieved by incorporating a microcontroller with energy meter and interface it through GSM module. This system enables KSEB to collect the bill automatically without utilizing the man power. The data collected at the customer premises is shared to the KSEB office through web/GSM. A database at the KSEB office stores all the details and will be accessible to the officials and customers on demand. When the energy consumption exceeds a particular value the heavy loads will automatically disconnected and alert the consumers. Electricity theft is a social evil that has to be completely eliminated. This paper suggests a method for effective energy management and power theft detection on distribution lines also. In the proposed system if there is any tapering between the distribution post and the actual customer, power theft detected message will be sent to KSEB office.

Keywords – GSM module, database, energy management, electricity theft

## **An efficient framework for occlusion invariant face recognition**

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### **Abstract**

Face recognition has been an active area of research and made significant advances in the last decade with widespread applications such as access control, video surveillance, forensics, law enforcement, crime investigation, boarder control, entertainment field etc., Despite of rapid developments in this technology under controlled settings, a semi-automatic system handling

occlusion in the faces of probe and gallery is the challenge to the current face recognition techniques for the faces captured in various uncontrolled environment. Most of the existing face recognition techniques assume frontal mug shot images are available in the gallery and for matching the occluded areas in faces are detected by any one of the approaches such as feature based approach, and then matching is performed. This is a complex process, needs lot of training and time consuming and moreover it fails to handle pose variations. Considering these issues as a challenge, a novel methodology is proposed to recognize the occluded non-frontal probe face in the gallery of uncontrolled images with pose variations and occlusions. In this approaches both probe and gallery image are reconstructed to frontal and matching is performed to achieve satisfactory performance in recognition. The images in the probe as well as gallery are divided into a finite number of disjointed local patches, and features are extracted for each patch, and the occlusion present is detected using MSVM classifier. Features obtained from the corresponding occlusion free patches of training images are used for face recognition. Pub Fig Database that includes the images with sunglasses, hand, hair, scarf, bread are used for experiment.

**Keywords:** Face recognition, pose variation, occlusion.

## **Implantable antenna For biomedical application**

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### **Abstract**

Implantable antennas are widely used in wireless telemetry applications. The implantable device is helpful in diagnosis, monitoring and transmission of patient allied data to nearby base stations. Recently MICS band (402-405) MHz has been assigned which is regulated by the United States Federal Communications Commission(FCC) and the European Radio communications Committee for bi directional biotelemetry operations. The antenna size should be small enough for implanting. Reducing the size of the antenna has a direct effect on the resonance frequency. This is due to the change in effective current length path which leads to shifting of the resonant frequency .Several miniaturization tools have been employed earlier like the use of high permittivity dielectric substrate, lengthening of the current flow path on the patch surface, inserting short pins between the ground and the patch plane etc.

With the rise in frequency bandwidth also rises which leads to higher bit rate between the implant and the base station. But with the increase in bandwidth the noise level also increases, which affects the efficiency of the communication channel. So conciliation between gain and bandwidth has to be achieved in order to have better design. The idea we are putting forward is an 'Implantable antenna for biomedical application'. In the proposed idea we are evaluating two different cases of the antenna, one with wing patch and the other with an additional circular patch. The same is done using HFSS software and as a result

various antenna parameters were observed. This implantable antenna operates in the upper C-band (5-8GHz) with a maximum return loss of -34.1db.

**Keywords:** Miniaturization, upper C-band, implantable antenna, HFSS.

## **Blind assist: Mobile application for assisting mobility for the visually impaired**

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### **Abstract**

Visually impaired people (VI) face many challenges while travelling. With the existing systems, they do not find any single solution because it usually require additional dedicated hardware which are expensive, single purpose oriented and cumbersome. According to WHO, as of 2014, 285 million people are VI worldwide. The problem of outdoor mobility of the visually impaired and reviews key assistive technologies aiding the blind in independent travel. In our project, by exploiting the great potential of modern smartphones we make travelling more simple, enjoyable, independent and cost effective. It is a solution for wide range of mobility challenges which are faced by the VI. We demonstrated different travel activities such as getting knowledge of the surrounding, railway timing, public as well as private road transportation and additional features like time, battery level etc., through a single application. With a simple gesture input the VI will get everything in the tip of their finger. APIs are used for retrieving relevant information based on user's context facilitate independent travel for VI.

**Keywords:** Blind assist, visually impaired, mobile application.

## **Predicting heart disease using fuzzy - SVM classification technique**

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### **Abstract**

In real world, a difficult task to identify the heart disease. Prediction of heart disease is a major challenge faced by hospitals and medical centers, especially when it comes to

accuracy. However, the classification algorithms are useful in the diagnosis of a disease using a multivariate medical data, which were acquired from the hospital environment using different technologies. In this system, new techniques for building an efficient intelligent classification system which involves fuzzy logic and SVM classification, new techniques are necessary since processing a huge amount of medical data in real time to infer new decisions on clinical data. A genetic based fuzzy classification method based on SVM has been proposed to classify the data set accurately.

**Keywords:** Prediction, Fuzzy, SVM, Classification, Medical data.

## **Human being detection technologies**

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### **Abstract**

Ultra-wideband (UWB) radars are currently used for various applications such as classification of aircrafts, subsurface sensing, collision avoidance, etc. Another important application of USB radar is detection of human beings trapped in buildings on fire, in collapsed buildings or avalanche victims. UWB radar for detection and positioning of human beings in complex environment can be developed based on different technologies such as video impulse, quasi-random noise, MIMO (multiple-input multiple-output), stepped-frequency continuous wave and frequency-modulated continuous wave. In the present study, the available technologies were compared based on their functional requirements. Relative advantages and disadvantages of these technologies in the application of human being detection and positioning were summarised. This study resulted in determining the strong and weak points of different technologies. Based on this, one can select suitable technology based on their specific needs.

**Keywords:** UWB radar, human being detection.