ASSESSMENT OF MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM OF PERINTHALMANNA MUNICIPALITY

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Abstract: *Municipal Solid Waste Management is one among the fundamental and essential services provided by municipal authorities in the country. The existing system of the municipal solid waste management of Perinthalmanna Municipality has been studied to assess its performance and the conformity to the regulations. Investigation was conducted about the prevailing process of collection, processing and disposal of the municipal solid waste by taking sample response survey among the people and the authorities who are managing the system. The study revealed that solid waste management in Perinthalmanna Municipality needs upgradation as it is not conforming to the MSWM rules.The suggested strategy is integrated solid waste management system or upgrading the existing system.*

Keywords: *Municipal solid waste management ,MSWM rules, integrated solid waste management.*

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STUDY ON BEHAVIOUR OF FIBRE REINFORCED CONCRETE USING BINDING WIRE

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***Abstract**: Concrete is most generally utilized building material on planet. Concrete possesses a very low tensile strength, limited ductility and little resistance to cracking. Fibre Reinforced Concrete (FRC) is a composite material consists of cement based matrix along with uniform or random distribution of short discrete fibres, which can be steel fibres, nylons, polyethylene etc. Various types of fibre reinforced concrete are being used against plain concrete due to their higher flexural strength, better tensile strength, modulus of rupture and crack resistance. The application of irregular arrangement of fibres to concrete altogether upgrades its essential characteristics. In this project we study the effects of addition of binding wires on the compressive strength, flexural strength and split tensile strength of concrete experimentally. Different quantities of binding wires are added to the concrete to find out the optimum quantities of binding wires in which the FRC with binding wires is more effective in terms of strength and crack resistance capacity. Tests were conducted to study the flexural, compressive strength and split tensile strength of steel fibre reinforced concrete with varying diameter of steel binding wire.*

***Keywords:** Fibre Reinforced Concrete (FRC).*

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PARTIAL REPLACEMENT OF FINE AGGREGATE BY PULVERIZED PLASTIC IN CEMENT CONCRETE

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Abstract: *Solid waste management is one of the major environmental concerns in the world. With the scarcity of space for land filling and due to its ever increasing cost. Waste utilization has become an attractive alternative to disposal. Reuse of bulky waste is considered the best environmental alternative for solving the problem of disposal. One such waste is plastics which could be used in various application. The project presents a detailed study about the effect of waste and recycled plastics on the fresh and hardened properties of concrete. Fine aggregate used in cement concrete is replaced by fine crushed plastics. The various test to be conducted on concrete are compression test, split tensile strength, flexural strength etc. High density Poly Ethylene is the Plastic used for replacing fine aggregate. Paint bottles are being crushed to obtain the HDPE .M20 grade concrete is chosen for the investigation. In this investigation we made a comparative study of compressive strength and tensile strength of both conventional concrete and concrete containing plastic at 28 days. Methodology of the project is the systematic, theoretical analysis of the methods applied to a field of study. It include literature review, collection of materials, mix proportion, casting of specimens, curing of specimens, testing of specimens, analysis and discussion of test results, comparison with plain concrete, conclusions etc.*

Keywords: High density Poly Ethylene(HDPE).

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COST COMPARATIVE STUDY OF CONVENTIONAL AND COST-EFFECTIVE CONSTRUCTION MATERIALS

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Abstract: *Construction cost in India is increasing at around 50 per cent over the average inflation levels. It has registered increase of up to 15 per cent every year, primarily due to cost of basic building materials such as steel, cement, bricks, timber and other inputs as well as cost of labour. As a result, the cost of construction using conventional building materials is becoming beyond the affordable limits particularly for low-income groups of population as well as a large cross section of the middle -income groups. Therefore, there is a need to adopt cost-effective construction methods either by up-gradation of traditional technologies using local resources or applying modern construction materials and techniques with efficient inputs leading to economic solutions. This has become the most relevant aspect in the context of the large volume of housing to be constructed in both rural and urban areas and the consideration of limitations in the availability of resources such as building materials and finance. In this study cost effectiveness of various innovative materials with conventional materials is studied for a building by designing and cost estimation. Use of Expanded Polystyrene Wall panel and gypsum plastering has been included as the cost-effective materials in place of laterite masonry and cement plastering. Due to the reduced availability and increasing cost, people have been forced to look for alternatives for conventionally used building materials for reducing and optimizing the construction cost. In this study, laterite blocks and cement plastering was compared with its cost-effective alternatives, EPS Wall panel and Gypsum plastering. Structural design and cost estimation were done by using both conventional and cost-effective materials for a proposed building. And a cost-comparative study was done. Even though many studies have discussed the structural integrity of these materials, local community are not convinced about the cost effectiveness. This study was done to state the cost-effectiveness while using these materials.*

Keywords: *Polystyrene Wall panel.*

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SISAL FIBRE REINFORCED GYPSUM BOARDS AS PARTITION WALLS

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Abstract: *In the modern world the need for high rise buildings and building construction are increasing rapidly. We know the building construction industry is responsible for 7 percentage of global carbon dioxide emission. Also so there is a huge growing requirement of building materials in India due to the existing housing shortage mainly for the low income groups in urban India. In order to overcome the above problems we require innovative energy efficient building material. Sisal fibre is a natural fibre extracted from sisal plants which has many benefits like moth & rot resistant, anti-static, anti-bacterial, dust & mite resistant, is a great heat and sound insulator, regulates environmental moisture and is biodegradable. Gypsum is a good building product which has many benefits like fire resistance, cooling effect, highly finished surface, termite resistant, sound resistant etc. Here this project aims to understand the potential of using sisal fibre as a reinforcing material in gypsum block and understanding the behaviour and character of the finished product. Which is very superior than traditional system in time cost and quality. We know gypsum is a waste product and have many benefits if it can be used for construction purpose. We also know that sisal fibre is a strongest natural fibre, and found abundantly in India. By utilising the benefits of the two we can overcome the weakness of the gypsum and induce quality to the finished product.*

Keywords: *Sisal Fibre, Biodegradable.*

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STUDY ON PERFORMANCE OF POLYSTYRENE BUILDING BLOCKS

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Abstract: *Traditional burnt bricks, quarry stones, timber, and corrugated iron sheets remain the most commonly used construction materials. The heavy weight of bricks accounts for the great mass of construction and thus causes more vulnerability against earthquake forces. In this study we have tried to reduce the density of masonry material, as well as improve their thermal insulation properties by incorporating Expanded Polystyrene beads in concrete. Polystyrene blocks can be produced by replacing the normal aggregates in concrete or mortar either partially or fully, depending upon the requirements of density and strength levels. The present study covers the use of polystyrene beads to achieve lightweight concrete and hence introducing a light weight building block. The main aim of this study is understanding the properties like water absorption, density and compressive strength of polystyrene blocks and compare the results normal building blocks.*

Keywords: *Polystyrene, vulnerability.*

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WASTE FOUNDRY SAND AND RUBBER TYRE AS SUBSTITUTES FOR AGGREGATES IN CONCRETE

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Abstract: *From the last few years, various projects had done work in concreting and invent various techniques and methods to produce concrete which has the desired properties. Concrete is one of the most vital and common materials used in the construction field. The current area of research in the concrete was introducing waste foundry sand (WFS) and rubber tyre in the ordinary concrete. Waste foundry sand is the byproduct of metal casting industries, which causes environmental problems because of its improper disposal. Thus, its usage in building material, construction and in other fields is essential for reduction of Environmental problems. This research is carried out to produce an eco- friendly concrete. This paper recommends the effective use of waste foundry sand as a partial replacement for fine aggregate and rubber tyre as a partial replacement for course aggregate in concrete. Ingredients for concrete are cement, course aggregate, Rubber tyre, fine aggregate and waste foundry sand. The aim of this project was to know the behavior and mechanical properties of concrete for its eco-friendly and economical use.*

Keywords: *Waste foundry sand (WFS).*

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COMPARATIVE STUDY ON SAND BED REINFORCED WITH FLEX CELL AND PET BOTTLE CELL

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Abstract: *Development of the infrastructure is the most important need in present time. Due to space constrains many times construction takes place on poor soil. So improvement of soil is the most important one. Soil reinforcement is one of the most popular ground improvement techniques. Here we are using reinforcement as Flex cell and Pet bottle cell and also collect soil as sandy soil. In this project we have studied the penetration response of soil reinforced with PET bottle cell and Flex cell. PET bottle cells and Flex cell are made in the form of a geo cell. First of all we test the soil having a density by load test and the results are recorded. Then test conducted on unreinforced sand and then tests are conducted in soil with PET bottle cells and Flex cell placed in a single layer and then in double layer at different depths with different spacing. From there, we observed the soil strength are improved due to reinforcement of soil. The result depend on depth and spacing of reinforcement.*

Keywords: *PET bottle cells, Flex cell.*

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SOIL STABILIZATION USING LIME AND SUGARCANE BAGASSE ASH

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Abstract: *Soil stabilization is the process of changing soil properties to improve strength and durability. Chemical stabilization is one of the most common method used for the improvement of engineering properties of problematic soil. Over the last few decades, lime has been used as a chemical stabilizer. At this era of energy utilization and resource depletion, there is an emerging trend in the utilization of waste materials as soil stabilizer. Sugarcane bagasse ash is the burned product of sugarcane bagasse, comprising high percentage of silica content. It is a pozzolanic material which has the potential to be used as a soil stabilizer. In this project, the potential of sugarcane bagasse ash as a soil stabilizer is evaluated and compared with the stabilization effectiveness of lime. On stabilization using sugarcane bagasse ash, it is observed that there is an increase of 183% in unconfined compressive strength and a decrease of 9.4% in plasticity index when compared to that of virgin soil. This clearly indicates that sugarcane bagasse ash is an effective soil stabilizer. On comparison, it is observed that sugarcane bagasse ash is not effective as lime in stabilizing which shows that there is an increase of 264% in unconfined compressive strength and a decrease of 7% in plasticity index. It is concluded that sugarcane bagasse ash is an eco-friendly stabilizer which can be used to develop sustainable building units like compressed stabilized earth block.*

Keywords: Pozzolanic material,Stabilisation, Plasticity index

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SOIL STABILIZATION USING JUTE FIBRE AND BAMBOO LEAF ASH

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Abstract: *The soil is the most important material used in different field of civil engineering. Soil stabilisation is the process of improving the engineering performance of soil. The soil is used for mainly in construction, pavement, foundation works etc. The required soil available for these purposes may not possess adequate strength for the above works. This will certainly affect the stability of the structure. The earth is consisted of various types of soils. Clay soil is one of the fine grained natural rock or soil material that consist one or more clay minerals with traces of organic matter and traces of metals. The clay soil is fine grained, slow to drain, quickly harden and difficult to use in unstable condition since it has fine particles. The different stabilizing materials are using including fly ash , lime, rice husk ash, quarry dust, granite powder etc. In this project jute Fibre and bamboo leaf ash will use to stabilise the soil. This experiment is conducted for fine grained soil in paddy field at valamboor roads in Chunkam-Pattikkad junction in Perinthalmanna Malappuram district, Where the soil has undergone differential settlement.This experimental study mainly focuses on the effect of jute and bamboo leaf ash in the soil.The jute Fibre is collected from local market in Calicut and has diameter of 0.2mm and cut in to 20mmlength for conducting the experiment, Which is generally available in the threaded form. Bamboo leaf ash is a waste material formed from the burning of bamboo leaves, which is collected from Vengoor near MEA engineering college. The fallen dry leaves were collected and spread on the ground and were manually burned in to ash. It is determined by different soil testing methods with the addition of various percentage of above materials that is 0.5%,1%,1.5%and 2%of the soil and the results is noted. This may help to improve the strength of soil by reducing environmental problems and contribute to the economy.*

Keywords: *Soil stabilisation.*

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Study on Concrete with Partial Replacement of Coarse Aggregate by Over burnt Brick Bats and Cement by Micro Silica

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ABSTRACT

The solid materials required for concrete production are all non-renewable resources. To have sustainable construction and development, it is necessary to reduce the use of natural non-renewable resources by construction industries. The solid waste generated in some material manufacturing industries can be used for the partial replacement of the raw materials in concrete. The advantage gained through this process is waste management and resource conservation leading to sustainable construction and development.

Brick-making units generate a large amount of rejected bricks due to the uneven temperature control in the kiln and these rejected bricks can be used as a material for coarse aggregate. Micro silica is a waste material available from Ferro silicon industry. It is added to cement in order to increase its compressive strength, bond strength, and abrasion resistance.

This paper focuses on the study of the effect of partial replacement of coarse aggregate with over-burnt brick bats and cement with micro silica in M40 concrete production at different water cement ratio. Design of experiments technique by Taguchi method was used to investigate the effect of significant factors and to obtain the optimum condition. The software Minitab Version 17 is used to design the number of experiments to be performed. To study the effect of partially replaced materials on concrete, cubes were casted with the replacement of coarse aggregate by over-burnt brick bats and cement by micro silica for 5%, 10%, 15%, and 20% each. The influence of water cement ratio was also studied for 0.40, 0.45, 0.50, and 0.55 ratios. The casted cubes were cured and tested for 28 days compressive strength. The optimum quantity of over burnt brick and micro silica for the partial replacement of coarse aggregate and cement respectively are 15% each, and the optimum water cement ratio is 0.45 for yielding maximum compressive strength for M40 concrete. It was found that the factor micro silica is the most influencing parameter and water cement ratio is the least influencing parameter on the compressive strength of M40 concrete.

Keywords: over burnt brick, micro silica, preliminary test, compression test, design of experimental technique

Land Use and Land Cover Change Detection Using Remote Sensing and GIS

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ABSTRACT

Land is one of the most important natural resources, as life and various development activities are based on it. Mapping land use land cover (LULC) changes at regional scale is essential for a wide range of application, including landslide detection, erosion control, land planning etc. Land use land cover alterations (based especially on human activities), negatively affecting the patterns of climate, the patterns of natural hazard and socio economic dynamics in global and local scale. It is urgently needed to monitor Land use land cover (LULC) changes and to analyse the consequences of these changes in order to provide information for policy makers to support sustainable development. Remote sensing (RS) and geographic information system (GIS) make it possible to study change in Land use and land cover (LULC). It provides efficient method for analysis of LULC changes in less time, at low cost and with better accuracy. LULC changes of Perinthalmanna municipality from the year 2012-2019 are determined in this paper.

Keywords: Land Use Land Cover, Remote Sensing, GIS, Supervised classification

WeGo: An Efficient Travel Assistant Application using Android

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***Abstract*— The greatest infuriating task for a backpack traveller is to generate a well-organized and cost-effective trip plan. Even if the travel agency deliver some preplanned schedules, they will not be adequate for the particular customer. Many people likely to take rest and enjoy for the period of holidays. However, the complex process of travel schedule arrangement is mostly unfavorable and results in the cancellation of the travelling. Mostly we like travelling with fun. But when it comes to planning it is always difficult to make it happen. It is the problem for every trip to get cancelled. Our main aim of the project is to collect information about the current traffic situations, food availability and accommodation. Travel assistant application is all about planning a trip in most effective manner. It helps a user with travel routes, food, accommodation details, nearby gas stations etc., and helps to rent adventure-travelling gears. The proposed system organizes individual travel schedules, delivers particular data for banqueting, entertaining, and lodging. The system proposes a simple and rapid method, which diminishes the time that it takes travelers to plan their travel.**

Keywords—Android, travelling application, firebase, rewards, services

I. INTRODUCTION

Generally the traveling market is splitted into two parts. For casual customers, they will pick a package from local travel agents. The package, in fact, represents a pre-generated itinerary. In order to arrange accommodation in hotels, make ready the vehicles for transportation, ticket booking in parks or museums, the travel agency will help and support the users. This will help the customers to make a timely and efficient travel plan. Accordingly, the users don't want to prepare a travel plan by themselves. Evenif the travel agencies provide the best services, it will not that much sufficient for an experienced traveller to meet his personal requirements. Sometimes the trip package will be more expensive for the user with the lack of a little Points Of Interests (POIs). Therefore, the arranging of accommodation, travel and ticket bookings are done by the user itself. The trip agencies tend to favor the most POIs. Usually, the trip agencies prepare and provide the same set of travel schedules at the time of receiving huge number of Points Of Interests. That type of POIs may not be satisfying the customers who have visited the city for several times or have limited time budget. It is impossible for a user to get his personal trip plan. The travel agent's service cannot cover the whole POI set, leading to few choices for the users [1]. In our app named WeGo, we are providing information about the various tourist spot and cuisine available restaurant and hotels for accommodation that are known to the users in the locality [2].Ratings are available, so it will be useful for users in selecting the appropriate one. Rather than providing information, we analyse users current location and provide information about the real time distance need to cover and information on places, restaurants and hotels. So users can change their plan timely by analysing information provided by the app. App also provides travelling gears for rent if the user are in urgency. User can also earn benefits from the app by getting reward point on giving additional information to our database.User can redeem the reward to get discounted food coupons and discount in the travel gears provided by the app.

II. SURVEY OF EXISTING SOLUTIONS

Hsien-Tsung Chang, Yi-Ming Chang, and Meng-Tze Tsai proposed an Automatic Travel Itinerary Planning System for Domestic Areas. Select the tourist spot using greedy algorithm within a well-defined span from the existing location as the following endpoint [3]. A trip schedule identical the favourites of the user will habitually be created. The technique only deliberates acceptance and trip arrangement that involves a great deal of strength [3]. Melvin proposed an Automatic Itinerary Planning for Traveling Service Based on Budget using Spatial Data mining with Hadoop by Y. I. Jinesh Melvin, K. S. Charumathi, J. Teena. An automatic schedule production facility with economical centered for the backpack travelers [4]. The service creates a best schedule centered on the user's first choice [4]. To search for an optimal solution, they use Nearest Neighbour Algorithm with some application for finding shortest path and optimize trip in successful manner [4]. Automated Travelling Itinerary System by Aysha Shaikh, Yash Sakaria, Karan Patel, Dharmesh Mistry [5]. Creates customized travel itineraries automatically based on the user's preferences [5]. More efficient approximate algorithms to increase the efficiency with which single day itineraries are combined into multi day itineraries. Greedy Based Approximation Algorithm is used [5].

III. MATERIALS AND METHODS

There are some components needed for the proposed to work properly during implementation.

A. Components needed for the system

1) React Native CLI

We used react native to write the entire code for app. It is a platform to develop android and IOS app using the same java script code.

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2) Visual Studio Code

Visual Studio Code is a free software for coding in any programming language by simply adding tools for autocompleting code. It also provides terminal for writing commands. *App uses visual studio code to write entire code such as xml file and java script file.*

3) Android SDK

It is a tool which helps the code written in java script to debug and provide output.

4) Google Maps API

They are service provided by google in the form of API to implement in web and android using unique API key. Billing account is needed to access the functions of API and they charges money for each request

5) .Google Places API

The Places API is used to fetch place details in the google database. A http is request is sent as input and json file is returned as the output. For this a unique API key is required for request and Google charges for each request.

6) Google Firebase

Firebase is a tool provided by Google which include database, cloud storage etc. which is free to a limit and charges for excess use. Our app uses firebase authentication for user login and sign up information and firebase real-time database to collect and view information on different cuisines.

7) Wikipedia API

Wikipedia API is an API provided by wikipedia.in website which is used to fetch data from their domain. A http request is sent to get the html file output which is converted to text content by react native in the app.

B. Methodology

The Fig. 1. shows the overall methodology used in the proposed system.

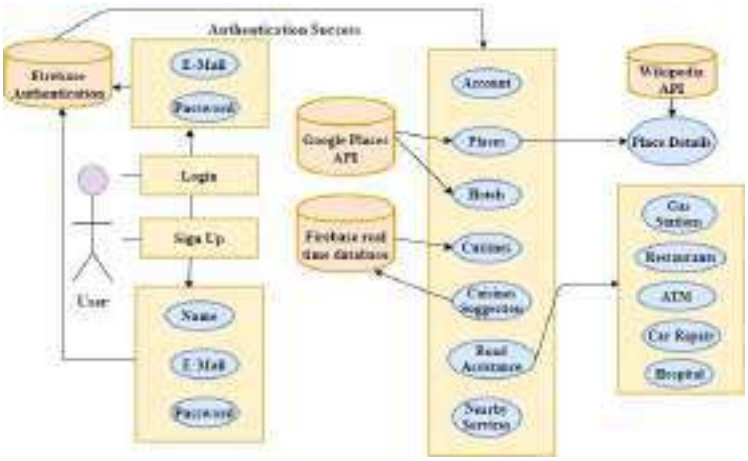

Fig. 1. Methodology of proposed App

1) Plan your destination

Before make a trip, the traveller chose a preferred destination. The App showed the shortest route and time estimation

2) Details on tourist spots

In this module, we should get the users current location. Different tourist places provided by google filtered by app to avoid wrong places information. Ratings, Current situation of tourist places and details on specialty of the spots were also shown.

3) Nearby Services

Here also, the users obtained the current location. Obtained the nearby gas stations, restaurants, hospitals, ATM and car mechanical shops were also available. Distance and time to the location should be noted.

4) Show best cuisines available in different places

The details of the famous cuisines were made available. The information on restaurant in which it is available also shown in this.

5) Cuisines suggestion

This module allowed the user to suggest cuisines they tasted good. Then add the information on availability of the cuisine. Get reward on each suggestion after verification by the app. We should make other users to taste it.

6) Rent adventure and travel gears

In this module, search adventure and travel gears were done. We showed the available adventure and travel gears. It showd the details of rent. The provision of online payment also made in the App.

7) Rewards

The App earned rewards by providing information of different cuisines. Reward awarded only after verification by app. Redeem rewards as discounted food coupons or get discount in rental adventure gears provided by app.

IV. RESULTS AND DISCUSSIONS

A. Results of proposed App

Splash screen is a simple layout page that show for 10 sec whenever app opens. For Login and signup authentication app uses firebase authentication method consisting of email and password. User name is also collected on sign up to display on home screen and profile page of app. In home screen we show different services provided by our mainly six services divided into two section, nearby and other services. In profile page user image name and points acquired by user is shown user can change profile image any time they needed it is kept secret and cannot be used by the app. In side drawer we include logout button, and navigation to profile page and about page of the app.

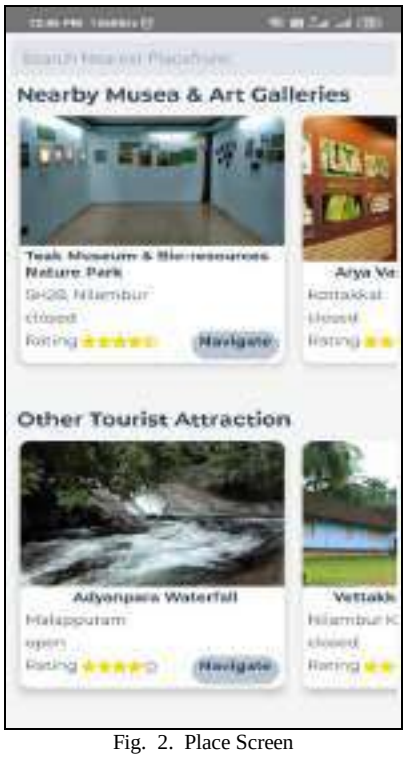

Fig. 2. Place Screen

Main feature of the app is to show places nearby you after detecting the location of user as shown in Fig. 2. Currently we use Google places API to fetch place data and Wikipedia to get one paragraph information of each places .When we click the places, we can see the details of the places.

Fig. 3. Cuisines

In cuisines page as shown in Fig. 3. we show user best cuisines available in Kerala. The database is collected from the users itself and shown to other user after verification. App use firebase real-time database to store data of cuisines, fetch them, and show to user [6].

This service is similar to places page as shown in Fig. 4. which show information on hotels available in different location to user. Database for this section is also collected from Google places API [7].

Fig. 4. Hotel

In this section user can add suggestion on different cuisines they tasted in different places and earn reward coins as reward, which is shown in Fig. 5. Coins are rewarded only after verification by app to filter out false information. User can use the rewards to buy travelling gears provided by app [6].

Fig. 5. Add Food

Fig. 6. shows navigation to destination and other places uses Google maps for navigation [8].

Fig. 6. Road Assistance

Nearby services is a sub section in road assistance page which shows gas station, restaurants, ATM and hospital near to location in need of emergency for travelers which is shown in Fig. 7. Here also we use Google places API to fetch data [6].


Fig. 7. nearby services screen

Rental page show traveling gears provided by app to users for rent [9]. User can also purchase it using app coins, which is shown in Fig. 8. Or it is online shopping platform of products needed for travelers.

Fig. 8. Rental Page

The Fig. 9. shows the nearby car rental shop available to current location of user. The data is collected from Google Places API.

Fig. 9. Nearby Vehicle Rental

App provides coins as a reward for every food suggestion made by user as shown in Fig. 10. The coins will be rewarded only after verification by app to ignore false information. User can use this coin to purchase rental products provided by app. User can also get discounted food coupons on reaching a certain no of coin [10].

Fig. 10. Coin Information

B. Comparison result with existing system

As we know, Google Map is enough to get information on nearby places and all, but Google is providing big data, which make user difficult to sort out, as many people having different interest to use it. We proposed in the App to make Google places data filter out to backpack travellers and tourist from other places only. The proposed App filters out Google data, which needed for travellers only. It ensures that best results are given to user by taking suggestion from user later and improve the proposed App features. App also ensures that a traveller does not want to go for any other platform for their travelling needs.

CONCLUSION

Travelling assistant is always a research material for developers who loves to travel. They always want to develop an application that could provide a more accurate data and a real time location updates along with data update based on the current location. Even though there are applications based on location and travel planning, there is no application exists that integrate all the features into one. Google Maps provide routes, nearby services, real time traffic update and so on. However, they are not suggesting you a itinerary when you choose a source and destination. You have to choose what you need or according to your requirements. Therefore, an itinerary planner or a travel assistant that could suggest data according to user travel plan will help user to travel a complete plan about their planning. So our objective was to provide an assistance for travel planning. We could provide real time information and efficient and affordable travel planning. This application also helps to reduce travelers' fuel cost and suggest affordable hotels and restaurants.

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Integrated Parking System for Real-Time Parking

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Abstract— The lack of parking spaces is getting worse as the number of vehicles on the road rises daily. Finding a parking spot can be difficult, especially in big cities or places where athletic or cultural events are planned. An integrated parking system is suggested as a solution to this problem. Despite the fact that there has been a tonne of research on the creation of smart parking systems, much of it does not deal with the problem of in-the-moment detection of incorrect parking and automatic collection of parking fees. The proposed system combined a real-time parking reservation system with a smart payment method for the beneficial to the society.

Keywords— Slot reservation, QR scanning, online payment, automatic barricade.

I. INTRODUCTION

As the population and economy grow, so does the number of vehicles on the road. Vehicles cruising for parking are estimated to account for more than 40% of total traffic density in metropolitan regions. Continuously cruising in a specific area, causes traffic congestion and air pollution. An integrated parking system, in this case, resolves these issues by intelligently utilizing the parking station. The majority of smart parking systems proposed in recent years in the literature provide solutions for the layout of parking space data systems, car park booking services, accommodation management and prevention of parking spaces, real-time transportation within the parking space, and so on. Even so, very few efforts have focused on real-time and automatic detection of parking illegally.

Parking is quickly becoming one of the most serious issues currently facing cities, and it is becoming cost-prohibitive. As a result, Parking is scarce in major cities worldwide, including universities and tourist attractions. Finding a parking space during big events, for example, can be difficult. Commuters waste time and fuel having a look for open parking areas. For drivers, finding a parking place in a parking area can be extremely frustrating. This frustration can occur when parking places are difficult to locate or when another driver takes the parking place before they would reach it. The ability for customers to schedule convenient spots and prepay fees was the integrated parking system's primary design goal. Through the same app, we also provide space booking at the parking zone.

II. REVIEW OF EXISTING SYSTEMS

Students from Siddaganga Institute of Technology in Tumakuru, India, Abhijeet Anand, Abhinav Kumar, A N Mukunda Rao, Anupam Ankesh, and Ankur Raj suggested a Smart Parking System (S-Park) in 2020 [1]. Under this approach, the driver must first register at the building's entrance gate. The driver receives a one-time registration card, and the registration data is stored in the Raspberry Pi database (RFID Card). To check the availability of parking spots in various parking zones, use the website or the Android app. Using the admin login for the website, the operator makes a parking space reservation.

Based on the driver's preferred parking location, a one-time customized parking token (RFID tag) is provided. The driver may utilize SPARK to navigate to the proper parking area using Google Maps (Android App). Unauthorized parking is prevented by opening the parking area barriers with the parking token provided at the entrance gate. Finally, you return the parking token to the entrance gate when you exit the building. Using wireless sensor technology and networks, Robin Grodi, Danda B. Rawat, and Fernando Rios-Gutierrez suggested a smart parking system in 2016 [2]. Parking space statuses (occupied or vacant) are detected and transmitted to a database using a wireless sensor network (WSN). Users can access this data via a website or a mobile app to get real-time updates (application). While the WSN allows for flexible sensor location, this system should give customers almost rapid information on parking space availability. If smart parking is successfully implemented, the time and money costs of traffic bottlenecks, wasted petrol, and time spent looking for parking spaces due to inefficient parking would be significantly reduced.

In order to cut down on the time spent looking for parking, Y. Rahayu and F.N. Mustapa proposed a Secure Parking System based on Short Message Services (SMS) in 2014 [3]. By sending an SMS, the user of this system may quickly reserve a parking space. A micro-RTU, a wireless communication device, manages the SMS (Remote Terminal Unit). This micro-RTU provides the user with a booking confirmation and reservation information, including a password and spot number. The provided password is required to enter the parking area and is only valid for a short period of time. This method's main flaw is that it prevents consumers from choosing a place. Consequently, it is not a user-friendly solution. An Automated Parking System with Bluetooth Access was suggested in 2012 by H. Singh, C. Anand, V. Kumar, and A. Sharma [4]. When Bluetooth is used in a parking system, security is increased and an autonomous system is provided, eliminating the need for manual intervention. A Bluetooth reader is a feature of this parking system that enables user authorization and identification. Users must turn on their mobile Bluetooth in this mode in order to sign up and identify themselves [5].

Bluetooth must be restarted when the session is over [6]. Through the use of an ARM microprocessor, which controls the mechanical engines to park the vehicle in the proper parking area, the space management and automation are carried out. The advantage of a Bluetooth-enabled automatic parking system is that paper payments are no longer necessary [7]. The system's 10-meter range is its primary shortcoming.

III. PROPOSED SYSTEM

The proposed system is made up of three distinct modules. These are Admin module, User module, Location Manager module, and lastly the Payment Gateway and automatic barricade system as shown in Fig. 1. Here Admin and Manager modules are developed as web applications and user modules as android applications.

A. Admin

If the administrator's username and password are both genuine, they will allow them to view the registered users. The administrator can then approve the registered locations and view the locations that were declined or blocked. Additionally, the administrator has access to user concerns and can respond to them.

B. User

In this system, as soon as the user inputs his user ID and password, the software checks the user login information against the database. If it is accurate, it then downloads all of the user's information and stores it in a global variable. The customer can then choose a parking space and confirm it by making a payment. They can read the administrator's responses and file complaints, if necessary.

C. Manager

If the admin enters a valid login and password for Location Manager, they will be able to view the registered users. They can add parking spaces, check the status of such spaces, approve bookings, and see the progress of those bookings. They can also examine responses from admin and other users to complaints.

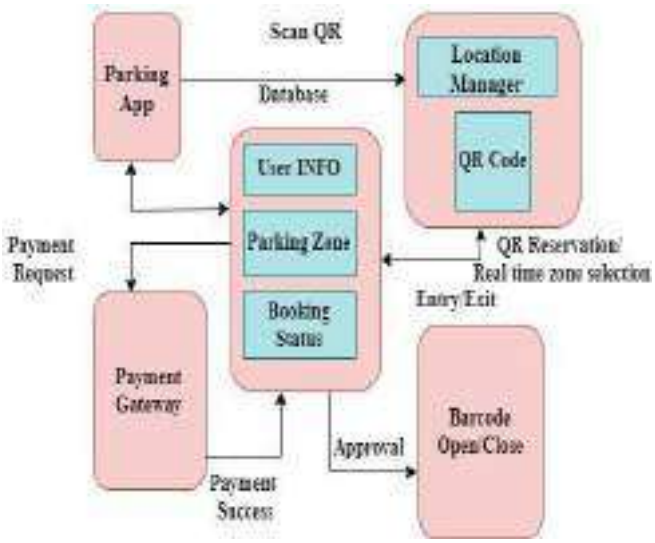

Fig. 1. Block Diagram

D. Payment Gateway

The technology known as a payment gateway is what collects and sends payment information from the customer to the acquirer before sending the payment acceptance or decline back to the customer. A payment gateway securely verifies the card information of the customer, confirms that the funds are available, and eventually permits businesses to receive payment. Between a merchant's website and its acquirer, it serves as an interface. It secures the transmission of sensitive credit card information from the customer to the acquiring bank via the merchant.

E. Automatic Barricade

In order to provide smooth entrance and leave, an automated gate system normally comprises of a combination of automatic barriers and bollards connected to a vehicle access control system.

IV. IMPLEMENTATION

The Android App and Website were created with the primary goal of providing information on available parking spaces in various parking zones. The app is developed with Android Studio and Java, while the website is built with HTML and CSS [8].

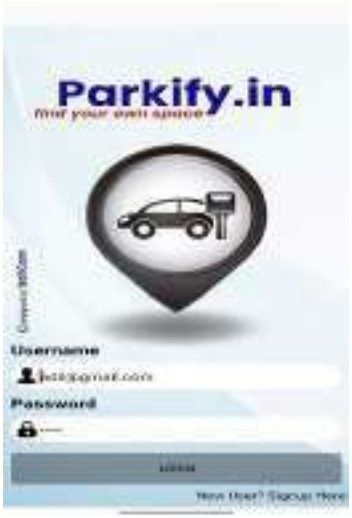

Fig. 2. Android App

Through the user mobile app, user can login by entering their username and password and they can pre-book the respective slots for particular time period by selecting the view space option on the side bar. After choosing the slot and the time, the payment request will be sent. Once payment is succeeded, booking will be approved by the admin. User can check the booking status on view booking tab. They may read the administrator's responses and file complaints, if necessary.

After approval the QR will generate at the user interface which will define the details of booking. At exit/entry point there will be an automatic barricade system with respect to Quick Response scanner. By showing the QR to the scanner the barricade will open automatically. Location manager can supervise the reservation manually. At exit point with the help of same QR scanner by scanning user will come to know whether time period exceeds. If it exceeds then the user is supposed to pay the remaining to open the barricade or if we exit before the reserved time, the balance amount will get refund to our account.

Fig. 3. Website

Through web app, the admin can add the managers for particular zones and also can view the details of managers and the registered users. The administrator can then approve the registered locations and see the locations that were declined or banned. Both managers and admins have access to the complaints made by users and can respond to them.

Fig. 4. Admin Interface

The manager may add parking spaces, view parking slot status, authorize bookings, and view booking status through the same website using his login information. Additionally, they have the ability to email customer service complaints and observe user responses.

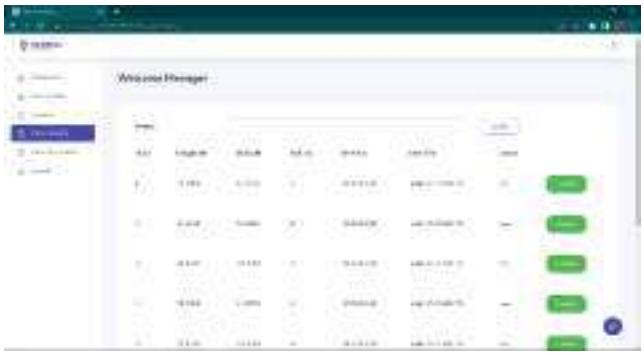

Fig 5. Manager Interface

V. TOOLS AND TECHNOLOGIES

In this system, we used python language, Flask as framework and tool as PyCharm for the backend development of the website. For frontend development, we used bootstrap, HTML, CSS, and JavaScript [9]. For Android development, we used Java, XML, and the tool android studio. And for database creation, we used MySQL and SQL Yog. Adobe Photoshop is used for UI design [10].

A. Python

Python is an interpreted, dynamic, high-level programming language that is free and open source. It is compatible with both object-oriented and procedural programming [11].

B. Flask

Flask is a simple and lightweight Python web framework provides handy tools and functionalities for constructing Python online applications. It provides developers with flexibility and is a more accessible framework for new developers because it allows you to easily build a web application using only a single Python file [12].

C. PyCharm

An excellent environment for Python, web, and data science development is provided by PyCharm, a Python Integrated Development Environment (IDE), which offers a variety of crucial tools for Python developers that are closely integrated [13].

D. Quick Response

A Quick Response (QR) code is a type of barcode that can be swiftly scanned by a digital device that encodes information as a sequence of pixels in a square-shaped grid. The user interface will produce the QR code after the reservation.

E. Bootstrap

Bootstrap is a free and open-source front-end programming framework for creating websites and online apps. The Bootstrap framework simplifies the creation of responsive, mobile-first websites and apps by utilizing HTML, CSS, and JavaScript (JS) [14].

F. Java

Java is an object-oriented programming language and software platform that is used on billions of devices, including notebook computers, mobile devices, game consoles, medical devices, and more. Java's ideas and grammar are based on the C and C++ computer languages.

G. MySQL

MySQL is a relational database management system (RDBMS) created by Oracle that is based on structured query language (SQL).

H. Adobe Photoshop

For raster image manipulation, graphic design, and digital art, Adobe Photoshop is frequently used. Layering is used to provide the design and editing processes depth and flexibility, as well as powerful editing tools that, when used together, can do practically anything.

VI. RESULTS

The system displays the views formed and the outcomes of the Integrated Parking System as the framework is continuously implemented. To show this task, we log in to the android app “Parkify.in” and reserve our convenient parking slot. Through the view space option, As illustrated in fig, we can check the availability of vacancies and select our slot. The colors green and red indicate vacant and occupied parking slots, respectively as shown in Fig. 6.

Fig. 6. slots view

Then the payment request will be sent. Once payment is succeeded, the booking will be approved by the manager. And we can check the booking status on the view Booking option. If our booking is completed, the status will be "approved". For check-in, we can click the blue arrow mark and can scan the QR code displayed on the barricade. So the status will be changed to "check-in" which is shown in Fig. 7. Finally when we checkout, the above same process should be repeated. We should scan the same QR code and the status will be changed to "checkout".

Fig. 7. Booking Status

Then at the entry point of the parking space, while the user trying to check-in, the location manager clicks on the Scan QR button present on the view booking panel of his interface. Hence the QR code is generated for the specific user. By scanning this QR which is generated by the manager, the barricade will open automatically. At the exit point when scanning the same QR, if we exit before the reserved time, the balance amount of the parking charge will be refunded to our account. If we exit after exceeding the reserved time limit, we should pay the extra charge for that time which is shown in Fig. 8.

Fig. 8. Automatic barricade

A. Comparison with Existing Systems

Table 1. .Comparison Table

Paper	Methodology	Reservation	Space management	Payment Gateway
Yan et al. [1]	RFID tag	No	Yes	No
Abhinay Kumar [2]	Micro RTU	No	No	No
Lee et al. [3]	ARM Microcontroller	No	No	No
Abu et al. [4]	Wireless sensor network	No	Yes	No
Proposed System	ARM microcontroller, QR	Yes	Yes	Yes

The proposed system rectified all the limitations of existing system by providing reservation, space management and payment option which is shown in Table 1.

CONCLUSION

In the proposed system, an integrated parking system prototype is presented that offers a new parking management solution for a variety of parking facility sites around the city, including malls, theatres, and other locations. Drivers may learn about the availability of parking spaces and book a space using a web-based application. Additionally, by providing the motorist with convenient payment options, it enables the automated collection of parking costs. This can reduce traffic congestion in cities like Mumbai while also saving user's time and gas. In contrast to conventional parking tactics, this technology limits the driver's exertion in parking areas and may reduce manual involvement in parking areas. People can use this application to address major parking concerns.

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Human Friendly Smart Trolley with Automatic Billing System

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***Abstract*-- Shopping and buying is an integral part of our daily lives. Big mega markets have a wide variety of items and different stores can have different deliveries of goods. It is difficult for many consumers to stand in the long queue for the billing of goods purchased. This causes a wastage of money and a poor bill for the wrong customer. Trolleys are used in supermarkets or grocery stores to make shopping simpler. However, it is difficult for customers to control the trolley while shopping. An automated customer following trolley was implemented which calculates the total sum of grocery items carried in the trolley by the customers. This reduces the customer's effort to pull the trolley and keep the line for the payment of the grocery products. The customer who has a specific tag and a web camera installed in front of the trolley will recognize the tag and move the trolley to the customer. Using the RFID tag and the Raspberry Pi receiver, the item bill inserted was obtained in the trolley. This results in an ideal solution to all these problems.**

Keywords: Image processing, Raspberry pi, Supermarkets, Trolley. RFID.

I. INTRODUCTION

Moving a shopping cart today is a daunting job in malls and retail areas because of the heavy weight of items. So in order to overcome this issue, a Human Friendly Smart Trolley with Automated Billing System was proposed. With these trolleys, consumers can enjoy their shopping and pay more attention to their shopping list without the need to move their shopping carts. As we can see in a shopping center or grocery store, like big bazaars and D-marts; there are trolleys available, but they are operated manually. An automated moving shopping cart with sensors is designed for the convenience of customers. The sensor on the trolley, tracks the customer and keeps moving. If the customer stays, the trolley always stays at a maintained distance. Upon a total purchase, the person has to go to the payment-billing counter. There will be a long queue at the billing counter. The billing system will be placed in the trolley consists of an RFID reader. If a person places some product in a trolley, their code will be identified using an RFID reader connected to the trolley. Radio frequency identification (RFID) technology has been commonly used in the field of construction for the past two decades. In practice, RFID allows the regulation of a wide range of processes at all stages of the building's life cycle, from its creation to its occupants. When we put the commodity, the cost will be added to the overall bill. Therefore, the billing would be performed in the trolley itself which will be seen on the LCD.

In depth, the automated trolley follows the customer, which measures the total amount of grocery items put inside the trolley by the customer. The customer who has a unique tag and a web camera placed in front of the trolley will identify the tag and move the trolley to the customer. Using the RFID tag and the Raspberry Pi receiver, we get the bill of the item inserted in the trolley. To follow the customer, we use the Raspberry pi module and the pi cam. The Pi Cam detects the color of the band that the customer wears. We know the long queues on the billing counter of the shopping malls. The proposed trolley was designed with the goal of making the system reliable, simpler, faster and more effective. There is a lot of justification to pursue this initiative. Customer satisfaction is one of the most important aspects of any company. The potential for improving customer service in urban shopping malls and shops has been reached by us. There are improvisations that can be made in the future in the new framework that we have put in place. As technology progresses, new technologies can be

incorporated. It can be used to solve real world problems and make tasks easier.

Core modules of the whole system can be listed as:

1. Raspberry pi unit with the software system to communicate with the central database, interfaced with RFID scanner, Ultrasound sensors, and the colour tag scanning camera.
2. Camera installed on the trolley base to scan for the customer colour tags in their hands.
3. Colour tag database and wearable colour tag for the customers.

II. RELATED RESEARCH

In 2017, Pandita et al. introduced the idea of automatic shopping trolleys using sensors which enabled the customers to focus more on shopping than on manually operating trolleys [1]. With low cost and power consumption, they enjoyed using trolleys without the heavy task of pushing it. But the main difficulty faced by them was that they couldn't detect humans directly and move after customers [1]. In 2014, Sainath et al. introduced an automated trolley with Raspberry Pi, which allowed the users to self-checkout at the billing section of supermarket [2]. This trolley enabled the customers to save time and manpower. It made the customers to know about their bill amount during the time of each purchase. The main problem faced by them was that only high scale vendors could implement this type of trolley [2]. In 2015, Rupali Savant et al. introduced a smart trolley, which replaced the barcode reading system with RFID tags [3]. This system reduced the time and cost. But this system created the problem of difficulty in access to customers [3]. In 2017, L.S.Y Dehigaspege et al. introduced a new trolley system called "Follow me" which made the shopping easier and convenient for customers [4]. It used an automatic human guiding travelling and billing with the help of Bar code reader and an android based tablet with extensive user interface technique. It allowed the automatic parking and automatic charging while parked at its slot [4]. In 2016, Yathisha et.al. introduced a system, which employed a tablet and android technology for tracking the goods during each purchase and allows automatic parking and charging [5]. Wani, Mukund, et al. et al. uses a trolley that uses LCD screens to display items they have purchased during shopping. It uses an RFID tag for billing. Since the trolley is electronic, it was not able to cover the automatic travelling facility [6].

III. PROPOSED SYSTEM

A. COMPONENTS REQUIRED

The basic required objects for implementing 'Human Friendly Smart Trolley with Automatic Billing System are Raspberry Pi, Pi cam, Gear motors, Battery, RFID tags, LCD and Ultrasonic sensor. In order to perform the computation process, Raspberry Pi was used. Pi cam was used for detecting the color band. The component used for the effective movement of trolley was possible with the help of gear motors. RFID tags were used to bill the products during purchase. A 4-mAh battery was used in this proposed system. LCD was used to display the bill and an ultrasonic sensor to avoid collision.

1) Raspberry Pi 3 Model B

Raspberry pi is the core part of our system. The raspberry pi model b+ was realized in 2014 as this has many advantages over any microprocessor and microcontroller. The main advantages include low cost, high-speed processing, ability of I/O ports and the memory unit. The specifications of pi model b+ processing speed range from 700 MHz to 1.4 ghz,1GB RAM, BCM 43438 wireless LAN and Bluetooth Low Energy (BLE) on board 100 Base Ethernet, 40-pin extended GPIO ports, four USB 2 ports, four Pole stereo output and composite video port full size HDMI cable, CSI camera port for connecting a Raspberry Pi camera DSI part for connecting a Raspberry Pi touch screen display, Micro SD port for operating system and storing data and Micro USB power source up to 2.5A [7]. The proposed system contains Raspbian OS to operate raspberry pi. All the components are connected in raspberry pi through the Printed circuit board (PCB). All the codes are written in python and opencv during implementation. The proposed system used opencv to track the color of the customer tag.

Fig.1. Raspberry Pi 3 Model B

2) Zebronics web camera

To identify or track the color of the tag that customer have, a zebronics web camera was used which have 3 pin lines with a resolution of 640x480. Also have a white version fetcher web camera gives x and y coordinates to the raspberry pi if the color is matches with the customer tag.

Fig.2. Zebronics web camera

3) Gear Motor

Two gear motors of 500 rpm placed or attached to the two back wheels of the trolley. The front wheel of the trolley is 360 degree rotating wheel. The two gear motors will help the trolley to move or follow the customer. When the camera module the color tag of the customer, the raspberry pi gives the instruction to the motor to rotate. Suppose the customer moves from the left side, the trolley also moves the left side by rotating its right wheel and hold the left wheel. In this proposed system, the x and y range was set accordingly. When the camera identifies the color tag in the center of the frame, both motors rotate if the tag in the left side of the frame. The trolley moves the left side of the frame and tag in the right side the trolley moves the right side.

4) RFID Tags

RFID tag is used as the customer purchases those as we know all of the products in the supermarket are now covered by barcode, which have many disadvantages over RFID. RFID is fast and no sight transaction required. If all the products have RFID transaction, and it will completely minimize the time complexity of billing. Because scanning barcode is a time consuming process. The proposed system consists of three RFID Tags and one receiver in each tag, which store the different products information. When the customers purchase the product into the trolley, The RFID receiver gives the information to the raspberry pi and then stores it. The data become converted in the pi [8]. To convert RFID logic to pi, the max 232 ic was used.

RFID is used to calculate the amount of products placed in the trolley. In the raspberry pi board, there is an insert button and remove button. By using the insert button, the products are placed in the trolley. It will sense the code, and calculate the amount of the product.

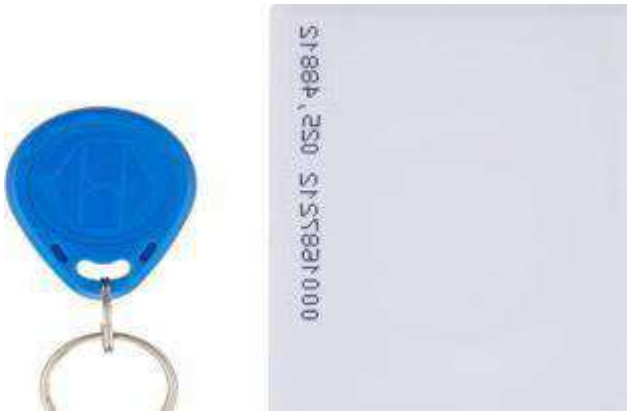

Fig.3. RFID Tags

5) MAX232

Max 232 is an IC, which is used to convert TTL logic to corresponding RS 232 logic level. The raspberry pi and RFID are different voltage level devices so the output signal from RFID reader may give wrong output when it reads it.

6) L293D Motor Driver

It is a motor driver IC that is placed in PCB that will prevent the back emf produced by the two gear motors and to avoid shortage of pi. It is a 16 pin IC that controls the voltage and gives through voltage to it.

Fig.4. L293D Motor Driver

7) Buttons

There are three tactical buttons, which are used for shopping. The first button is used for start, stop the shopping second button is used to insert the items on the trolley, and third one is used to remove items on the trolley.

8) *LED*

There are four LEDs used in the system. Three of it blows with the corresponding buttons actions and one is used when the power achieve the system

9) BUZZER

Buzzer is an audio signaling device. Here buzzer will make an alarm sound when the RFID tag read a product.

B. IMPLEMENTATION

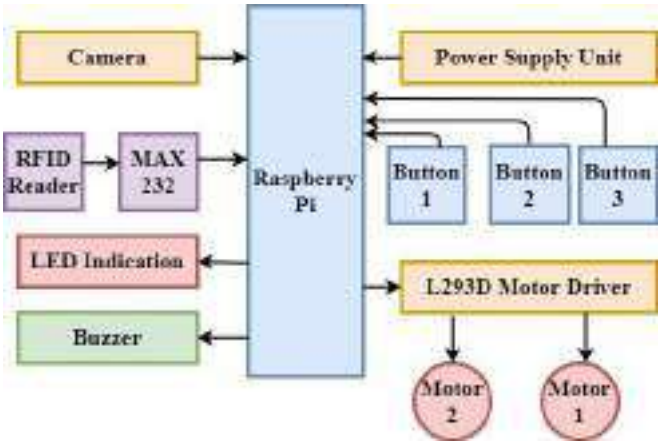

Fig.5. System design

Here we describe the implementation of the Human Friendly Smart Trolley with Automatic Billing System having several components connected in raspberry pi. The raspberry pi is the core part of the automatic trolley because all the units are connected in pi. The software section working on the pi consists of two parts including camera module and RFID Reader. The camera module takes frequency images and sends to the pi. The Python IDE program analyzes the image [8]. The corresponding instructions are provided in the gear motor through l293d. l293d clip is used to prevent the back emf. RFID module read the products and sends to the max232 IC. The max232, which converts the Transistor logic (TTL) logic level, signal in to its equivalent RS-232c level. The pi is a RS 232 logic device has three buttons, one controls the ON and OFF actions and another, two controls the reading and removing actions. When each action is performed, the buzzer will create a sound. In addition, the LED indication can be provided and the Python IDE calculates the dates in the bill, which is sending to the center.

IV. RESULT

Automated trolley functioned based on the color tag ratio stored in the trolley memory in the HSV ratio of the color tag. This color tag mechanism interconnects the unique customer with the trolley. Identify the customer's color tag in their hand by using the camera installed in the trolley. Trolley identifies the customers based on the HSV ratio of the color tag. Trolley follows the customer if the identified color tag matches the customer color tag otherwise it stops and starts scanning for the matching color tag among the customers in the camera's field of view. Automated trolley system may not be much successful in the busy business hours of the malls and in the malls with shelves arranged in a congested manner.

Ultrasound sensors have been installed in 3 sides of the trolley to identify the obstacles including shelves and human beings, the trigger distance has been set for 30 cm from front and 15cm from both sides. The product's id got scanned by the RFID scanner installed in the trolley basket side. By pressing add, the trolley system will add the item in the kart. If we want to remove the product from the basket we have to press the remove button and scan the particular product to be removed. The raspberry pi module will be having the central database access to identify the product and its price details. When a customer clicks the OFF button, the request will show how much money the customer needs to pay so that the customer can easily complete his shopping.

Fig.6. Automatic trolley system

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V. CONCLUSION

Human Friendly Smart Trolley with Automated Billing System is a system that follows the customer and gives the bill of the product that is inserted in it. It will be much easier for aged customers and children to use trolleys without any effort. By using the product, we can save time for the customer especially in the billing part. It is sure that the system is very much helpful for the customers and without bothering about their trolley; they can make their purchase easy. Trolley and the customer will be provided with the same color tag and the matching enables the customers to use their trolley easily. Carrying trolley along with the customers is a very difficult task for the customers. Te proposed system provides an easy way to reduce all these problems. In future, we hope that we can provide a system which is more user-friendly.

ACKNOWLEDGMENT

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WeGo: An Efficient Travel Assistant Application using Android

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***Abstract*— The greatest infuriating task for a backpack traveller is to generate a well-organized and cost-effective trip plan. Even if the travel agency deliver some preplanned schedules, they will not be adequate for the particular customer. Many people likely to take rest and enjoy for the period of holidays. However, the complex process of travel schedule arrangement is mostly unfavorable and results in the cancellation of the travelling. Mostly we like travelling with fun. But when it comes to planning it is always difficult to make it happen. It is the problem for every trip to get cancelled. Our main aim of the project is to collect information about the current traffic situations, food availability and accommodation. Travel assistant application is all about planning a trip in most effective manner. It helps a user with travel routes, food, accommodation details, nearby gas stations etc., and helps to rent adventure-travelling gears. The proposed system organizes individual travel schedules, delivers particular data for banqueting, entertaining, and lodging. The system proposes a simple and rapid method, which diminishes the time that it takes travelers to plan their travel.**

Keywords—Android, travelling application, firebase, rewards, services

I. INTRODUCTION

Generally the traveling market is splitted into two parts. For casual customers, they will pick a package from local travel agents. The package, in fact, represents a pre-generated itinerary. In order to arrange accommodation in hotels, make ready the vehicles for transportation, ticket booking in parks or museums, the travel agency will help and support the users. This will help the customers to make a timely and efficient travel plan. Accordingly, the users don't want to prepare a travel plan by themselves. Evenif the travel agencies provide the best services, it will not that much sufficient for an experienced traveller to meet his personal requirements. Sometimes the trip package will be more expensive for the user with the lack of a little Points Of Interests (POIs). Therefore, the arranging of accommodation, travel and ticket bookings are done by the user itself. The trip agencies tend to favor the most POIs. Usually, the trip agencies prepare and provide the same set of travel schedules at the time of receiving huge number of Points Of Interests. That type of POIs may not be satisfying the customers who have visited the city for several times or have limited time budget. It is impossible for a user to get his personal trip plan. The travel agent's service cannot cover the whole POI set, leading to few choices for the users [1]. In our app named WeGo, we are providing information about the various tourist spot and cuisine available restaurant and hotels for accommodation that are known to the users in the locality [2].Ratings are available, so it will be useful for users in selecting the appropriate one. Rather than providing information, we analyse users current location and provide information about the real time distance need to cover and information on places, restaurants and hotels. So users can change their plan timely by analysing information provided by the app. App also provides travelling gears for rent if the user are in urgency. User can also earn benefits from the app by getting reward point on giving additional information to our database.User can redeem the reward to get discounted food coupons and discount in the travel gears provided by the app.

II. SURVEY OF EXISTING SOLUTIONS

Hsien-Tsung Chang, Yi-Ming Chang, and Meng-Tze Tsai proposed an Automatic Travel Itinerary Planning System for Domestic Areas. Select the tourist spot using greedy algorithm within a well-defined span from the existing location as the following endpoint [3]. A trip schedule identical the favourites of the user will habitually be created. The technique only deliberates acceptance and trip arrangement that involves a great deal of strength [3]. Melvin proposed an Automatic Itinerary Planning for Traveling Service Based on Budget using Spatial Data mining with Hadoop by Y. I. Jinesh Melvin, K. S. Charumathi, J. Teena. An automatic schedule production facility with economical centered for the backpack travelers [4]. The service creates a best schedule centered on the user's first choice [4]. To search for an optimal solution, they use Nearest Neighbour Algorithm with some application for finding shortest path and optimize trip in successful manner [4]. Automated Travelling Itinerary System by Aysha Shaikh, Yash Sakaria, Karan Patel, Dharmesh Mistry [5]. Creates customized travel itineraries automatically based on the user's preferences [5]. More efficient approximate algorithms to increase the efficiency with which single day itineraries are combined into multi day itineraries. Greedy Based Approximation Algorithm is used [5].

III. MATERIALS AND METHODS

There are some components needed for the proposed to work properly during implementation.

A. Components needed for the system

1) React Native CLI

We used react native to write the entire code for app. It is a platform to develop android and IOS app using the same java script code.

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2) Visual Studio Code

Visual Studio Code is a free software for coding in any programming language by simply adding tools for autocompleting code. It also provides terminal for writing commands. *App uses visual studio code to write entire code such as xml file and java script file.*

3) Android SDK

It is a tool which helps the code written in java script to debug and provide output.

4) Google Maps API

They are service provided by google in the form of API to implement in web and android using unique API key. Billing account is needed to access the functions of API and they charges money for each request

5) .Google Places API

The Places API is used to fetch place details in the google database. A http is request is sent as input and json file is returned as the output. For this a unique API key is required for request and Google charges for each request.

6) Google Firebase

Firebase is a tool provided by Google which include database, cloud storage etc. which is free to a limit and charges for excess use. Our app uses firebase authentication for user login and sign up information and firebase real-time database to collect and view information on different cuisines.

7) Wikipedia API

Wikipedia API is an API provided by wikipedia.in website which is used to fetch data from their domain. A http request is sent to get the html file output which is converted to text content by react native in the app.

B. Methodology

The Fig. 1. shows the overall methodology used in the proposed system.

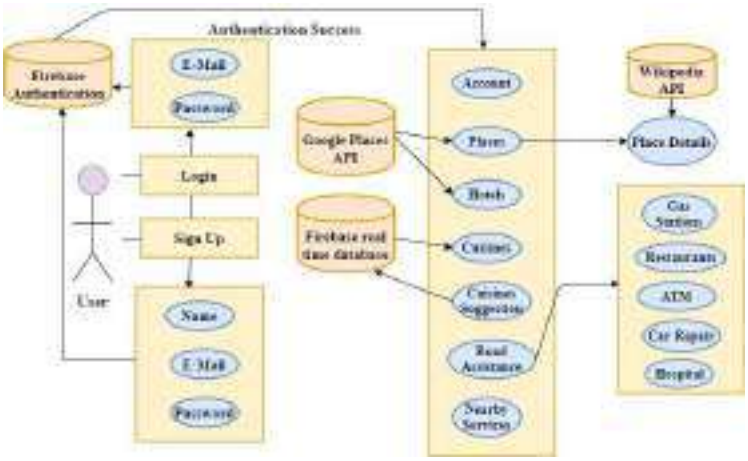

Fig. 1. Methodology of proposed App

1) Plan your destination

Before make a trip, the traveller chose a preferred destination. The App showed the shortest route and time estimation

2) Details on tourist spots

In this module, we should get the users current location. Different tourist places provided by google filtered by app to avoid wrong places information. Ratings, Current situation of tourist places and details on specialty of the spots were also shown.

3) Nearby Services

Here also, the users obtained the current location. Obtained the nearby gas stations, restaurants, hospitals, ATM and car mechanical shops were also available. Distance and time to the location should be noted.

4) Show best cuisines available in different places

The details of the famous cuisines were made available. The information on restaurant in which it is available also shown in this.

5) Cuisines suggestion

This module allowed the user to suggest cuisines they tasted good. Then add the information on availability of the cuisine. Get reward on each suggestion after verification by the app. We should make other users to taste it.

6) Rent adventure and travel gears

In this module, search adventure and travel gears were done. We showed the available adventure and travel gears. It showd the details of rent. The provision of online payment also made in the App.

7) Rewards

The App earned rewards by providing information of different cuisines. Reward awarded only after verification by app. Redeem rewards as discounted food coupons or get discount in rental adventure gears provided by app.

IV. RESULTS AND DISCUSSIONS

A. Results of proposed App

Splash screen is a simple layout page that show for 10 sec whenever app opens. For Login and signup authentication app uses firebase authentication method consisting of email and password. User name is also collected on sign up to display on home screen and profile page of app. In home screen we show different services provided by our mainly six services divided into two section, nearby and other services. In profile page user image name and points acquired by user is shown user can change profile image any time they needed it is kept secret and cannot be used by the app. In side drawer we include logout button, and navigation to profile page and about page of the app.

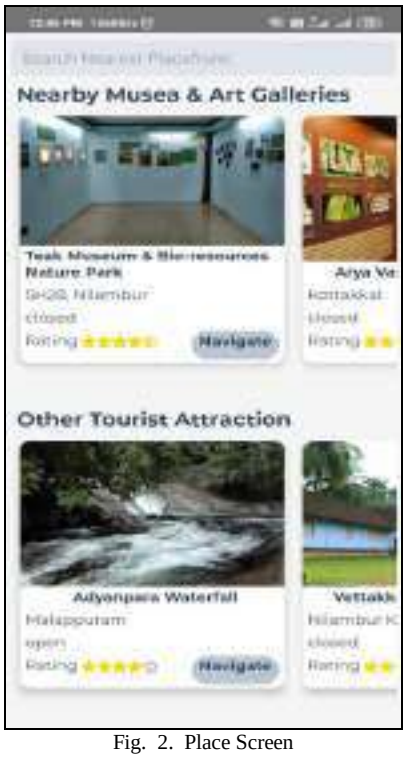

Fig. 2. Place Screen

Main feature of the app is to show places nearby you after detecting the location of user as shown in Fig. 2. Currently we use Google places API to fetch place data and Wikipedia to get one paragraph information of each places .When we click the places, we can see the details of the places.

Fig. 3. Cuisines

In cuisines page as shown in Fig. 3. we show user best cuisines available in Kerala. The database is collected from the users itself and shown to other user after verification. App use firebase real-time database to store data of cuisines, fetch them, and show to user [6].

This service is similar to places page as shown in Fig. 4. which show information on hotels available in different location to user. Database for this section is also collected from Google places API [7].

Fig. 4. Hotel

In this section user can add suggestion on different cuisines they tasted in different places and earn reward coins as reward, which is shown in Fig. 5. Coins are rewarded only after verification by app to filter out false information. User can use the rewards to buy travelling gears provided by app [6].

Fig. 5. Add Food

Fig. 6. shows navigation to destination and other places uses Google maps for navigation [8].

Fig. 6. Road Assistance

Nearby services is a sub section in road assistance page which shows gas station, restaurants, ATM and hospital near to location in need of emergency for travelers which is shown in Fig. 7. Here also we use Google places API to fetch data [6].


Fig. 7. nearby services screen

Rental page show traveling gears provided by app to users for rent [9]. User can also purchase it using app coins, which is shown in Fig. 8. Or it is online shopping platform of products needed for travelers.

Fig. 8. Rental Page

The Fig. 9. shows the nearby car rental shop available to current location of user. The data is collected from Google Places API.

Fig. 9. Nearby Vehicle Rental

App provides coins as a reward for every food suggestion made by user as shown in Fig. 10. The coins will be rewarded only after verification by app to ignore false information. User can use this coin to purchase rental products provided by app. User can also get discounted food coupons on reaching a certain no of coin [10].

Fig. 10. Coin Information

B. Comparison result with existing system

As we know, Google Map is enough to get information on nearby places and all, but Google is providing big data, which make user difficult to sort out, as many people having different interest to use it. We proposed in the App to make Google places data filter out to backpack travellers and tourist from other places only. The proposed App filters out Google data, which needed for travellers only. It ensures that best results are given to user by taking suggestion from user later and improve the proposed App features. App also ensures that a traveller does not want to go for any other platform for their travelling needs.

CONCLUSION

Travelling assistant is always a research material for developers who loves to travel. They always want to develop an application that could provide a more accurate data and a real time location updates along with data update based on the current location. Even though there are applications based on location and travel planning, there is no application exists that integrate all the features into one. Google Maps provide routes, nearby services, real time traffic update and so on. However, they are not suggesting you a itinerary when you choose a source and destination. You have to choose what you need or according to your requirements. Therefore, an itinerary planner or a travel assistant that could suggest data according to user travel plan will help user to travel a complete plan about their planning. So our objective was to provide an assistance for travel planning. We could provide real time information and efficient and affordable travel planning. This application also helps to reduce travelers' fuel cost and suggest affordable hotels and restaurants.

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The Effects of the National Education Policy 2020 on Professional Education

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Abstract

The National Educational Policy 2020 is crucial in completely revamping the previous, antiquated educational system. NEP 2020 is built on the ideas of quality, independence, responsibility, equity, and economy, and a multidisciplinary, comprehensive approach. This will result in fresh changes to the job and educational landscape throughout the nation. Well, if it isn't done properly, no policy will benefit from it. Anyhow, it seems that this plan is a well-considered and sincere effort to change the Indian educational system. The integration of professional education is a crucial component of higher education, as this policy emphasises. The newly unveiled National Education Policy (NEP) 2020, which places a strong emphasis on the overall development of students who will eventually join the workforce, offers some encouragement for progress in this regard. While the National Education Policy (NEP) 2020 has made considerable reforms to schools and higher education, it has also given life skills and career training a significant amount of weight. Numerous studies suggest that the vocational development programme in India has not been properly received. In light of the National Education Policy (NEP) 2020, this essay attempts to give an assessment of the difficulties, results, and current state of vocational development and professional education programmes.

Keywords: *National Educational Policy, Higher Education, Professional Education*

I. INTRODUCTION

Education is a crucial cornerstone for the future of society. And that the educational system should be well-planned and excellent for the various ways in which society may evolve (Thakur, Bajwan, & Parel, 2021) (Daniels, 2012). The "biggest choice" in decades has finally been made with the implementation of the New Education Policy 2020, which replaced the previous educational system after 34 long years. The policy is quite radical and calls for a complete overhaul of everything as we know it. Literally every youngster or student who had grown tired of the current dumb educational system wished for this. So, this is a method of instruction that is both intelligent and effective. Students capture their aspirations with soaring flights rather than burdened wings. As youth are the country's future, that will undoubtedly alter the destiny of millions of pupils as well as our nation's future. As a result, students are able to choose the ideal job for themselves (MHRD, 2020).

Underwater Wireless Optical Communication Systems: A Survey

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***Abstract*—Underwater wireless communication (UWC) means the transmission of data using wireless channels through the underwater, i.e. radio frequency waves (RF), acoustic waves and optical waves in an unguided water environment. In this review article we focus on underwater optical wireless communications (UWOCs) using optical waves as transmission medium. UWOCs have a much higher communication frequency and therefore a much higher data rate compared to RF and acoustic counterparts.Due to this high-speed data transfer advantage, UWOC has been very attractive over the past few years. Many applications have been proposed in UWOC systems for protection of the environment, underwater exploration, emergency alerts and military operations etc. However, underwater channels also suffer from extreme absorption and dispersion. In recent years, a variety of innovative methods of network architecture have been developed to meet these technological challenges, which are different from standard terrestrial, open space optical communications. In this article we give a detailed overview of various research activities on UWOC.**

***Index Terms*—Underwater Wireless Optical Communication, UWOC, MIMO, Log-normal fading channel, optimal and equal gain combining.**

I. Introduction

Inquisitiveness and exploration have driven people into the deep ocean. However, so far we are less acquainted with the ocean floor than we are with the atmosphere of Moon. The ocean occupies about 70 percent of the Earth's surface . As a result of its scientific, political and economic importance, ocean exploration is rapidly gaining global attention [1], [2]. Conductive sea water, however, is a natural barrier to most information carriers, such as radio waves commonly used during this information era. It makes contact underwater a hard to crash and poses significant challenges to ocean exploration. As a potential solution to this issue, the UWOC has recently acquired globally an increasing research interest [3], [4].

An significant element inhibiting ocean exploration well behind its terrestrial or even space equivalent is the hostile underwater environment for knowledge transmission. The only possible way to communicate underwater often appears to be by using submarine cables. Such a wired system includes complex and expensive wet-mate connectors. These connectors are normally installed, particularly in deep water, by one or more remote vehicles (ROVs) which need to be operated with care by well-trained mother ship operators. There is also a time-consuming and labor-intensive process to install or sustain a wired underwater communication network.

Underwater wireless networking, on the other hand, has gained more and more recognition with its high scalability and versatility. Acoustic wireless communications are historically the dominant alternative because of the low acoustic water attenuation [5]. However, bandwidth with wide time latency and expansive antennas is essentially tight. For underwater wireless communication, electromagnetic induction and radio frequency electromagnetic waves may also be taken. In suitable seawater, however, the reachable bandwidth and connection distance are still very restricted, [6] especially under the limit of the small antenna scale.

The light will revolutionize the way we interact in the underwater environment as a special band of electromagnetic radiation. Over the past years, UWOC has gained tremendous attention in both academic and business communities with the benefits of ample bandwidth, high reliability, small footprint and low latency. Underwater Wireless Communication Technology, UWOC provides many interesting choices for a variety of short-distance bandwidth-intensive applications to supplement the more developed acoustic connection. The theoretical performance of different underwater communication technologies (UWC) based on bandwidth and range of communication [7], [8], [9], [10] is shown in Fig. 1 and Fig. 2. The overall comparison of three UWC technologies is shown in Table I.

Typically, fast and secure connectivity is provided by wired or fiber-based technology. Nevertheless, its use can be challenging in areas with difficult access and deep waters, as it limits the range and controllability of underwater vehicles. In these situations, wireless networking methods are of great importance. The large available bandwidth enables optical networks to deliver unprecedented high data rates (from Mbps to Gbps) over short and medium ranges (typically up to several decades of meters) [11]. In addition, optical transmission is generally not delayed due to the high speed of propagation of optical waves in water. Optical communication is therefore a desirable alternative to acoustic remote communication [12].

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Reversible Data Hiding and Coupled Chaotic Logistic Map Using Image Encryption

K. Anupama and K. Shanooja

1 Introduction

Technologists and researchers have made various efforts to solve the problems and issues generally reflected by the rapid growth of Internet, cloud computing, and the multimedia technologies in the field of data security. The issues are of mainly information security, integrality, copyrighting, hacking, etc. Information security means securing the information from unauthorized access, disclosure, modification, use, disruption, in inspection, recording, or destruction. Generally saying, the information security must secure or ensure the protection of information throughout the lifespan of the information transmission through a public domain. The data hiding can be categorized into two, Cryptography and Steganography. Cryptography is practice of converting the plain text into scribbled form called cipher text. Decryption is the opposite process of encryption, which recovers the plaintext back. The encryption and decryption are controlled by the key in each instance. In steganography, it is an art of hidden writing, conceal a secret message inside a cover medium so that it is impossible to sense the existence of the secrete message. It protects the messages and communication parties. Large varieties of steganographic techniques are there exist, in which some are more complex than others but all of them have strong and weak points. In steganography, all modern data compression, spread spectrum, information theory, any cryptography technologies are brought together for privacy on Internet. According to [1] the origin of "Steganography" derives from Greek and it means "cover writing." The commonly used method to conceal secrete message in image is steganography.

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Reversible data hiding (RDH) is the applications of steganography. Reversible data hiding is a process of reconstruction of the original image after the extraction of the embedded message in it without any alteration or error.

Different variety of image file formats exists in image steganography. According to [2] there are different steganographic algorithms which are used for different image file formats. Lossless and lossy compression method types are there. In both methods, for storage some space is allocated, but has different procedures for it. Lossy compression creates short files as it deletes excess image data from the original image and also the details.

Huge concentration is paid to RDH in encrypted domains, as it shows outstanding performance that the original image can be restored after the hidden data is extracted out while protecting the image content's confidentially. In this work, the cover image analysis is performed for prediction of possible errors to avoid the distortion of the image while reconstruction in decoding phase. Median edge detector (MED) is used for the prediction of problematic pixel location and formation of error location binary map is done in preprocessing step. Along with preprocessing, the image is encrypted by using the coupled logistic chaotic map and after that the problematic pixel location is inserted in the encrypted image by using MSB substitution method. The remaining available MSB of the encrypted image is scanned for image embedding. In the decoding phase, the concealed data is extracted by using the data hiding key and the cover image is reconstructed by using the encryption key without any distortion. As a result of using the coupled chaotic logistic map the visual security of encrypted image is increased. The statistical analysis is done and it is better than the previous state of the art.

2 Secure Lossless Data Hiding in Encrypted Domain

Reversible data hiding in encrypted images is one of the most leading research areas. Two phases are there; one is encoding phase and the other is decoding phase. In encoding phase, it consists of four processes mainly they are: the prediction error detection using MED, the encryption using coupled chaotic logistic map, the embedding of error location map, and message embedding using MSB substitution. Decoding phase consist of extraction of camouflaged message using corresponding key in data embedding and reconstruction of cover image without any errors using proper key. Illustration of encoding phase is given in Fig. 1.

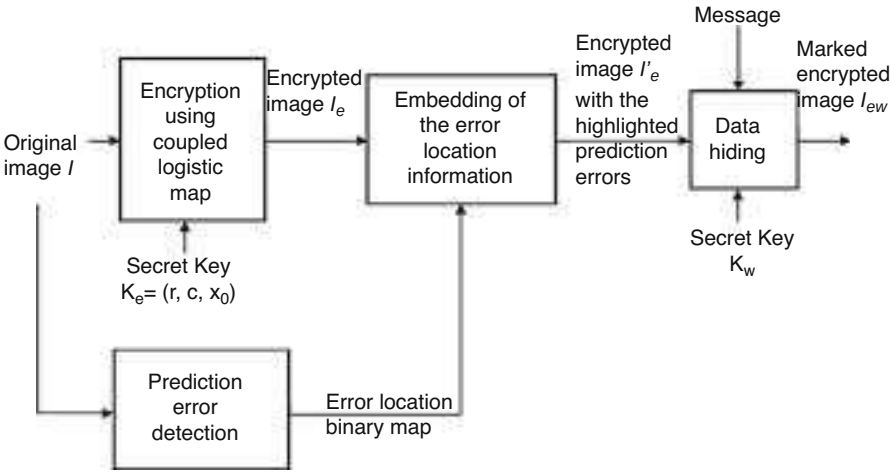

Fig. 1 Overview of the encoding phase

2.1 Prediction Error Detection Using MED (Median Edge Detector)

The MSB substitution method is used for data embedding, so the preprocessing of the cover image is essential for better recovery. The main requirement of reversible data hiding is minimum distortion or error free. The reversible data hiding is practice of restoring the original image back after the removal of the hidden data. Once the MSB values mislaid in the encryption process then it is difficult to get back in the decoding phase, so there need a process for recovering the lost MSB values back. Here median edge detector (MED) is used for prediction process. In MED method the prediction value of a pixel of an image is calculated using its neighbors. MED is a high performance predictor [3]. MED uses only three pixels to determine the type of pixels area which is currently predicted. Predictor decides where the pixel is in, whether it is in horizontal edge, vertical edge, or smooth area. MED predictor predicts the pixel based on local characteristics. Based on the casual area in pixel, there are three sub predictors. The causal neighbor's area is shown in Fig. 2. MED is an efficient predictor that recognizes three different types of causal areas.

– Firstly, let us consider the current pixel $p(t, l)$, with t lies between 0 and m and l lies between 0 and n. Take the inverse value of this current pixel $p(t, l)$ using the Eq. 1.

$$inv(t, l) = (p(t, l) + 128) \text{mod} 256 \tag{1}$$

– Now calculate the prediction value $pred(t, l)$ using the Eq. 2.

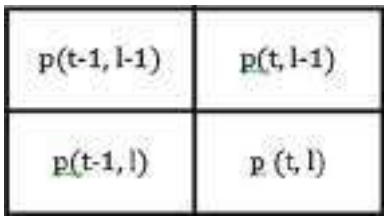

Fig. 2 Causal pixels for MED predictor

$$pred(t,l) = \begin{cases} \min(p(t-1,l),\, p(t,l-1)), & \text{if } p(t-1,l-1) \geq \max(p(t-1,l),\, p(t,l-1)) \\ \max(p(t-1,l),\, p(t,l-1)), & \text{if } p(t-1,l-1) \leq \min(p(t-1,l),\, p(t,l-1)) \\ p(t-1,l) + p(t,l-1) - p(t-1,l-1)), & \text{otherwise} \end{cases} \tag{2}$$

– Absolute difference between $pred(t,l)$ and $p(t,l)$ and between $pred(t,l)$ and $inv(t,l)$ is calculated and the results are recorded.
– Finally, compare the values between $(|pred(t,l) - p(t,l)|)$ and $(|pred(t,l) - inv(t,l)|)$, if $(|pred(t,l) - p(t,l)|) > (|pred(t,l) - inv(t,l)|)$, prediction error and information of position of the prediction is stored in a binary map [4].

2.2 Image Encryption Using Coupled Chaotic Logistic Map

Data transmission on public computer networks has created the necessity for security. Numerous encryption techniques have been emerged for data encryption. There exist symmetric, asymmetric, or hybrid encryption processes and can be applied to block or stream [5]. Image has innate uniqueness and is different from textual information content. So the traditional methods like Data Encryption Standard (DES) or Advanced Encryption Standard (AES) are not extraordinary options for image encryption [6].

Now for the image encryption chaos-based methods are used to protect the content of the image. The chaotic map encryption [7] has a complicated dynamic behavior, but it as normally simple nonlinear model. The sequence generated by using chaotic map [8] is high sensitive to the change in initial condition value and this system shows a variety of dynamics depending on the value of the bifurcation parameter p. In this work, coupled chaotic logistic map generator is used for the generation of pseudo-random binary sequence. Chaotic logistic map generator poses very good complex dynamics. By considering one more logistic map makes the generated sequence more sensitive and increases security of encrypted image. The result of the first logistic map is given to the input for the second logistic map. The key is used as the parameter for the chaotic generators. The generated pseudo-random sequence is exclusive-or (XOR) with the image pixels. The coupled chaotic logistic map using encryption step is shown in Fig. 3. The image is encrypted pixel by pixel by using the pseudo-random binary sequence $s(t,l)$ generated from the

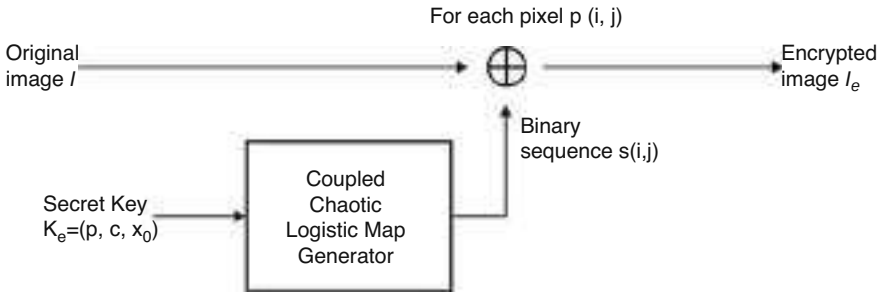

Fig. 3 Illustration of encryption step

chaotic generator. The encrypted image pixel p_e is generated by Eq. 3. Chaotic logistic map uses the pseudo-random properties of the logistic map and its equation is given below in Eq. 4.

$$p_e(t, l) = s(t, l) \oplus p(t, l). \tag{3}$$

$$X_{n+1} = pX_n(1 - X_n), \tag{4}$$

where $X_n \in [0, 4]$ and $p \in [1, 4]$. This relationship exhibits chaotic behavior for values of $p \approx 3.9$. The Eq. 4 is considered as the basic equation in the coupled chaotic logistic map and this is a discrete map function.

In this work, the encryption process is completely reversible and no overflow, hence able to recover the cover image back in decryption process.

3 Embedding of the Error Location Map and Secret Message

In this section, the predictor error location information is embedded into the encrypted image. Before the embedding process, the original image is encrypted. The encrypted image I_e is modified to keep away from prediction errors [4]. After adapting the encrypted image, the secrete message is embedded into by using the MSB substitution method. The to-be insert image is encrypted for to ensure security. The remaining available MSB value of the adapted encrypted image pixels is used for the embedding of secrete message bits b_k. The available MSB value of the adapted encrypted image pixels is replaced with the bit of to-be inserted message. A data hiding key is used for data embedding process. The embedding equation is given in Eq. 5, where p_{ew} is marked encrypted image pixel and p_e is the encrypted image pixel.

$$p_{ew}(t, l) = b_k \times 128 + (p_e(t, l) \bmod 128). \tag{5}$$

4 Cover Image Recovery and Hidden Message Extraction

The decode phase is illustrated in Fig. 4 shown below. The hidden message is decoded with the help of secret key used in the embedding time. Firstly, scan the marked encrypted image I_{ew} in line order for each pixel and the MSB value is extracted by using Eq. 6 and store it. The cover image is decrypted with the help of MSB prediction and the reconstructed image I'.

$$b_k = p_{ew}(t, l)/128, \tag{6}$$

On scanning the marked encrypted image, if the sequence of eight MSB equal to 1, then it shows the start of an error sequence. So the following pixels are not marked and scan is continued for the next sequence of eight MSB equal to 1, which shows the error sequence is over. This process of scanning for extraction is repeated until the end of image.

This approach is completely reversible, the original cover image I can perfectly reconstruct without any alteration. The Peak Signal-to-Noise Ratio (PSNR) is getting infinity and the Structural Similarity Index Map (SSIM) is getting value 1. To recover the cover image back, marked encrypted image I_{ew} must be decrypted with the secret key used in the encryption stage by using Eq. 7. $\tilde{p}$ represents the pixel of the reconstructed image I'. By using Eq. 6, it is possible to recover the correct seven LSB values only, so to predict the MSB values the MSB prediction method is utilized. The MSB values are predicted by using Eqs. 8 and 9.

$$\tilde{p}(t, l) = s(t, l) \oplus p_{ew}(t, l) \tag{7}$$

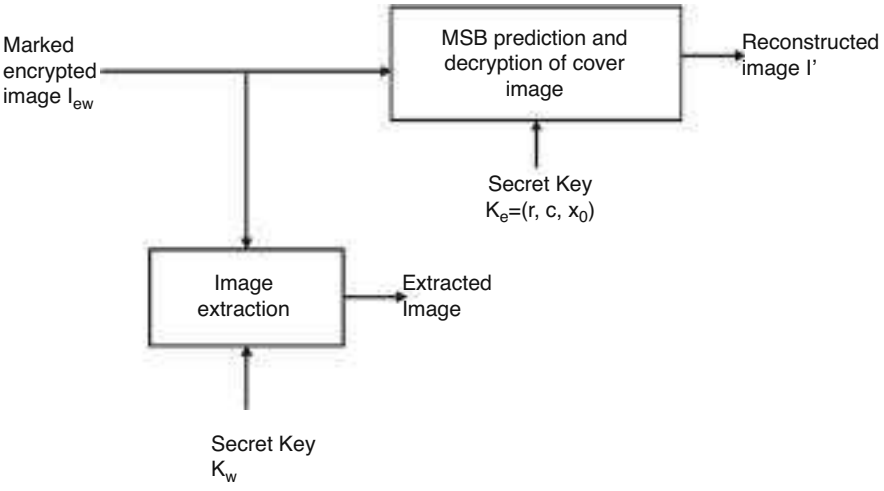

Fig. 4 Overview of decoding phase

$$\begin{cases} \Delta^0 = \left| pred(t,l) - \tilde{p}(t,l)^{\text{MSB}=0} \right|, \\ \Delta^1 = \left| pred(t,l) - \tilde{p}(t,l)^{\text{MSB}=1} \right|. \end{cases} \tag{8}$$

$$\tilde{p}(t,l) = \begin{cases} \tilde{p}(t,l)^{\text{MSB}=0}, & \text{if } \Delta^0 < \Delta^1, \\ \tilde{p}(t,l)^{\text{MSB}=1}, & \text{else.} \end{cases} \tag{9}$$

5 Experimental Results and Comparisons

For better understanding of how this work was done, the results of this work are shown below. MATLAB 2014a environment is used for the implementation of this work. Gray scale images sized 512×512 are used, standard test images and images from database [9] are taken for experiments. The key used for these experiments is $(r, p, x_0) = (3.896754, 0.123456, \text{ and } 0.567891)$. After pre-processing the original image, there will be problematic pixel which have the most probable chance to predict wrong. So observe the amplitude of the error pixel and do necessary modification to avoid this error. So the image have to adapt before embedding the data. The problematic pixels often found in the contours. More prediction error will reduce the payload. One important process in this work is the prediction error detection. Without proper prediction error detection, it is not possible to achieve a high PSNR and SSIM value. The results of this method using the image "0.pgm" from the BOWS-2 database [9] are shown in Fig. 5. The obtained decrypted image has PSNR $+\infty$ and SSIM having 1. In some input images the PSNR and SSIM values may decrease.

The statistical analysis of the work is performed to verify the high visual security level of the encrypted or marked encrypted image. For this, diverse statistical metrics are used: horizontal correlation coefficients, vertical correlation coefficients, Entropy, Number of Changing Pixel Rate (NPCR), Unified Averaged Changed Intensity (UACI), and PSNR between original images and encrypted or marked encrypted images. The result of statistical analysis is tabulated and shown in Table 1. The entropy value is 7.981, which is very high for encrypted image and close to 8. These entropy values show that the gray-level distribution is uniform. The PSNR value of the encrypted image is ($\approx$8.21 dB), which shows that the original image and encrypted image are entirely different. The correlation of adjacent pixel of the original image is high and is shown in Table 1. The NPCR value is 100%, which is the maximal value. The UACI value is also better and close to 32.70%.

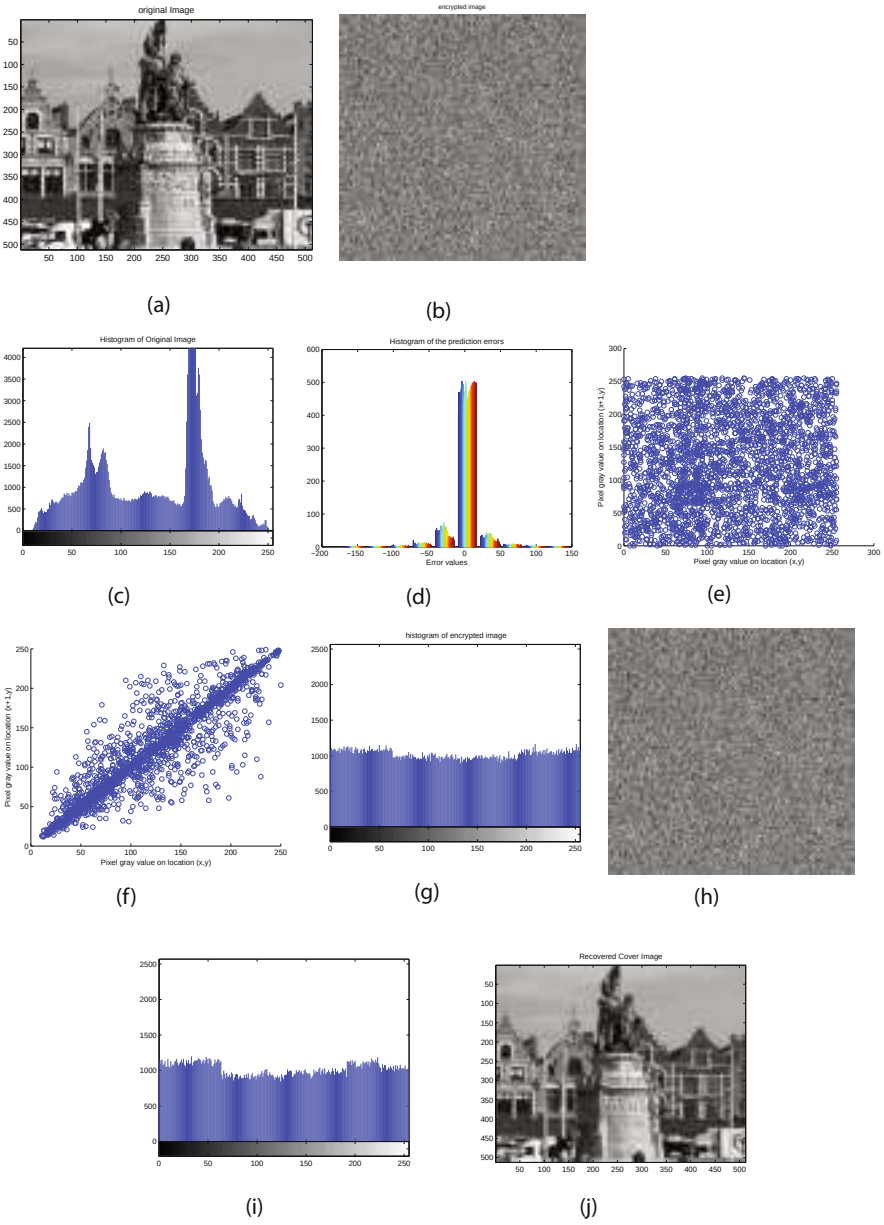

Fig. 5 Experiment result of proposed method: (**a**) cover image "0.pgm," (**b**) encrypted image, (**c**) histogram of cover image, (**d**) histogram of prediction errors, (**e**) horizontal correlation in the encrypted image, (**f**) horizontal correlation in the cover image, (**g**) histogram of encrypted image, (**h**) marked encrypted image, (**i**) histogram of marked encrypted image, (**j**) recovered cover image

Table 1 Quality evaluation of the obtained images using proposed method

Image	Horizontal correlation	Vertical correlation	Entropy	NPCR (%)	UACI (%)	PSNR (dB)
Original image Fig. 5a	0.9389	0.9437	7.3227	–	-	-
Encrypted image Fig. 5b	0.0347	−0.0431	7.9817	100	32.7022	8.276470
Marked encrypted image Fig. 5h	0.0096	−0.1431	7.9817	100	32.7022	8.276471

5.1 Horizontal and Vertical Correlation Coefficients

$$\text{corr}_{p,p_N} = \frac{E\{|p - E(p)|\,|p_N - E(p_N)|\}}{\sqrt{V(p)V(p_N)}}, \tag{10}$$

where p_N represents the considered neighbor of pixel p, $E(x)$ is sample mean, and $V(x)$ is the sample variance.

5.2 Shannon Entropy

$$H(I) = -\sum_{l=0}^{255} P(\alpha_l)\log_2(P(\alpha_l)), \tag{11}$$

where I is a m × n image with 256 gray-levels $\alpha_l (0 \leq l \leq 256)$ and $P(\alpha_l)$ is the probability of α_l.

5.3 Number of Changing Pixel Rate (NPCR)

$$\text{NPCR} = \frac{\sum_{i=0}^{m-1}\sum_{j=0}^{n-1} d(t,l)}{m \times n} \times 100, \tag{12}$$

where $d(t,l)$ is defined as:

$$d(t,l) = \begin{cases} 1, & \text{if} p(t,l) = p'(t,l), \\ 0, & \text{otherwise.} \end{cases} \tag{13}$$

5.4 Unified Averaged Changed Intensity (UACI)

$$\text{UACI} = \frac{100}{m \times n} \sum_{t=0}^{m-1} \sum_{l=0}^{n-1} \frac{\left| p(t,l) - p'(t,l) \right|}{255}. \tag{14}$$

5.5 *Peak-Signal-to-Noise Ratio (PSNR)*

$$\text{PSNR} = 10 \cdot \log_{10} \frac{255^2}{\frac{1}{m \times n} \sum_{t=0}^{m-1} \sum_{l=0}^{n-1} (p(t,l) - p'(t,l))^2}. \tag{15}$$

The performance of the coupled chaotic logistic map using encryption is compared with the piecewise linear map using encryption. The encrypted image is highly secure to the differential attack and is evaluated by using NPCR and UACI values. The NPCR and UACI values are compared with the existing methods stated in [4]. These values obtained by the proposed method is better than other state of the art and is tabulated in Table 2. The encryption time of proposed method is less than the time consumed by the piecewise linear map using encryption. The encryption using piecewise linear chaotic map consumed encryption time is 1.07 s and by considering proposed method, the time consumed for encryption is 0.4625 s. It means that proposed method encryption process takes only less time.

The performance of proposed approach is compared with the previous approaches using the standard test images Lena, Barbara, and Airplane which

Table 2 Comparison of NPCR and UACI value of various encrypted image

Method	Input image	Parameters of encrypted image	
Puteaux [4]	Lena	99.7902	29.368
	Barbara	99.7902	30.286
	Airplane	99.7902	31.6661
	0	99.6254	30.675
	1	99.7902	37.3576
	2	99.7902	35.4168
	3	99.7902	35.0662
	4	99.7902	30.705
Proposed method	Lena	100	29.908
	Barbara	100	33.0275
	Airplane	100	36.6963
	0	100	32.7022
	1	100	45.3956
	2	100	41.5807
	3	100	39.0431
	4	100	33.0275

Table 3 Performance analysis of NPCR and UACI values of encrypted image

Test image	NPCR (%) and UACI (%) values of encrypted image	Kyung [10]	Chin [11]	Haibin [12]	Puteaux [4]	Proposed
Lena	NPCR (%)	99.60	99.9	99.5716	99.7902	100
	UACI (%)	28.43	33.13	28.7491	29.368	29.908
Barbara	NPCR (%)	99.61	99.8	99.5182	99.7902	100
	UACI (%)	29.64	33.17	28.7107	30.286	33.0275
Airplane	NPCR (%)	99.61	-	99.61	99.7902	100
	UACI (%)	30.21	-	32.8065	31.6661	36.6963

are given in Table 3. From Table 3 it is understood that, the proposed method using embedded prediction error mechanism with coupled chaotic logistic map, has the NPCR value 100% and the UACI value is also better. The NPCR and UACI values show that the encrypted image is highly protected from statistical analysis like differential attack, etc. The SSIM value of our proposed method is 1. This means our reconstructed image is similar to the cover image. So this method found application in medical and military field.

6 Conclusion

This method allows us good embedding capacity and lossless recovery of exact cover image. Median edge detector predictor is used to improve the image recovery and to increase the payload capacity. Rather than making big modification of one value, it is better to small change some pixels to recover best image. The encrypted images are having better security to differential attacks. Coupled logistic chaotic map is used for the generation of the pseudo-random bytes for the encryption. Number of Changing Pixel Rate and Unified Averaged Changed Intensity values obtained are better than the other state-of-the-art method.

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Optimized Two Dimensional Wavelet Filter from BAT Algorithm

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***Abstract*—Due to the effect of a quantization error, it is not possible to fully restore the original image in the lossy wavelet-based image compression. However, the quantization error can be minimized by optimizing or evolving the filter bank. In this work, the coefficients of the standard wavelet filter and its inverse filter were optimized by evolution of Bat algorithm. The optimized wavelet filters were used with the SPIHT encoder/decoder for image compression. The performance of the optimized filters in reconstruction during the decompression process was investigated using the metrics PSNR, MSE and SSIM. The results obtained show that the proposed filter outperforms standard wavelet filters by minimizing the error between the original and the decompressed image.**

***Index Terms*—Optimized Wavelet Filter, Evolved Wavelet Filter, DWT Optimization, Adaptive DWT, BAT Algorithm, Swarm Intelligence Algorithm.**

I. Introduction

Image compression is critical for many applications that require massive data storage, transfer and recovery, such as multimedia, documentation, video conferencing and medical imaging. Uncompressed images require significant storage space and bandwidth for storage and transmission. The purpose of the compression process is to reduce redundancy in the image data so that the images can be easily processed or transmitted. It also reduces file size and allows more files to be stored in limited space.

The compression of images can be lossless or lossy [1]. With a lossless compression algorithm, the compressed image can be used to reconstruct the exact copy of the original input image, and none of the information is lost during the compression process. Lossy compression cannot accurately reconstruct the original input image from the compressed data. The fact is that much of the information in the image has been removed without dramatically changing the appearance of the image. While lossless compression is effective for accurate recovery, it usually does not provide sufficient compression rates to make image compression advantageous.

There has been a lot of research that focuses on DWT a traditional strategy for lossy image compression applications because of its ability to limit redundant data [2], [3], [4], [5], [6]. DWT Based image compression includes a transformation using any wavelet filter bank, quantization and encoding with standard encoders. As with decompression, the compressed data is decoded using the decoder, de-quantization and inverse transform. The transformation/inverse transformation should be possible with any reasonable type of wavelet filter bank. The quantization procedure is nothing more than a thresholding procedure. Due to this quantization procedure, errors will occur in the image data and it will be difficult to reconstruct the specific image after decompression. F. Moore et al [7] and M.R. Peterson 8] concluded that optimizing the filter bank with metaheuristic algorithms [8] would reduce this measurement error. Further research work was carried out in this area [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19] were performed to minimize the effects of the quantization error. Nevertheless, the results of a large number of test inputs and image quality measurements have not been fully evaluated in most of these works.

Optimisation algorithms [8] are highly efficient algorithms that aim to find solutions to very complex optimisation problems such as traveling salesmen problems, planning problems, optimizing profits, and so on. Nature-inspired metaheuristic algorithms are a collection of novel problem-solving approaches and techniques derived from natural phenomena. Many common examples of the algorithms of natural optimization include: GA, PSO, CS, Ant colony optimization, bat algorithm and so forth [8].

A modern and highly qualified image-compression method based on the optimized discrete wavelet transformation is proposed in this research, resulting in loss of less image quality compared to standard wavelet-based image compression techniques. Many performance factors, such as PSNR and SSIM, were determined to determine how accurately the image is replicated with regard to the reference image. The approach showed that after further research works this technique can more enhance the image quality.

Section II describes the materials and processes, the results obtained and its summary in Section III and in Section IV, the article is finally concluded.

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Medical Image Transmission Using a Secure Cryptographic Approach for IoMT Applications

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Abstract. Image security is very important in the field of medical imaging. To protect medical healthcare images, many studies have been undertaken. Because it eliminates data loss, encryption is the greatest solution for image secrecy. Traditional encryption methods, on the other hand, are difficult to apply to electronic health data due to data size limitations, redundancy, and scalability, especially when the data of a patient is delivered via different networks. As a result, since images are distinct from the text in terms of data loss and confidentiality, patients may loose the confidentiality and privacy of their data. Researchers discovered these security flaws and proposed different image encryption ways to remedy the problem. In order to build a safe image encryption solution for the healthcare business, this research proposes an efficient, lightweight encryption algorithm. The suggested lightweight encryption algorithm first separates the image into multiple clusters and then employs cluster-based permutations. Other procedures like diffusion and modulation could be used after that. The suggested technique is studied, analysed, and compared to generally encrypted ones in terms of information security and time complexity. The performance of the proposed method was assessed using a range of test images. Several experiments show that the proposed image cryptosystems methodology is more efficient than existing approaches.

Keywords: Image security · Hyperchaos system · Image clustering · Logistic adjusted sine map · Modulation encryption

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Diagnosis of Fetal Arrhythmia Using JADE Algorithm

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***Abstract*—The non-invasive heart rate of the fetus is of great relevance for clinical measures to detect health fluctuations of the fetus during pregnancy. The electrocardiogram (ECG) is often used to detect cardiovascular malformations and heart disorders in the patient. An ECG is not able to measure fetal pulse rate because it shows a low signal-to-noise ratio due to the movement of the fetus in relation to midriff of the mother. The proposed work is based on effective removal of noise components, detection of normal sinus rhythms and arrhythmias of the fetus. Fluctuations in heart rate indicate the disease arrhythmia, i.e. either low or high heart rate. The main goal of this research is to provide an independent component analysis method for removing the maternal ECG(m-ECG) from the selected ECG signal to obtain the fetal ECG(f-ECG). Joint Approximation Diagonal Eigen Vector (JADE) is an algorithm used to discriminate the different components within the signal. The separated f-ECG is used for peak detection and feature extraction. The arrhythmia is detected from the extracted features. The proposed technique has been evaluated with 17 samples and an accuracy of 94.11% is achieved.**

***Index Terms*—Electrocardiogram, Arrhythmia, Joint Approximation Diagnoal Eigen Vector, Peak detection**

I. Introduction

The fetus electrocardiogram can provide the valuable information and important knowledge of the fetal well being, Fetal health situations and movement of the fetal with respect to abdomen. Fetal heart rate (FHR) variations at the time of pregnancy period have generally noticed as indirect indications of fetal health conditions [1]. The unusual fetal ECG and fetal heart rate indicates the fetus doesn't have good health conditions and this leads to death. As the result FHR provides a significant importance and role for finding the disease that affects the heart. Fetal R peak detection is the main challenging task due to the weak signal to noise ratio (SNR) and the inert nature of the fetal ECG waveform. The non stationary nature is due to the movement of fetal in the abdomen.

Fetal ECG is a medical indication that gives electrical portrayal of FHR and health conditions of the fetal during pregnancy. The f-ECG is the only information provider in early stage of pregnancy for diagnosing the health conditions of the fetal. The main noise component present in the maternal ECG is maternal signal is the maternal heart variations. The amplitude of the maternal ECG is higher than that of fetal. So the fetal ECG from the maternal ECG is indistinguishable. The maternal ECG is the high amplitude noise that affects the fetal ECG. Generally the amplitude of fetal ECG is low. The f-ECG signals are also affected by electrical noise from other the other unwanted sources. Common ECG noises [2] are power line interference noise, muscular noise, respiration noise, skin resistance noise, instrumental noise, in addition to electromyogram and electrohysterogram. Due to contractions in the uterus, the f-ECG signals may be corrupted significantly. Fig.1 shows the flow chart of Arrhythmia detection technique.

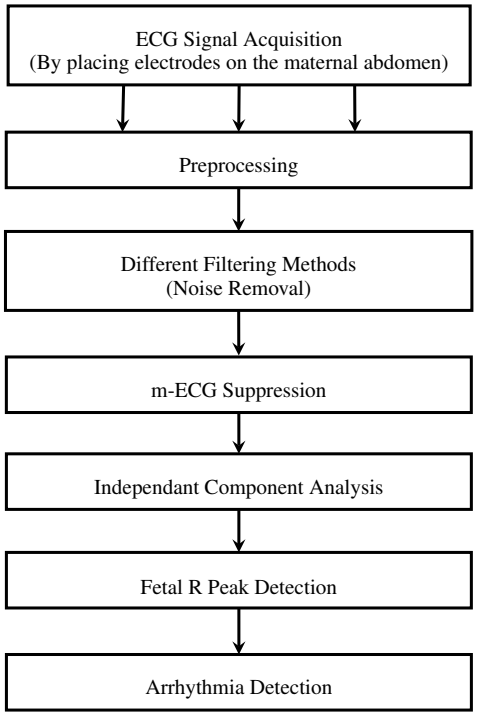

Fig. 1. Block diagram for Arrhythmia detection Process

In this work a hierarchical probabilistic method is introduced to estimate the R peak detection of fetal ECG. Initially, a preprocessing step is defined to eliminate the noise affect from the recorded signal. The pre processing step considers the m-ECG suppression, this step includes the removal of main

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Biomedical Image Security Based on 2D and 3D Chaotic Systems

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***Abstract*—Recently, identifying abnormalities via medical images became vital. As these images are transferred across the IoMT network, they require high safety. Unauthorised use of the data contained in these images might have disastrous consequences. There are numerous approaches to protecting images in IoMT. One of the most effective approaches for safeguarding medical images is encryption. Encryption methods rely heavily on the concepts of confusion and dispersion. This research developed effective encryption and decryption algorithms for secure image transmission based on the chaotic maps with two and three dimensions for the IoMT application. The RGB colour system is first converted to the YCbCr colour space via a colour transformation. Then each of these components will be divided into 16 blocks, and a block permutation will be used to alter the position of these blocks. To perform more confusion a pixel permutation technique is further used. As permutation is alone not sufficient to achieve a satisfactory encryption, the contents again undergone diffusion for getting the final ciphertext image. The provided encryption technique discussed in this paper has been verified and studied on certain colour images. The findings demonstrated that the statistical and differential assaults had a substantial impact on the security and validity of the results. Additionally, the ciphered image has a near-optimal information entropy and correlation coefficients close to zero.**

***Index Terms*—Image Encryption, Image Cryptography, 2D Chaotic Map, 3D Chaotic Map**

I. Introduction

E-health, smart health, and telemedicine are examples of sophisticated medical systems in Internet of Medical Things (IoMT). For end-to-end communication, these systems rely on digital medical information. Although this digitising saves time, it is open source. As a result, hackers may tamper with the medical image in digital format as it is being sent over the IoMT network. Furthermore, in medical diagnostics, determine the particular ailment from a modified digital medical image. As a result, the important difficulties for researchers are ensuring security and protecting the secrecy of a biomedical image, and minimising the encryption technique's processing time. Cryptography, steganography, and watermarking are some image encryption methods accessible [1]. On the other hand, traditional solutions are insufficient to offer high-level security for medical images in IoMT.

Each pixel in a digital image has a certain degree of correlation with the surrounding pixels, while text encryption is not very related to each other. Therefore, image encryption cannot be encrypted according to the traditional method of text encryption [2]. In the general image enciphering process, the connection between each pixel in the image will be broken as much as possible, making the image look messy. Many algorithms are based on the transform domain, such as Fourier transform, wavelet transform, etc. There are also some encryption methods, such as encryption algorithms based on DNA, artificial neural networks, and optics.

Chaotic systems have unique advantages, such as pseudo-randomness, convenience, and sensitivity to initial values, and can generate ideal secret keys. However, the encryption complexity of the chaotic system is relatively high, and the calculation is very cumbersome, resulting in a relatively low encryption efficiency [3]. However, with the continuous development of computer hardware and the continuous improvement of processing efficiency, some encryption algorithms are constantly being proposed.

At present, digital images have been widely used in various fields, and digital images occupy less memory and are more convenient to transmit. However, the digital image is two-dimensional in terms of data structure, which can be regarded as a matrix, and the size of the matrix is the same as that of the original image. Converting two-dimensional data into one-dimensional data is also a processing method, ignoring the

A Study on the Impact of National Education Policy-2020 in Higher Education and Research

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Abstract

The National Education Policy-2020 (NEP-2020) aims to deliver a high-quality education to help India's economy thrive. The new policy aims to accomplish three primary goals in the education system, from elementary school to higher education: maximum quality, equality, and honesty. The present education strategy in India focuses mostly on theoretical components, resulting in a lack of practical training among students, which is a big hindrance in matching global employment prospects. As a result, the National Education Policy-2020 aims to foster creative potential, skill development, and analytical thinking, all in high demand in the global employment market. As a result, every curriculum for higher education should be restructured to be outcome-based so that stakeholders know what they will study ahead of time and how it will benefit them to improve to face future economic developments. NEP-2020 is an innovative plan with both good and negative characteristics, aimed to give everyone a great school education and higher education with the expectation of holistic and research-based improvement. This paper begins with an overview of NEP-2020, identifying the policy's impact on higher education and research, studying its implementation suggestions, and identifying and analysing possible generic strategies for implementing NEP-2020 to meet its objectives.

Keywords: NEP 2020, Higher Education, NEP and Research

I. INTRODUCTION

After 34 years, India finally received a New Education Policy (NEP) in 2020. With the adoption of the new NEP by the Union cabinet on July 29, 2020, the much-anticipated changes in the Indian education system finally came (Kumar, 2020). The new strategy includes a comprehensive framework for guiding the country's educational development. The present educational curriculum was developed in 1986. According to the policy draught, education is essential for achieving full human potential, creating a more fair and just society, and

A Software Model of Masking Hidden Message in Steganography Tasks

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***Abstract*—The authors deal with the issue of developing a software model for disguising a concealed message in HUGO systems in conditions of affected noise in the connection channel using a discrete random Arnold cat map and a Baker map that are repetitive reverse discrete chaotic transforms. All stages of software model development are considered in detail, such as the choice of the development environment, the composition of software modules and their purpose, screenshots of graphical interfaces for various modes of operation of the model. In a software model to assess the random state of a secret message presented by a digital static picture, the authors enter a chaotic coefficient, a quantitative measure of the entropy of the probabilities of unordered pixels. In the designed software model, the authors suggest a procedure for defining the limit value of the chaotic coefficient corresponding to the limit of the random state of the hidden message. Testing of the software model shows the practical indistinguishability of the transformed hide message from the native noise in the connection channel and greatly improves the security of HUGO stegosystems.**

Keywords—Software model, HUGO stegosystem, Arnold cat map, Baker map, Pearson correlation coefficient, Natural noise, Chaotic coefficient, Chaotic maps, Steganology

INTRODUCTION

Steganography is a particular field of research related to developing and studying methods for concealing and detecting the transmission of information. The main difference between steganography and cryptography is the concealment of the fact of transmission of a secret message. Along with cryptography, steganography has also existed since ancient times. However, this is where the similarities end, especially in theory. Over the last quarter of a century, a new topic has been created and successfully developed. It is mathematical steganography or steganology, in which mathematical models of stegosystems are considered.

If we consider the new trends in modern steganography, we can identify the following distinguishing characteristics:

1. The increasing use of still digital photographs as covering objects with their preliminary transformation using discrete transformations.
2. Research on the creation of new stegosystems with increased secrecy of data transmission.
3. Increased attention to considering the presence of interference in communication channels and ways to combat them.
4. Active use of discrete chaotic transformations of hidden messages to mask them under natural noise in the data channel to increase the security of HUGO stegosystems.
5. Active expansion of research in the field of synthesis of highly undetectable stegosystems, the so-called HUGO-systems.

This article focused on discrete chaotic transformations of a concealed message to disguise it as natural noises in the connection channel. Users in electronic document management systems can implement such methods to increase the level of security of confidential documents transmitted in the communication channel.

DISCRETE TRANSFORMATIONS OF COVER OBJECTS AND HIDE MESSAGES IN STEGANOGRAPHY TASKS

Steganography approaches using a fixed digital picture as a cover object comprise two broad classes: the one class of techniques introduces a hidden message into the dimensional domain of the cover object. Another type of approach does this in the frequency area.

The investigator may use this group of methods for different cover objects. The following discrete transformations are used: DCT - Discrete Cosine Transform, DHT - Discrete Hadamard Transform, DWT - Discrete Wavelet Transform, DFT - Discrete Fourier Transform, SVD -Singular Value Decomposition.

It should be noted that discrete DCT and DWT transformations are most commonly utilized. These methods have successfully created widely used compression algorithms for JPEG2000 and JPEG still images.

As the authors have already noted above, in modern steganography, to increase the security of stegosystems, researchers have increasingly begun to use discrete chaotic transformations for hidden messages. Chaotic discrete changes belong to the field of chaos theory research.

Chaos theory is a branch of mathematics that deals with the disorderly behavior of systems under certain conditions.

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4th International Conference on Innovative Data Communication Technology and Application

A Lightweight Cryptographic Algorithm for Underwater Acoustic Networks

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[e]*Department of Electronics, Communications and Computers, University of Pitesti, Pitesti, ROMANIA*

Abstract

Underwater images are being utilised to detect a variety of key resources, such as items, minerals, and rare metals. We can send underwater images across a network since the Internet is so widely accessible. There is a need to send underwater images across underwater acoustic networks securely since they carry crucial information (UAN). To preserve data integrity and confidentiality, UANs need security techniques and algorithms. The security technology currently in use for land-based wireless sensor networks cannot be immediately adapted to UANs due to the differences in communication channels and physical conditions. The cryptographic technique for UANs is faced with several difficulties as a result of these additional characteristics. In this paper we are proposing an encryption algorithm of secure transmission of underwater images over the UANs. This algorithm is based on a confusion-diffusion architecture utilising the 2D Exponential-Cosine transform and DNA Encoding operations. The Security Study demonstrates its high degree of security and its ability to encrypt various colour images into cipher-images that are impossible to decipher.

Keywords: Image Encryption; Image Cryptography; Security in Underwater Acoustic Networks; Image Transmission in in Underwater Acoustic Networks.

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VICATRME '22

MEA ENGINEERING COLLEGE, KERALA, INDIA
MAY 24 - 26, 2022

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Second Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering

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PREFACE

At the outset, the organizing committee of VICATRME'22 extend a warm welcome to all of you to the ***2nd Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering (VICATRME'22)*** to be held during May 24 – 26, 2022. VICATRME'22 is organized by Department of Mechanical Engineering, MEA Engineering College, Perinthalmanna, Kerala (India)

The first edition of the conference was conducted in 2020 which included 240+ authors from various parts of the world during 2020. Best papers were published in CARE Journals (Revised Version of Full length paper after peer review). The main purpose of the conference was to disseminate and popularize the recent advancements in the field of Design, Manufacturing, Energy and Environmental Engineering to our budding engineers and researchers so as to intensify their research levels. Participants are provided with a platform to get their doubts clarified with subject experts and top academicians/researchers.

VICATRME'22 is intended to provide an insight into the current trends in the area of Design Engineering, Materials Engineering, Industrial Engineering & Management, Manufacturing Sciences, Thermal Engineering and the multidisciplinary research and also expected to be a platform for Scientists/Researchers, Academicians, Industrial Persons and Scholars to share innovative ideas and thoughts. The objective of this conference is to initiate a creative discussion on the advances in the areas of mechanical engineering.

Apart from paper presentation sessions, the conference will include invited talks by eminent scientists, professors and professionals on advanced trends in various fields of Mechanical Engineering.

This proceeding includes papers presented in the conference. All the submitted papers have been peer reviewed by the reviewers drawn from various fields of engineering depending on the subject matter of the paper. The papers were selected on the basis of originality, significance, and clarity for the purpose of the workshop. We hope, the selected and presented papers as well as the keynote speeches will inspire all participants for further research work.

We thank the institutions and research organizations which have deputed delegates to participate in the conference. We are also grateful to the advisory committee members, keynote speakers and the session chairs for their contribution to the success of VICATRME'22.

We would like to extend our sincere thanks and gratitude to The Management and all the administrative officials of MEA Engineering College for providing us all the required support in organizing VICATRME'22. We thank all the faculties and students of the Department of Mechanical Engineering, MEA Engineering College for their valuable suggestions and organizing committee members for their valuable contributions to the conference.

With Best Regards,

The Conference Committee

MESSAGE FROM THE PRESIDENT

May 20, 2022

MESSAGE

It is a moment of extreme happiness for me to know that MEA Engineering College, Perinthalmanna is conducting the 2nd Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering during 24th – 26th May 2022.

The conference aims to provide ample opportunity for participants to showcase findings and results of their ongoing research works as well as to have research discussion related to advanced engineering and technologies.

I appreciate the sincere efforts of the organizing team as well as convey my best wishes for grand success of the event.

Sd/-

Sayed Sadique Ali Shihab Thangal
President,
MEA Engineering College, Perinthalmanna.

MESSAGE FROM THE GENERAL SECRETARY

May 20, 2022

I am glad to know that the 2nd Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering will be conducted at MEA Engineering College, Perinthalmanna during 24th – 26th May 2022.

The focus of the conference is to bring researchers, academicians, scientists, practitioners and students together to participate and showcase findings and results of their ongoing research works by providing ample opportunity to participants for becoming a part of technical forum and to have research discussion related to advanced engineering and technologies

I extend my appreciation to the organizers for their sincere efforts in conducting this event and I also convey my best wishes for its grand success.

Sd/-

Prof. K. K. Syed Abid Hussain Thangal
General Secretary
MEA Engineering College, Perinthalmanna.

MESSAGE FROM THE PRINCIPAL

May 20, 2022

I congratulate and appreciate the Head of the department, Faculty members and students of Mechanical Engineering for their effort rendered for conducting the 2nd Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering during 24th – 26th May 2022.

This Conference intends to bring different principles under one ridge, provide prospects to exchange notions and to launch research relations. We have invited eminent personages from different segments to get a enhanced understanding of advanced technologies in Mechanical Engineering and the several approaches involved in manufacturing.

Hope this conference will act as an intermediate for all of us to enhance our knowledge.

With regards,

Dr G. Ramesh
Principal
MEA Engineering College, Perinthalmanna.

MESSAGE FROM THE ADMINISTRATION MANAGER

May 20, 2022

I am happy to know that the 2nd Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering (VICARTME'22) will be conducted at MEA Engineering College, Perinthalmanna during 24– 26 May 2022.

I am sure that VICATRME'22 will cover the latest developments and progress in Mechanical Engineering and allied disciplines

I take this opportunity to congratulate the organizers and convey my best wishes for the grand success of the VICARTME'22.

Sd/-

C. K. Zubair
Administration Manager,
MEA Engineering College, Perinthalmanna

MESSAGE FROM THE VICE PRINCIPAL

May 20, 2022

It is matter of a delightful excitement that Mechanical Engineering department of MEA Engineering College is organizing the 2nd Virtual international conference on Advance Technologies and Research in Mechanical Engineering (VICATRME' 22)

VICATRME' 22 will be a platform to mingle with International Researchers, Engineers, Scientists and specialists in the various research and development fields of Mechanical Engineering and Technology. The conference offers a premise for global experts to gather and interact online intensively on trending areas which will definitely influence research as well as numerous technological areas in day to day life. Eventually I express my deep gratitude and appreciation to the entire Staff members of Mechanical Engineering department who worked very hard to make this event successful.

I wish all success for VICATRME' 22

Prof. Haneesh Babu K. T.
Vice Principal
MEA Engineering College, Perinthalmanna

MESSAGE FROM THE DEAN (Academics)

May 20, 2022

Following the legacy of their first Virtual Conference, VICATRME'20, I am so glad that the Department of Mechanical Engineering, MEAEC is organizing the second International Conference on Advanced Technologies and Research in Mechanical Engineering - Virtually in online mode (VICATRME'22).

I believe that this platform would be a trendsetter on exchanging the latest innovative research experiences, recent developments and trends in the field of Mechanical Engineering and its allied areas.

I congratulate the team for their sincere efforts and wish the Conference all success.

Prof. Sreeram S.
Dean (Academics),
MEA Engineering College, Perinthalmanna

MESSAGE FROM THE DEAN (Research)

May 20, 2022

I am happy to note that the Mechanical Engineering department of MEA Engineering College is organizing VICATRME-2022.

The world is changing fast and the role of engineers is redefined on a daily basis especially in the post covid era. If engineers, teachers and students are not updated on the changes in the trends in new technologies coming up in to the field, we will be left behind the global pace. So, it is always advantageous to learn new things, listen to people who are working in the field and to have input on the modern research trends. I always feel that research and development is what makes the engineering a dynamic profession. Though many times confined to a research literature, quite often this literature comes in to the practical field and gets demonstrated in the working form. An engineer is basically an applied scientist who has to learn from science and make the things work. Conferences like this will be helpful for updating our basic input and to see that we are performing better in our profession.

I wish all success for VICATRME-2022

Dr. Hema Nalini A.V.
Dean (Research),
MEA Engineering College, Perinthalmanna

MESSAGE FROM THE HEAD OF THE DEPARTMENT

May 20, 2022

It gives me enormous pleasure to convene the Second Virtual International Conference on Advanced Technologies and Research in Mechanical Engineering (VICATRME'22) held during 24th to 26th May 2022 after the massive response of VICATRME'20. This virtual international conference broadcast and popularizes the recent advancements in different fields of mechanical engineering to our budding engineers and researchers to intensify their research levels.

I appreciate the co-convenor, organizing secretaries, organizing coordinators, faculty members and student volunteers for their continuous effort rendered for the smooth conduct of this conference.

Dr Mubarak M
Associate Professor and Head
Department of Mechanical Engineering
MEA Engineering College, Perinthalmanna

LIST OF ABSTRACTS

Inaugural Keynote Speech:

Development of Viscous Actuator Cylinder Theory for a Vertical Axis Wind Turbine (VAWT) and Application of VAWT for Wind Energy Harvesting from Highway Traffic and by an Airborne Drone

Ramesh K. Agarwal

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Abstract

This paper describes the development of an Actuator Cylinder Model to include the viscous effectsto study the flow field and power generation from a Vertical Axis Wind Turbine (VAWT). Turbulent flow effects in the actuator cylinder model are modeled by solving the Reynolds-Averaged Navier-Stokes (RANS) equations with the Spalart-Allmaras (SA) turbulence model in ANSYS FLUENT. A study is performed to establish mesh independence of the solutions. Numerical solutions on a fine mesh are compared to existing theoretical results based on inviscid theory for a series of flow conditions and turbine sizes. Similar trends in the present turbulent flow results are found as in the inviscid results for downstream velocity and pressure profiles. The Betz limit is found not to be applicable to VAWT. To consider wake interactions for wind-farm application, the actuator cylinder model is extended to two and three turbine cases. In addition, application of VAWTs is considered to harvest the wind energy due to highway traffic. A dynamic meshing technique is used at the exterior of a simplified car model to simulate a passing vehicle. Simulations using car velocities of 50mph, 60mph, and 70mph are analyzed for car to turbine spacing of 1m, 2m, and 3m. Comparisons in power are made between the steady state actuator cylinder model and the transient cases near-highway. In another application of VAWTs, an airborne wind energy application using a quadcopter drone and a series of suspended vertical axis wind turbines is considered. To analyze the viability of the airborne design, the required power to climb to 500m and to maintain the elevation is compared to the generated power from two and three turbines.

Biography

Dr. Ramesh K Agarwal is a William Palm Professor of Engineering in the Department of Mechanical Engineering and Materials Science at Washington University in St. Louis, Missouri, United States. At WUSTL, he is the director of the Aerospace Engineering Program, the Aerospace Research and Education Center, and the Computational Fluid Dynamics Laboratory. He was the Sam Bloomfield Distinguished Professor and Chair of Aerospace Engineering at Wichita State University in Wichita, Kansas, from 1994 to 1996. He was the Bloomfield Distinguished Professor and Executive Director of Wichita State University's National Institute for Aviation Research from 1996 to 2001. He holds a Ph.D. in Aeronautical Sciences from Stanford University, an M.S. in Aeronautical Engineering from the University of Minnesota, and a B.S. in Mechanical Engineering from Indian Institute of Technology, Kharagpur, India in 1968.

He obtained his Ph.D. in Computational Fluid Dynamics and has made significant contributions to the research community, as well as publishing multiple publications in indexed journals. He is a member of various professional and honorary groups, including the Royal Aeronautical Society, and has received the Reed Aeronautics Award. In 1981, he created a third-order upwind scheme for numerical integration of Navier-Stokes equations and performed some of the first transonic wing-body interactions studies for aircraft.

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Invited Talk 1:

Computational Fluid Flow and Heat Transfer In the Safety of Engineering Systems

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Abstract

Safety of complex engineering systems is nowadays a big concern for academicians, researchers and the engineering community. Many engineering systems inherently involve fluid flow and heat transfer phenomena which is also aimed in several instances to remove the excess heat evolving from such thermal systems so as to ensure better reliability and safety. Experimental investigations of all the possible accidents of complex thermal systems are highly cumbersome tasks. Under these circumstances, computational fluid dynamics based numerical problem solving became very much appealing for the last few decades in almost all branches of engineering. The simultaneous numerical solutions of continuity equation, momentum equations in the form of Navier-Stokes equations and energy equations after incorporating physically reasonable approximations and assumptions became a highly accepted methodology in engineering problem solving. The parametric studies dealing with cylindrical and rectangular nuclear fuel elements of fission reactors have been addressed by many researchers. Melting of nuclear fuel core, loss of coolant etc. are highly detrimental accidents pertinent to nuclear reactors and needs to be avoided at any cost. The computational fluid dynamics based study focusing on the effect of thermo-geometric parameters on nuclear reactor safety is thus an overwhelming area of research. More realistic analysis of such complex systems necessitates incorporation of temperature dependent thermo-physical properties, multi dimensional modelling and conjugate heat transfer analysis. Such studies would have great influence in the design and safer operation of nuclear submarines also. Flashover fire and associated temperature rise are also potential areas that are studied by employing computational fluid dynamics techniques during the recent past. Parametric

studies by employing numerical methods pertinent to performance of marine engines, marine heat exchangers, marine refrigeration and air-conditioning systems etc. also would be ultimately leading to marine safety. In a nutshell, the systematic methodology of employing fundamentals of computational fluid flow and heat transfer in the safety of complex engineering systems would be highlighted here.

Keywords: Computational fluid dynamics; thermal systems; fire safety; convective heat transfer; conjugate heat transfer; parametric study

Biography:

Dr. Favas T. K. is an Assistant Professor at Cochin University of Science and Technology's Department of Ship Technology. He has extensive knowledge of education and research. Before joining CUSAT, he worked as an ad-hoc at NIT Calicut. He has 16 articles at national and international conferences to his credit, as well as 5 papers in indexed journals. He took part in and organized a number of events to benefit the Science and Engineering community. He has chaired, reviewed, and served as a resource person for a number of national and international conferences.

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Invited Talk 2:

Effect of condensing cover on the yield of hemispherical, conical and conventional Solar still

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Abstract

An effort is made to enhance the coefficient of heat transfer for conventional, conical and hemispherical solar still in this study. For increasing the efficiency of solar still different research and development methods are to be used. By decreasing the shadow effect, we increase the solar still efficiency and also the maximum consumption of solar radiation. Here, study on latest conventional, conical and hemispherical solar still in Faculty of Engineering Jamia Millia Islamia, New Delhi (latitude 28°38' 41.2800" N and longitude 77°13' 0.1956" E). We assume that the basin area (A_b) of conical solar still is 1 m^2, and for conventional solar still the acrylic glass cover is inclined at 28° which is approximately same as the latitude of New Delhi. Keeping the same dimensions, we compare the output results of conical and hemispherical solar still to the conventional solar still and we get the maximum productivity for conical solar still. Calculation of the mass transfer & heat transfer coefficient are done here. For conventional, conical & hemispherical solar still, the maximum value of heat transfer coefficient is also for conventional solar still. Here, we calculate the similarity between the heat transfer & the mass transfer coefficient by using the MATLB.

On the basis of the research and study, the recommendations are made to control the water to be polluted by different sources, which adversely affects the life of human being as well as animals. The recommendations are aimed at the relevance and use of solar energy, to generate the potable water and save the water for drinking it also helpful to our environment. The recommendations include promotion of water distillation process by the use of solar energy throughout the country and especially for lower- and middle-class people because this class people generally dead because of water borne diseases.

Keywords: Hemispherical solar still; conical solar still; solar intensity; Solar still yield; Solar energy

Biography:

Dr. Mohd Zaheen Khan is currently employed as an assistant professor at Lucknow's Institute of Engineering and Technology. Before joining IET, Lucknow, he served as an academician in a variety of institutions at various capacities. Jamia Millia Islamia, New Delhi, awarded him his doctoral and post-graduate degrees. He has over 25 research articles published in SCI and Scopus indexed journals to his credit. He has chaired and been an invited speaker at numerous national and international conferences. He also holds five patents for his inventions. He serves as a peer reviewer for a number of journals. He has presented at over eight national conferences.

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Invited Talk 3:

Sustainable Manufacturing in Industry 4.0

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Abstract

The industrialization has been a major contributor to pollution and environmental challenges throughout history, culminating in an unsustainable production paradigm. Today's society recognises that a new economic model of production and consumption must consider its environmental and social impacts. Stakeholders pressurize industries to be more transparent in reporting their environmental and social implications. Industry 4.0, or the Fourth Industrial Revolution, intends to create a manufacturing system that is both viable and sustainable. The objective of the session is to summarize the connections between Industry 4.0 and Sustainable Manufacturing.

Biography

Dr Ramkumar P. N. is an Associate professor and Head of the Mechanical Engineering Department, Sreepathy Institute of Management and Technology, Vavanoor, Kerala, India. He received Bachelor degree in Mechanical Engineering in 2007 from University of Calicut, Kerala and Master degree in Production Management from Visvesvaraya Technological University, Karnataka in 2010. He completed the PhD programme of Calicut University, Calicut, India, at Department of Mechanical Engineering, Government Engineering College Thrissur, under Centre for Engineering Research Development (CERD) fellowship of Government of Kerala in the year 2020. His PhD work was on the applications of Lean Six Sigma in Indian SMEs for improving the processes and productivity. He has a teaching experience of 12 years including research and administration. He has to his credit 10 publications which includes international journals & conferences. His areas of research interest include Lean Six Sigma, Total Quality Management, Sustainability, and Industry 4.0.

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Invited Talk 4:

Properties of Natural Rubber Reinforced with Acacia Powder

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Abstract

Natural fibre polymer composites have been largely used in applications like aerospace, automotive and marines where mechanical and tribological properties are of prime consideration. In this work natural rubber of RSS grade 4, acacia powder and CBS were used to fabricate the composite. The following ingredients were used for forming the rubber composite: - natural rubber, acacia powder, CBS, TDQ, stearic acid, zinc oxide and Sulphur. A total of 6 mixes were made. The first mix is called the base mix and is without acacia powder and the rest of the mix contains acacia powder in the following weights percentages 10g, 15g, 20g, 25g and 30g respectively. Then each weight sample is mixed with natural rubber in a two-roll mill to evenly distribute the component throughout so as to get the desired properties. After the fabrication of rubber, a Rheometer was used to find the curing time for each mix and injection moulding was done to obtain moulded rubber. Tensile, Tear and FTIR tests were conducted on the samples. Morphological study will be done further.

Keywords: Acacia fibre; particle size; Natural rubber; Mechanical properties

Biography:

Dr.Ajith Kuriakose Mani is currently working as a Sr. Assistant Professor in Saintgits College of Engineering, Kerala. He obtained his Doctoral degree from NIT Calicut. To his credit he has published and presented 8 papers in the prestigious events and journals. He was a gold medallist in MG University during his Post Graduation. He has nearly 10 years of experience in both research and academia.

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Recycling Plastic Waste for 3D Printing

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Abstract

Recent times, the issue of plastic recycling have become one of the leading issues of environmental protection and waste management. Polymer materials have been found an application in many areas of daily life and industry. Along with their extended use, the problem of plastic wastes appeared because, after withdrawal from use, they became persistent and noxious wastes. The possibility of reusing polymeric materials gives a possibility of a second life and enables effective waste utilization to obtain consumable products. The 3D printing market is a well-growing sector. Printable filaments can be made from a variety of thermoplastic materials, including those from recycling. This paper focuses on a review of use of recycled PET (Polythene Terephthalate) and ABS (Acrylonitrile Butadiene Styrene) to produce filament for 3D printing and it's comparison of properties. Using this method we can further use the plastic recycling problem and make more use of the plastic waste.

Keywords: Plastic Recycling, ABS, PET, 3D Printing

Dynamic analysis of natural fibre based composite material

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Abstract

Composites have distinctive characteristics that can be utilized in various structures and/or structural components without compromising their structural performance and durability. However, use of natural fibres in composites makes the structure more economical as well as eco-friendly. In this Paper applying natural fibres to Wheel rim in automobile it is a critical component of a vehicle, also a connecting point for the wheel to road surface. It is the only part of the vehicle to be in contact with road surface. Wheel rim will transfer the vibrations from wheel to suspension and steady vertical load acting on a wheel rim through the vehicle. These are most influencing factors for comfortable ride and the performance of the vehicle. The only possible factor is to improve the material properties of the wheel rim for better performance and comfort. The work deals with a new designed material that is metal composite hybrid wheel rim. In which friction layer is used in between the composite and aluminium material to enhancing the damping capacity and improving the ride comfort. To find the natural frequencies and stiffness a model is designed using commercial software SOLIDWORKS and the factors are estimated by commercial analysis software ANSYS Workbench. The present work deals the analysis of hybrid wheel rim subjected to vertical load, damping factor and stiffness of material under various condition are found.

Keywords: Damping capacity, composite, friction damping layer, Frequency test, Aluminium, Epoxy.

Heat Transfer Investigations in Thermal Protective Clothing – A Review

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Abstract

Thermal protective clothing is a vital element in the safety of firefighters, military personnel, and some industrial operators who are subjected to extreme environments and air-borne particles. When a medium level of exposure to heat and flame can degrade the workers' performance, high heat or flame exposure can cause heat stress that can be terrible. Stakeholders nowadays are more concerned about the volume of accidents and fatalities reported among firefighters. Therefore, researchers have found it essential to investigate the heat and moisture transfer in thermal protective clothing, thereby envisaging improvements in Thermal Protective Performance (TPP). Experimental studies involving benchtop tests and fire test manikins have tried to predict the burns considering the combined flame and radiant heat. Heat flux and tolerance time are relatively significant factors that researchers have relied upon. Numerical studies have focused on developing models to identify the parameters influencing thermal protective performance. Protective clothings are multi-layer fabrics that are subjected to flash and fire conditions. Different modes of heat transfer and their combinations make the study interesting and challenging. Heat and mass transfer through clothing, air gap, and human skin layer are important parameters discussed. This article is a profound review of the literature on fire safety attires and their heat transfer mechanism to improve thermal protective performance.

Keywords: Thermal Protective Performance (TPP); Heat and Mass Transfer; Heat Flux; Safety Attires

Portable Rubber Sheet Dryer for Improving Grade of Rubber Sheet

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Abstract

Kerala is a nearly monopolistic contributor to the natural rubber production of India with 90% of the total production and 78% of the area under cultivation in the country. A wide range of farmers and landowners in several districts of Kerala state are engaged in rubber plantation and its estates. The profit for such people increases only when they can produce higher grade quality rubber sheets. The Higher-grade rubber sheets are produced through proper smoking procedures with the help of appropriate smoke stations. The objective of the study is to design and fabricate a rubber sheet smoking chamber. Realizing the need to upgrade from tradition, we created a smokehouse model that is sustainable, portable, compact, semi-automatic, easy to use and efficient. The smoke-dryer is mounted on wheels to transport from one place to another. Temperature is measured using thermocouple and heating chamber is ejected out when temperature crosses the limit. Smoke flow to different drying chambers is done with help of steel pipes and optimized supply of smoke is obtained. Solar panel as an accessory is mounted on the top to run the DC electric motors which functions as an actuator for removing the latex. In summary, a cost and energy efficient dryer is the aim of this research work and it is important that this technology offers a robust and reliable solution to the rubber processing industry.

Keywords: Smokehouse; Rubber sheet; Smoking Chamber; Dryer

Production, Characterization and Utilisation of Biodiesel Produced from Mixing of Waste Cooking Oil & Sunflower Oil

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Abstract

Recycled waste cooking oil is harmful to health, but it is not environmental friendly to dispose off used cooking oil. The best solution is to use it for industrial purposes, namely to convert it into biodiesel. Due to the awareness of adverse effects of conventional fuels to environment and the frequent rise in crude oil's price, the need for sustainable and environment friendly alternate source of energy has gained importance in recent years. Biodiesel is proved to be the best replacement for diesel because of its unique properties like significant reduction in greenhouse gas emissions, non sulphur emissions, non particulate matter pollutants, low toxicity and biodegradability. Cost of biodiesel produced from virgin vegetable oil through transesterification is higher than that of fossil fuel, because of high raw material cost. To minimize the bio fuel cost, these days waste cooking oil is used as feedstock.

Keywords: Waste cooking oil; Fuel; Biodiesel; Transesterification

Experimental analysis of triple basin solar still with and without use of Aluminium heat pipes

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Abstract

Solar still is very simple apparatus to convert the saline or brackish water into the potable water by application of solar energy. Many researchers from all around the world have applied their ideas to enhance the yield. Present research paper shows the aluminium heat pipes with triple basin solar still with evacuated tubes to enhance the yield. Experimental analysis has been carried out during the climate conditions of Ahmedabad, India with and without use of aluminium heat pipes. From the analysis, it has been found that the yield of the triple basin solar still is increased with use of aluminium heat pipes with evacuated tubes. Also the evaporation of the water is also raised by use of Aluminium heat pipes with evacuated tubes. From this research work, it has been concluded that the application of aluminium heat pipe is good alternative with evacuated heat pipes to enhance the yield of solar still.

Keywords: Solar energy; Solar still; Distillation; Evacuated tubes; Heat pipes

Experimental Investigation and CFD Simulation of Ethanol-Diesel Dual Fuel Engine

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Abstract

The influence of internal combustion engines on the advancement of the world is very high. From transportation to power generation, it plays a very crucial role. IC engines have helped the world to utilize the abundant source of energy from fossil fuels. Environmental pollution, fast depletion of fossil fuels, increase in energy demand and rise in prices of petroleum fuels demand replacement for conventional fuels. Alternative fuels which are used as replacement for conventional fuels should possess stability, availability and should produce lower emission. Conventional diesel engines can be easily modified to operate as dual fuel engines. Ethanol can be considered as good alternative fuel when used with other fuels with good combustion characteristics. Ethanol can be made by fermentation of agricultural waste products like sugar cane and corn molasses. Use of ethanol helps in reduction in some of the exhaust gases produced from the combustion in IC engines. There are different methods that can be adopted for supplying ethanol to the combustion chamber. The objective of the work is to identify the optimum blend ratio for ethanol-diesel so as to obtain sufficient reduction in exhaust gas emissions without considerable increase in fuel consumption. The injection timing of the fuel into the combustion chamber is also advanced to analyse the effect of giving more time for combustion for the ethanol blended diesel. The present paper is aimed at finding the optimum blend ratio of ethanol at suitable injection timing so that a reduction in NO_x can be achieved without much reduction in the performance of the engine. CFD analysis is done on a sector of the combustion chamber of the engine with Ansys Forte software to compare the results with the experimental data.

Keywords: Diesel Engine; Performance; Ethanol production; Emission control; Injection timing

An Experimental Study on Performance Enhancement Of Solar Cooker by Integrating Various Design Alteration

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Abstract

Solar cooker is a device which uses direct sunlight energy to cook food and to kill microbes on various drinks and other food materials. A box type solar cooker was experimentally analyzed and improved its performance by various design modifications. Conventional cooker was compared with sensible thermal energy storage cooker and glass solar cooker. Water temperature, absorber plate temperature, ambient temperature and solar intensity were measured. Thermal energy storage was used for evening cooking and glass cooker for faster cooking. For efficient and continuous cooking, thermal energy storage has been considered in solar cookers due to remarkable temperature fluctuations between sunrise and sunset. Naturally occurring sensible heat storages like stones with high specific heat capacity, was used as thermal energy storage medium in a box type solar cooker. Granite and medium concrete were used as sensible thermal energy storage medium. Modification of solar cooker was done where the outer ply wood box and thermal insulation was replaced with glass. Box type solar cooker was designed as per BIS 13429:2000 with outer box dimensions 550 mm×550 mm×190 mm and absorber plate with 475 mm×475 mm ×150 mm its energy and exergy efficiencies were compared with granite and medium concrete cooker having same dimensions, considering a 40 mm thickness sensible heat storage block below the absorber plate. Glass cooker have an outer dimension 491 mm×491 mm ×152mm where absorber plate dimensions maintained constant.

Keywords: Box type solar cooker, Sensible heat storage, Thermal energy storage, Modified glass solar cooker.

Technological Utilization of Footwear Industry Wastes

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Abstract

Footwear industry generates a lot of wastes every year which requires technological interventions for the safeguarding of environment. Ethylene vinyl acetate (EVA), polyurethane are commonly used polymer in footwear industry and also a lot of other plastic waste which generate a big quantum of wastes worldwide. These wastes must be recycled or re-utilized otherwise it creates lot of environmental problems. Natural rubber (NR) is an elastomer available plenty in Kerala having many industrial applications. Its cost is increasing up significantly (10 times in 10 year). Natural rubber product developing units are facing a big problem in terms of cost and quality. This project is to examine the feasibility of introducing EVA, Polyurethane, Plastic wastes, into natural rubber in a technologically viable way without sacrificing the basic qualities of NR. Different samples are prepared by varying the Phr (parts per hundreds of rubber) of EVA waste in NR matrix. Rheological examination is carried out to determine the optimum cure time. Mechanical properties of the system are studied. Differential scanning calorimetry (DSC) analysis is carried out to evaluate the performance of blend in terms of glass transition temperature and crystallization temperature. Development of a product from optimized formulation shall be tried.

Keywords: EVA; Phr ; Natural rubber; Blend; Glass transition temperature

Design and Fabrication of Stair Climbing Mechanism to Lift Load Over Stairs

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Abstract

This project deals with the design and manufacture of mechanism for stair climbing to lift load over staircase flight. Our project consists of the construction of a base and pistons to move load using compressed fluid as a medium. It is easy with the help of wheels on straight level paths carrying heavy load but it is a challenge especially in India in the case of stairs. This project offers an alternative to carrying load in buildings that do not have elevators. It is a mechanical system in which the load can be carried by an individual through a flight of stairs. The project may also be used with wheel chair to move the handicapped staff over a flight of stairs. This is a pure mechanical-based system therefore potential usage areas also include areas where electricity is not available. The project focused on both an average family's economic needs and the efficiency requirements of any industry.

Keywords: Staircase; Pistons; Elevators; Handicapped; Wheel chair

Kinetic study and pyrolysis behaviour of low-value waste agricultural biomass and online characterization of hot vapours

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Abstract

Bioenergy is the most promising and viable way for future security, whereas the main supply of energy comes from fossil fuel that is neither renewable nor sustainable; thus finding, an alternative energy source, biomass, was found to be a more effective and capable source to replace fossil fuel totally or partially. Thus, the present study addresses the pyrolysis behaviour and kinetics exploration of low-value waste agricultural biomass via TGA at manifold heating rates. Kissinger-Akahira-Sunose (KAS), Ozawa–Flynn–Wall (OFW), Distributed Activation Energy Model (DAEM), Coats-Redfern (CR), Vyazovkin model (VM), and the master plot were applied to investigate the kinetics parameters. However, real-time gas composition assessment was accomplished via a TGA-FTIR analyzer. Physicochemical results endorse its potential to be consumed as a feedstock for pyrolysis. TGA-FTIR analyzer confirmed the utmost CO_2 discharge (28.73 and 33.14%) and carbonyl products (20.60 and 29.35) for WS and CS, respectively. The average activation energy of WS and CS from KAS, OFW, DAEM, and VZ is originated to be 237.12, 186.40, 170.50, and 163.63 kJ mol^{-1} and 176.37, 170.51, 196.12, 194.91 kJ mol^{-1}, respectively. The thermodynamic study also states that biomass can be used for pyrolysis feedstock.

Keywords: Waste Biomass, Characterization, Kinetics, TGA, TGA-FTIR, Master Plots.

Design Modification of Handmade Paper Making Machine for Improving Productivity

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Abstract

Growth in population, better literacy, the need for communication and documentation, evergreen acceptability of print media and requirements for artistic works increase global paper usage continuously. Handmade paper (HMP) is a high-quality paper which is produced with the help of hand-operated paper making (VAT) machines. HMP is made generally with recycled materials like cotton waste and plant fibres such as lemongrass, corn husk, mulberry, banana etc. Hence the HMP is entirely wood-free which ensures its' environment friendliness. Each and every papermaker finds their own way to produce the handmade paper and every papermaker believes that their method is the best. This study investigates the productivity of papermaking by the VAT machine in an Indian HMP industry. The data were collected through direct observations, interviews with the employees and sampling. The study identified that the productivity was low than the standard values. Further investigations were carried out to find out the reasons for lower productivity. The major reason identified was the difficulty in operating the VAT machine. The effort to be taken by the VAT section employees are much more and the HMP making is a tedious job for the employees as they have to work with water for a long duration which reduces the employees' motivation and hence the productivity. Subsequently, a modified design of the VAT machine had been developed and the corresponding fabrication works had been carried out for commissioning the new VAT machine. The new VAT machine was tested and performance analysis was conducted. The new VAT machine reduces the employees' operating effort and hence reduces the labour turnover. The operating time was also reduced for the production with the new machine's design. Due to these improvements, an increase in productivity was also recorded. This study suggests the industry to change the remaining old VAT machines with the new VAT machines to improve productivity.

Keywords: Handmade paper; Handmade paper making machine; Productivity; Design modification.

Graphene oxide nanoparticle blended tamanu methyl ester as a promising alternative fuel for nonmodified compression ignition engine

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Abstract

The research assesses the engine characteristics powered by Tamanu methyl ester (TME) with graphene oxide (GO) nano-additives added at 25, 50 and 75 ppm concentrations. The tests were performed on the standard CI engine at different load conditions (0 % to 100%) with a rated speed of 1800 rpm. The magnetic stirrer and ultrasonicator were used to mix GO nanoparticles with TMW. The doping of nanoparticles to TME improved the performance and emission characteristics of the base fuel due to the increased surface area to volume ratio (S/V) of the nano-additives. Furthermore, the addition of GO nanoparticles increased brake thermal efficiency (BTE) and decreased brake specific energy consumption (BSEC) by 3.5 and 5.47% as compared to neat TME. As a result of the improved chemical reaction, the HC and CO were drastically reduced with the doping of fuel-borne particles in TME. In addition, the results also noticed the remarkable reduction in NOx and smoke opacity with the nanoparticle in TME because of improving the heat transfer rate within the inner layer of fuel particles. TME +50 ppm GO resulted in the shortest ignition delay (ID), while PBD+75 ppm GO resulted in the highest mass fraction burnt (MFB). According to particle size diameter (PSD) analysis, the fine nanoparticles were recorded for better performance throughout the engine load conditions. As a whole, TME+50 ppm GO nanoparticle performed best in terms of improved performance and reduced emissions.

Keyword: Nanoparticle; NOx Reduction; Tamanu Methyl Ester; Surface area

Effect of process parameters on production of biochar from biomass waste through pyrolysis: A review

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Abstract

One of the potential energy sources which serve as an alternative to fossil fuels, biomass, due to its high carbon content, transforms into high energy biochar through a thermochemical process. Pyrolysis has emerged as one of the most pivotal techniques to carry out a thermochemical study, which yields high-energy biochar along with bio-oil and syngas as a by-product. Biomass composition such as moisture, cellulose, and lignin content influences the assembly of biochar from biomass. The pyrolytic product quality and its standard greatly depend on process parameters such as temperature, residence time, heating rate, etc. Based upon the origin of raw materials, various biomasses are categorized and studied. Thus, the present review emphasizes a holistic view of biochar, production from feedstock, engineering production strategies, its applications, and future prospects. This article reveals a systematic emphasis on the continuation and growth of biochar and its production methods, such as physical engineering, chemical, and bio-engineering techniques. Also, biochar alternatives such as nutrient formations and the surface area made it a promising cost-effective source of carbon-based products such as gasification, pyrolysis, and hydrothermal liquefaction, commercially available wastewater treatment, energy storage devices, microbial fuel cell electrodes, nanotubes, and super-capacitors repair have been reviewed. This paper also covers the in-depth strategies and ideas for future work.

Keywords: Biomass, Thermochemical conversion, Pyrolysis, Process parameter, Biochar.

360 Degree Flexible Drilling Machine

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Abstract

Nowadays, the drilling machine is developing very fast with more uses and application. In basic drilling machine, the machine work in particular direction which is the limitation in this machine. And there is more problem like space between the drill and job is very less. In this project we are working on the flexible drilling machine which can work in any direction and can be adjust as per choice. And drilling machine work automatically that can make work easier and can done more accurately. It is mounted on the flat surface as like table which can rotate in any direction, move up and down. It will reduce the setting time and capital for the operation. And in this drilling machine, we use permanent magnetic chuck which is attached to drilling machine.

Keywords: 360 Degree; Flexibility; Drill bit; Rotation; Arms; Motor;

Design and Development of Magnetic Floor Chip Sweeper

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Abstract

Magnetic Floor Chip Sweeper is useful for quick cleaning of dangerous ferrous scrap metals which include iron chips, shavings, nails, nuts, screws, tacks, barbed wire and staples in various industries. Strong permanent ceramic magnets have been used in this device. An adjustable spring-loaded handle with a quick release discards all items picked up in the proper place. A strong magnetic base has been used to pick loose nails and screws. The parts of the chip sweeper are frame, separator sheet, magnet, magnet housing, wheels and lever. This heavy-duty Sweeper can be used on concrete, carpet and even grass surfaces. This product can have the capability to detect as well as move in direction of dust and thus resulting in better cleaning of floors. As a whole this is a successful product developed that can be used in current Indian scenario.

Keywords: Magnet; metal chips; frame; magnet housing; telescopic rod; levers

Assortment and Study Performance of Steam Trap in Process Industry

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Abstract

Steam trap is the most important link in the condensate loop because it connects steam usage with condensate return. The function of steam trap is to discharge condensate while not permitting the escape of live steam. For the efficient usage of steam inside the process equipment, the steam should be kept inside the device until the complete steam is transformed into condensate. For this to be happen the steam trap functioning will be in perfect condition. The main objective of the study is to analyse the operating characteristics of the presently installed steam trap and their effects on the efficiency of heat transfer in their respective process applications. From the study it may clear that trap failure may be of two live steam to discharge and steam leak. Trap failure may also result in the water logging of heat exchangers of textile processing units. All these may result in excessive steam usage and it directly have an economy impact. This thesis work is an analytical study of steam traps to improve the steam system efficiency.

Keywords: Condensate return, Steam System, Steam Trap.

Application of integrated Lean Six Sigma quality healthcare system practice in Indian healthcare

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Abstract

Integration of continuous improvement methodologies has gained momentum and international fame on improving healthcare performance. However, there is an individual methodology not gained due to dynamic conditions in the marketplace. The study investigates the impact on the integration of Lean, Six Sigma (DMAIC) and TQM concepts in the Indian healthcare sector to maintain its sustainability. The integrated Lean Six Sigma quality healthcare system (ILSSQHS) was developed under ten critical success factors (CSFs) through extant literature review and from experts' opinions. The purpose of this ILSSQHS model is to assess the performance and quality of care in private hospitals in India. Data were analysed by performing statistical analysis using SPSS. This study revealed that CSF leadership management commitment is higher in rank and healthcare operational effectiveness seems lower rank in the healthcare. The result revealed that all CSFs are found a significant and positive association with ILSSQHS practice as perceived by healthcare managers.

Keywords: healthcare; hospitals; lean; Six Sigma; quality; India; integrated Lean Six Sigma quality healthcare system; ILSSQHS model; critical success factors; CSFs.

A comparative Analysis of exergy using engine performance results based on a dual blend of Cotton seed & Simarouba oil and Vateria Indica Blends in a four-stroke single cylinder Diesel engine

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Abstract

Scarcity in petroleum fuels along with pollution concerns has led to the search for alternate fuels. In this present work, an attempt is made to transesterify cotton seed and Simarouba oils to produce the corresponding biodiesels. The esterification and transesterification was carried in the presence of heterogeneous catalyst MgPO4. The various properties of the biodiesel are determined in the laboratory. Vateria indica is a species endemic to India belongs to Dipterocarpaceae family. The oil of Vateria indica is obtained by aqueous extraction method this oil is transesterified to obtain the biodiesel by two step process of esterification followed by transesterification. This biodiesel is blended by the volumetric proportions of 10% and 20% with diesel. The cotton seed and Simarouba biodiesels are blended in equal proportions with petro diesel and tested for performance and exergy analysis along with Vateria indica blends. It is found from performance and exergy analysis blends of biodiesels performed better compare to diesel.

Keywords: Trans-esterification; Cotton seed oil; Simarouba oil; Vateria indica oil; Blend; Exergy

Biodiesel Production Using Catalyzed Transesterification

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Abstract

Biodiesel is an alternative fuel mainly produced from vegetable oil or animal fats. It is a renewable substitute of regular fuel. As a replacement of petroleum fuel it is much cleaner alternative. Its physical components are much similar to diesel fuel. Renewable sources are used to create biodiesel. Sources like new or used vegetable oil and animal fats are not toxic and can be broken down by living organisms using a special process. To complete the process an alcohol, mostly methanol is used to create a chemical reaction with these oils and fats. After the reaction, we get a new liquid substance called fatty acid methyl esters. We call it biodiesel when we use it as fuel. Waste coconut oil is used as bio fuel in this project. It is used directly or can be mixed with diesel as a blend and is used to find the performance of four-stroke diesel engine.

Keywords: biodiesel; fuel; waste coconut oil; methanol

Investigation and Characterization of different Biodiesel from Non-edible Vegetable Oils of Indian Origin

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Abstract

Over the past few years, scientists across the country have been revolutionizing the future of fuel. Vegetable oils have the potential to be used as an alternative fuel. Vegetable oils are produced in India from a variety of oilseed crops. Several vegetable oil methyl esters have been examined and determined to be appropriate for testing in diesel engines in different parts of the world. The higher viscosity, lower volatility content, and polyunsaturated nature of different oils are the most harmful characteristics. Converting different vegetable oils into biodiesel is the most common way through transesterification. Transesterification of vegetable oils produces biodiesel fuels, which are primary methyl esters. The characteristics of methyl esters obtained from certain non-edible vegetable oils available of Indian origin (kukui nut, kusum, and flaxseed) have been examined in the current study. The viscosity of these oils is dramatically reduced when they are converted into their methyl esters, ranging from 6 to 14 cSt. The esters, as well as pure vegetable oil and mineral diesel, were tested for viscosity at temperatures ranging from 40°C to 100°C on a Redwood viscometer multiple in accordance with ASTM standards D445. Flash point, specific gravity and Fire point of neat kukui nut oil, kusum oil and flaxseed oil and their methyl esters were also reported in this investigation.

Keywords: Biodiesel, Viscosity, Transesterification, Flash point, Specific gravity

Growth kinetics of Spirulina platensis cultured with agro-industrial wastes.

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Abstract

Biorefinery is a concept with relevance in bioeconomy, that refers to the transformation of biomass in products with high commercial interest. For that reason, several investigations propose microalgae biomass as a new source of products to be used in the energetic industry (as feedstocks for biofuels), foods, and cosmetic industry for its high added value compounds. The conversion yields of these products obtained from microalgae species depend on inducing stress and adapting certain cultivation strategies. There are several factors that affect the growth such as the concentration in the medium such as carbon, phosphates, and nitrogen sources. According with the above, this study shows how culture mediums can be improved for more *Spirulina platensis* biomass production, measuring the growth of microalgae, using different culture media: agro-industrial residues and culture medium in photobioreactors at the laboratory level. When Spirulina platensis was cultivated in Zarrouk medium the pH shows a behavior variable, increasing the pH. This increase during the culture, inhibits the growth of *Spirulina platensis* biomass, so the growth rate was evaluated by adding a buffer that not only lowered the pH value, but kept it constant and at the same time, improve the kinetic, increasing the speed of growth. In another hand, this growth was compared with the obtained using hydrothermal treatment eluents from agroindustrial agave and sargassum residues. This last method produced better results in crops that containing 20% of sargassum in their composition.

Keywords: Biorefinery; circular bioeconomy; microalgal Biorefinery; Spirulina platensis; agave; sargassum.

Analysis of DC Magnetron Sputtering Coated Inserts in CNC Machining process

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Abstract

Machining is the process of cutting or removing materials from a work item with a cutting tool to get the desired form. Computer numerical control (CNC) machines play an important role in all kinds of manufacturing industry. CNC type machines are very effective in the precision when compared to manual lathes These complex machines are controlled by a computer and provide a level of efficiency, accuracy, and consistency that would be impossible to achieve through a manual process. CNC machining can be defined as a process in which pre-programmed computer software dictates the movement of factory machinery and tools. As a result, manufacturers can produce parts in less time, reduce waste, and eliminate the risk of human error. The major objective of this work is to extend the life and quality of the cutting tool by improving its hardness and wear resistance by using DC Magnetron Sputtering to coat a one micrometre thin film layer of Tungsten carbide on it. HSS insert is to be characterized for chemical composition, micro structured, grain distribution and surface hardness, etc. Further studies on this, coated insert for its corrosion behavior using salt spray method and wear behavior using a pin on disc machine are to be carried out.

Keywords: Sputtering; Substrate; Target; Buffing; Machining;

An Extensive Review: Machining Investigation, Cooling Technique of Hard Materials in a State of Hard Turning with Regard to Environmental Issue

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Abstract

In recent times, hard turning is being preferred over grinding for machining of hardened steels. The hard turning has many benefits over the grinding process such as higher material removal rate (MRR), economical, reduces setup time and environment friendly. Now a days, environmental concern is also a major issue which has been taken into the consideration while performing any manufacturing process. There are some more issues which need to be focused and discuss such as heat generation, tool life, minimization of cutting fluid usage, behavior of work material, cutting tool materials and surface finish. Environmental and health hazards associated with the use of conventional cutting fluids and government regulations have resulted in higher machining costs. The motto of this research paper is to do a thorough review of the advancements in the machining processes of hard materials. In addition, different cutting fluids are reviewed, and environmental concerns about their usage in metal cutting industries were discussed. Researchers have worked upon numerous aspects related to hard turning and have come up with their own recommendations to overcome these challenges.

Keywords: Hard materials; cutting fluids; hard turning; MRR; cutting tool

Inundation Kit

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Abstract

Flooding has been one of the major experiencing during rainy seasons and times of great typhoons. The project's purpose is to design a device that will enable cars to float and reduce risk of damage of vehicles in the midst of flood. This system consist of an inflatable bag integrated with rain sensors, blower, relay switch, Off- delay relay, valve tube which in combine to form a floating setup for automobiles. This will allow reducing the water damage caused to the mechanical parts.

Keywords: Flood; Rain sensor; Blower; Inflatable bag.

Accuracy Enhancing Techniques for Electric Demand Forecasting in Smart grid

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Abstract

In modern power systems, smart grid has developed as a promising technology to facilitate the future electric power grid and to balance supply and demand .The alternating nature of distributed energy resources causes dynamic uncertainties and non-linearity in the smart grid environment. This results in power imbalance in generation as well as distribution. Hence demand forecasting plays an important role in accelerating the operation of the future smart grid. In this paper we review and compare different load forecasting techniques used in short term forecasting, medium term forecasting and long term forecasting. The parameters like weather, air temperature, wind speed, types of loads that affect the load forecasting are also considered .Several methods like machine learning techniques, time series analysis, Support vector regression, Decision tree, linear regression, fuzzy sets, deep learning models, and hybrid models of AI and ANN are also employed in this review to depict the best and accurate load forecasting technique.

Keywords: Demand forecasting; Artificial Neural Networks; AI, Short term forecasting; Medium term load forecasting; Long term forecasting.

Design and Analysis of Two Cavity Mould and Four Cavity Mould for Auto Part (Lever)

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Abstract

In today's Injection mould industries, the designing of components and injection mould are constantly upgrade as per the needs of the customer, to achieve a good rate of profit, continuous improvement in processing, etc. Therefore, efforts were made to design the two injection moulds with the suitable 3D-CAD software. It was decided to study two cavity mould and four Cavity mould for Auto Part (Lever) which are used in automobile industries. Further the analysis work using the CAE software was also carried out for two cavity mould and four Cavity mould for Auto Part (Lever). The purpose of the study was to find out the suitable design of injection mould for the selected parts in terms of processing parameters. It was observed that gate positions have been different in two cavity and four cavity mould which eventually affects fill time, it is being also observed that fill time of four cavity mould is less than two cavity mould. Average temperature observed in four cavity is little bit more than as compared to two cavities, but at the same time temperature variance is less in four cavity which provides better results. Better quality is predicted in four cavity mould and higher injection pressure is also observed in four cavity which provides better packing. Mold flow Analysis comparison between four cavity and two cavity mould suggests four cavity mould would work better with better part quality and in similar cycle time.

Keywords: Two cavity Mould; Four Cavity Mould; Mould design; CAD; CAE; Injection mould machine

S-SMILE model: A leveraging mechanism to polarize performance in small and medium enterprises-an empirical study

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Abstract:

The economic development of a country is mostly based on manufacturing industries, wherein the role of the SMEs in manufacturing industries is considered to be more vital. The SMEs, which mostly depend on large manufacturing industries, are not able to sustain, hence could not achieve any long-term benefit. To address this issue, a novel effort is made to achieve long-term benefits by implementing the Lean concepts in Indian SMEs by deploying a research instrument to measure performance. This paper has been designed to analyse the performance of SMEs in India by a newly developed model, namely system for small medium implementing lean enterprises (S-SMILE). The model comprises of 12 critical success factors (CSFs) with 71 variables, which are analysed and validated through the perception of managerial executives. The results showed that the 12 CSFs of the S-SMILE model have a structural relationship and support the implementation towards attaining the performance.

Keywords: System for small medium implementing lean enterprises model; S-SMILE model; lean manufacturing; critical success factors; CSFs; small and medium enterprises; SMEs; performance.

Design and Fabrication of Automated Pepper Separator Integrated with Dryer

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Abstract

In this project we fabricate a machine for the purpose of threshing the peppers. In many industries even now the peppers are separated manually. Due to this manual process in industries there is wastage of money and time. In order to avoid this wastage we have designed the following model called pepper thresher machine. This is an advanced and easy process to separate pepper from the plant. In this process we do not need any high electrical supply to operate the machine. This model has the following parts in it Rotating drum, a hopper and cam operated tray arrangement. we introduce through our project is mainly useful for drying grounds such as seeds, fruits, In our project, the air dryer consists of two main parts such as heating element and dc Fan . The dc Fan is used to passing the hot air to the materials, so that the moisture contents in the material was removed. The size of our project is also portable. So we can move the air dryer to any place very easily.

Keywords: Thresher machine; DC Fan; Rotating drum; Air dryer.

Pyrolysis of Plastics

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Abstract

Over 1.3 billion metric ton of plastic is being manufactured every year to meet the demands of modern world. This paper deals with the production of fuels by burning plastics in the absence of oxygen. The process of producing fuels by heating plastics in the absence of oxygen is called pyrolysis. The type of plastic used is LDPE (Low Density Polyethylene) as its structure is easy to break. LDPE is used because this type of plastics are used everywhere and is left without being recycled and creates a major problem to the environment. So the used plastics are collected and brought to this process. The experimental setup consists of a reactor, a condenser, heater or burner and pipes.

Keywords: Pyrolysis; LDPE; Reactor; Condenser; Naphtha; Diesel Fuel

Electrical power generation using railway track

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Abstract

Non-conventional energy using railway track needs no fuel input to generate the output of electrical power. In our project we are generating electric power by simply running the train on the railway track. This project uses simple drive mechanism such as rack and pinion assembly and chain drive mechanism. The control mechanism carries the rack and pinion, D.C generator, battery and inverter control. When a train moves over the track, the flap deflects in downward direction due to the load exerted by the train's bogies. The flap is moving in a downward direction the spring which is attached to flap get compress in downward direction and hence rack is also move in downward direction and due to these pinion get rotates and therefore bigger freewheel rotated because both are mounted on same shaft. As there is a rotation of bigger freewheel then the smaller freewheel is also rotated through chain drive. The freewheel and flywheel are mounted on same shaft therefore the flywheel also rotated. The flywheel is attached to the shaft of the generator so if the flywheel will rotated then there is a rotation shaft generator and power get generated and that power is stored into the battery. The generated power can be stored into the battery and used to power track side equipments. The proposed system will be designed for power applications for major track-side equipment such as warning signals, and lights.

Keywords: Non-conventional energy, Power generation, Railway track

Design and Mechanism of Automatic Robotic Arm

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Abstract

In the present age each one favoured to do things effortlessly in a rapid way. Everything connected with androids and smart gadgets. The manufacturers wants' their products are easy to be used by the customers even though if they don't have a certain level of technical knowledge. By considering these the project focused on an automatic robotic arm which performs effectively repetitive works based on the instructions given by the user by dumping a specific program. This robotic arm is controlled by an android. This robotic arm motion is restricted or constrained by using 6 controlled motors. It is a 4 - axis robotic arm having motions upward, downward, right and left. The robotic arm and android are interrelated wirelessly by using a Bluetooth module. These are programmed through an Arduino mega controller. It is mainly designed for the function of pick and place of objects as guided in the program.

Keywords: Efficient repetitive work, Arduino mega controller, Bluetooth module, Servomotors, Smart phone

Mechanical Footstep Power Generation

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Abstract

Now-a-days energy and power are the one of the basic needs in this modern world. Energy demand is increasing day by day. On the other hand, the many energy resources are getting exhausted and wasted. Proposal for utilization of waste energy of foot power with human locomotion is very relevant in populated countries like India where roads, railway stations, bus stands, temples, etc. are overcrowded and millions of people move around. This whole energy is wasted. If this energy made possible for utilization it will be a great invention. In this project we are converting non-conventional from just walking foot step into electrical energy. This project uses simple drive mechanism such as rope and pulley assembly. The control mechanism carries the rope and pulley, and D.C generator to output. In this project we are generating electrical power as non-conventional method by simply walking or running on the footsteps. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step needs no fuel input power to generate the electrical power. In this project the simple drive mechanism such as rope and pulley assembly and ratchet lock mechanism is used for generating power by utilization of force which is obtained during the walking on steps is converted in to electrical energy with the help of mechanical systems. The generated power is stored by means of battery and this is used for activating the connected loads. This is one of the compact and efficient systems for generating electricity which can be easily installed in many regions.

Keywords: Mechanical footstep, power generation, rope and pulley mechanism, ratchet lock.

Design and manufacturing of solar powered lawn mower

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Abstract

Fossil Fuels are depleting day by day, along with increase in fuel prices. The effect of emission of harmful gases in the atmosphere is also a major factor. Thus, we have to use renewable energy sources as it doesn't produce any toxic gases in the atmosphere. This paper therefore focuses on the exploitation of the abundant solar energy, gotten from the sun to drive a lawn mower. A solar powered lawn mower was designed and developed, based on the general principle of mowing. The designed solar powered lawnmower comprises of DC motor, a rechargeable battery, solar panel, stainless-steel blade and control switch. Mowing is achieved by the D.C motor which provides the required torque needed to drive the stainless steel blade which is directly coupled to the shaft of the D.C motor. The solar powered lawnmower is operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. The battery recharges through the solar charging controller. In designing the cutting blade, the force required to cut the lawn motor as well as the force acting on the blade was considered. Performance evaluation of the developed machine was carried out with different types of grasses.

Keywords: Solar lawn mower, Grass cutter, solar charge controller, Solar operated

Analysis of Mustard Oil and Castor Oil using as Lubricant

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Abstract

Vegetable oil has been investigated to displace products which are derived from petroleum because of its environmentally safe properties and has become a vital source for bio-lubricants. Vegetable oil availability as one of the renewable sources is one of the usefulness of it. Additionally, vegetable oil-based lubricants have indicated the potentials for reducing carbon dioxide and hydrocarbon emission while operating in internal combustion engines and in industrial processes. In this study mustard oil, Castor oil and the combination of both with different proportions such as blends compared with any conventionally used mineral oil like SAE 20 or SAE 40 etc. This study mainly focused on chemical analysis, physical analysis and thermal analysis. Mainly mustard oil and castor oil shows moderate cloud and pour point. Therefore, their blend also to use for the study.

Keywords: Mustard oil; castor oil; lubricants; Vegetable oil

Experimental and Analysis study on Formability, Spring back and Thinning effect using U and V Bending die

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Abstract

In latest revolution in automobile industry, more emphasize towards fuel efficiency and reduction of weight. In this concern, aluminium alloys are majorly used to replace heavy material into light material without affecting strength of the assembly. Press tool manufacturing is one of the widely emerging trends in the production area. Basically, sheet metal components are produced using a press tool. The spring back, thinning effect and formability in V and U bending operation plays vital roles with parameters like punch angle, punch velocity, sheet thickness, etc. In this research work, comparison has been made between experimental result and analytical result using V and U bending die components. In this study, Aluminium (Al) 2024 is used to investigate the effect of different punch angle, punch radius and different thickness via experimentally and analysis using V Bending die. In U Bending die, the same process has been followed except change the punch angle. Therefore, to find out how spring back, thinning effect and formability will be affected by these factors in different aluminium grade material then the graphical representation will be done. Furthermore, analysis CAE has been done for the analytical results and then its values have been compared with the actual trial to get the verified results to prevent the manufacturing defects and optimize the quality of the component produced. It was concluded that the experimental and analytical result were having accuracy of above 90% in both U and V bending die.

Keywords: Al 2024; Tool Design; U Bending die; V Bending die; spring back; thinning effect

Concentration and Co-Ordination Exercise Tool

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Abstract

The invention related to the psychology, pedagogy, medicine and physiology. The aim of the experiment is to check and improve the level of concentration and the level of brain-eye-hand coordination among children by daily practicing Concentration and Coordination Exercise Tool. Exercising the brain regularly is one of the easiest and most effective ways to reduce the symptoms of mental retardation and other disabilities. A quantitative method was adopted for the study. The tool used was Concentration and Co-ordination exercise tool developed by Coexin Technologies Healthcare Private Limited which was standardized in normal population. The apparatus were administered to a group of 60 children whose age were ranging from 5-18. There were different type of strings were used for the study. Karl Pearson's Product Moment Correlation and paired samples t- test was used to analyze the collected data. The research reveals that there is significant difference between pre-test and post-test of time and error in design strings and there is a significant level of improvement in concentration and coordination among children after the exercise of CCET for 21 days. Also the research showed that the memory got enhanced, hand writing improved, self-confidence improved, concentration improved and coordination improved.

Keywords: Concentration; Co-ordination; Fine Motor; Co-ordination Apparatus

Multi Purpose Pipeline Robot

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Abstract

Underground pipelines are the only solution for the water supply problems. Most of the drinking water projects in Kerala depend on water bodies like ponds and rivers. The water has to be carried to places kilometers apart through the underground pipelines. Especially during summer when the scarcity of drinking water felt, these water supplies should not be blocked. Also it's a fact that the purity of pumped water will be low during summer. This will result in increased amount of mud and soil contents in the pumped and transported water. Also the movement of water results in the gradual removal of the corrosion resistant coating provided in the pipe. All these ultimately lead to the destruction of the pipe. Since the diameter of the pipe is less than half meter and it's buried under the soil, it's impossible for humans to do the job. MULTI PURPOSE PIPELINE ROBOT is a remote-controlled robot which can go long distance through the pipe, clean it and apply coating so as to prevent rusting of the pipe material. It is necessary to remove the salt deposition in the pipeso as to maintain the flow pressure and discharge. It also detects internal cracks in the pipe. So we can eliminate or minimize fluid leakage. Proper and regular maintenance will avoid the risk of leakage and failure of pipe.

Keywords: Pipeline Robot; Crack Detection; Cleaning Mechanism, Coating Mechanism

Automatic Ladder

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Abstract

A common ladder is a very useful equipment we are using in our daily life. Our product 'the automatic ladder' is a substitute for older ladder and we can carry some weight to the upstairs and also unload those products automatically. This Automatic ladder is very useful for small purposes. We can also make this design in larger size can be used Can be used in commercial purpose like constructions .There are many accidents are occurring from an ordinary ladders while climbing with weight. But using our automatic ladder can able to prevent such accidents .This ladder can reduce human effort and make our small works more convenient.

Keywords: Ladder; Portable; Construction; Automatic unloading.

Intelligent & Secured Notary System Using Blockchain

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Abstract

In a traditional notary system process, the correctness of the activities between the parties is guaranteed by a central authority or guaranteeing institution. The traditional notary system has its own limitations like non-preservation of the notary documents. The literature review shows us that a notary system can be implemented using Blockchain. Blockchain helps to decentralize the centralized task. The work in this paper aims to create a Blockchain-based Notary system that can generate certificates with a digital signature. The use of an interactive agent is used for user convenience. This prototype also provides users to access information in their preferred regional language and not just English. This blockchain-based prototype provides the facility to save the documents by using MongoDB hence preventing the duplication of the notary along with additional data security to the end-users. A speech recognition feature is also added in order to make this prototype accessible to the end-user in their spoken language.

Keywords: Blockchain, Artificial Intelligence, Smart Contract, Notary system, Encryption Database, Interactive Agent, Speech recognition, Multi-Lingual.

Production of cellulose using macroalgal biomass in terms of biorefinery: high-pressure water pretreatment and effect of enzymatic hydrolysis

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Abstract

Macroalgae are third-generation biomass in the concept of biorefinery. *Sargassum spp*. found on the coasts of México country as accumulated biomass that can be potentially used as an alternative for bioethanol production by their rich polysaccharides content, going through processes such pretreatment and enzymatic hydrolysis. Pretreatment and enzymatic hydrolysis are processes to fractionate the algae biomass into the glucan to become more accessible cellulose and the use of enzymes convert them into their monomeric form to obtain fermentable sugars. The objective of the experimental section was to perform pretreatment and enzymatic hydrolysis of *Sargassum spp.* Sargassum was pretreated by a hydrothermal reactor carried out at 190ºC for 50 min in a 300 mL reactor work volume and this was used as a substrate for enzymatic hydrolysis. The EH assays were performed in flasks with a working volume of 25 mL, with cellulase/hemicellulase enzymes Cellic CTec 2 in combination with Cellic HTec 2 at a ratio of 1:1 and 1:2 (v/v) and a solid loading rate was 10 FPU/g glucan. The supernatant concentration (glucose) was analyzed by HPLC to calculate saccharification yield. The hydrothermal pretreatment effect in pretreated biomass was obtained 34.89% of glucan a dry basis. In enzymatic hydrolysis a concentration of 0.69 g/L of glucose was liberated from (control) non-pretreated biomass, while enzymatically hydrolyzed biomass with Cellic CTec 2 and Cellic HTec 2 (1:1 and 1:2) glucose concentrations increased with pretreated biomass obtained at 34.28 g/L and 44.81 g/L, respectively corresponding to 82.51 and 99% saccharification yield. The combination of enzymes increases the fractionate algae fiber porosity to be more available for the cellulases to act the EH and obtained glucose from *Sargassum spp*. This macroalgae can be considered a raw material in the development of the third generation of biorefinery.

Keywords: Sargassum; Bioethanol, Biorefinery; Hydrothermal pretreatment; Enzymatic hydrolysis

Briquetting of Biomass

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Abstract

Generally, briquette manufacture (briquetting) involves the collection of combustible materials that are not usable as such because of their low density, and compressing them into a solid fuel product of any convenient shape that can be burned like wood or charcoal. Thus the material is compressed to form a product of higher bulk density, lower moisture content, and uniform size, shape, and material properties. Briquettes are easier to package and store, cheaper to transport, more convenient to use, and their burning characteristics are better than those of the original organic waste material. The raw material of a briquette must bind during compression; otherwise, when the briquette is removed from the mold, it will crumble. Improved cohesion can be obtained with a binder but also without, since under high temperature and pressure, some materials such as wood bind naturally. A binder must not cause smoke or gummy deposits, while the creation of excess dust must also be avoided. Two different sorts of binders may be employed. Combustible binders are prepared from natural or synthetic resins, animal manure or treated, dewatered sewage sludge. Noncombustible binders include clay, cement, and other adhesive minerals. Although combustible binders are preferable, noncombustible binders may be suitable if used in sufficiently low concentrations. For example, if organic waste is mixed with too much clay, the briquettes will not easily ignite or burn uniformly.

Keywords: Briquetting; Compression; Binder

Plastic Brick Manufacturing Machine

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Abstract

We aim at design and fabrication of a Plastic Brick Manufacturing Machine which brings down the recyclable plastic wastes. Demand for building materials is going up tremendously day-by-day in view of the ever-increasing requirement of housing and habitat sectors. Such a crisis prompted the researchers to re-orient themselves so as to evolve a new technology to manufacture appropriate masonry products, using locally available low-cost materials. The plastic products that we mostly use are non-bio degradable and hence after use, these are ultimately used for filling our landfills. Attempting to reduce the quantity of plastic wastes we decided to fabricate a plastic recycling machine. In this connection the fact that the demand for bricks for housing and general construction purposes is on the rise. Thus, it was felt that fabrication of a machine for manufacturing bricks by using plastic waste as one of its components will reduce plastic waste to a great extent and at the same time, we will also get a good building material for construction purpose.

Keywords: Plastic brick; Land fills; Building material; Fabrication; Recycling machine

Gross Motor Co-Ordination Diagnostic and Exercise Tool

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Abstract

The invention related to the psychology, pedagogy, medicine and physiology. The invention is a Gross Motor Coordination Diagnostic and Exercise Tool. The present inventions used to measure the level of gross motor co-ordination and concentration of humans. Also this instrument helps to improve the concentration, gross motor coordination, self-confidence, memory enhancement, develop body balance and improving ability to focus by daily practicing.. This is a task given electronic device as there will be a Light Dependent Resistor (LDR) is placed at the centre of tool and 10 Red LEDs are placed around the LDR to indicate the failure. When laser light falls on the LDR it senses the light and starts counting time in seconds. If the light fails to fall on the LDR, it shows error while the red LEDs will glow accordingly and the time will be shown in the display. By using the interpretation table a person can assess their level of gross motor co-ordination and concentration with the standardized values. The research reveals that Gross Motor Co-ordination Diagnostic and Exercise Tool shows a highly reliable to measure the level of Gross motor co-ordination and concentration and also it is highly reliable in improvement of gross motor coordination, concentration , enhancement of memory power, self-confidence, sports skill, develop body balance and improving ability to focus.

Keywords: **Concentration; Co-ordination; Gross Motor; Co-ordination Apparatus**

A Broad Review on Defects Using Different Sheet Metal Operation

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Abstract

During the production of sheet metal components using any cutting and non-cutting operations, to find out the prediction of defects is major challenge in various industries such as automobile sector, marine, aerospace, transportation etc. In sheet metal forming operation, there are involved various variables which is affecting the components. In many research work, developed the different types of models for predict the defect in sheet metal forming operation. In this study, an extensive review of previous literature based on the prediction of defects and their reduction procedure has been studied. Burr formation, springback/spring go effect, thinning, scoring marks, wrinkling effect etc. are the common defects of sheet metal operation. In this study, different processes were defined that how to eliminate the defects from the component. Many researchers were studied the prediction of defect using experimental and analytically approaches. This paper also explained how finite element analysis technique was very useful to estimated of defects in numerical values. It is also observed that blank profile, sheet material, lubrication friction, temperature, speed of drawing and drawing force can significantly affect on the result. The forming parameters and their characteristics which is having great impact on sheet metal forming operation were explained.

Keyword: Forming operations, Defects, Finite element analysis, Machine parameters, Drawing die, Bending die

Advancement of Additive Manufacturing Technology in Development of Personalized Implant Devices

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Abstract

The design and development of orthopaedic implants using additive manufacturing technology has created a new pathway for the medical healthcare sector. Using computed scanning technologies, the produced images were transformed to three dimensional digital models. This improvises the patient anatomy and paves future ways in enhancing rapid production in human implants. Every human is unique, which implies every orthopaedic patient needed personalized and customized implant solutions. Currently, pre-designed standard implant models were using for arthroplasties. It witnessed a surge in the failure rate during post-surgical studies. Improper fixation and bone breakage are considered primary reasons of failures with a failure rate of 40% and 20%, respectively. These issues can be kept at bay by developing more closely matches customized implants. Recently, designs of orthopaedic scaffolds were customized and manufactured. This in turn induces a nose dive in the failure rate and enhances human physical health. High precision and easy printable methods on complex structures using biomaterials has influenced the next generation of healthcare sector. Herein, aims to summaries the current innovations, limitation of developing customized implants and future application of additive manufacturing in the medical field. The study also includes the development of human implants, and tissue engineered scaffolds.

Keywords: Additive manufacturing, Medical implants, Scaffolds, stents, Orthopedic, healthcare, scanning devices

Barriers to Implementation of Industry 4.0 in the Developing Countries

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Abstract

Technological advancements in the industrial processes sped up the industrial revolutions and the fourth industrial revolution i.e., Industry 4.0 (I4) had been originated in the year 2011. The first industrial revolution was focused on the mechanisation of equipment, while the second industrial revolution was focused on achieving mass production with the help of electrical-based systems. The third industrial revolution brought partial automation through the improvements in electronics and communication whereas the fourth industrial revolution helped the industries to become autonomous (i.e., working with least manual interferences) with the support of data science, artificial intelligence and internet technologies. I4 helps in gaining sustainable development and competitive advantage for all the industrial enterprises globally. This study identifies that the industries are adopting I4 concepts at a slower rate in developing countries like India when compared with the developed countries. Especially, implementation of I4 in micro small and medium (MSME) sector industries takes place at a much slower rate. The reasons identified were the lack of awareness of I4 and its' benefits, fear of capital investment requirements, non-availability of technology/ advanced systems, non-availability of skilled employees/ consultants, and lack of support from the stakeholders. The study emphasizes that the government and/ or the industrial consortiums should make aware the industrialists regarding I4 concepts, especially in a region with ascending demographic development, which will bring the successful and sustainable future development towards the 4th industrial revolution.

Keywords: Industrial revolutions; Industry 4.0; MSMEs; Sustainable development.

Briquetting Machine

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Abstract

The study presents a detailed design study of the new briquetting machine called biomass briquetting machine. Briquetting of the saw dust represents one of the possible solutions to the local energy shortages in many developing countries. Briquetting of the saw dust represents one of the possible solutions to the local energy shortages in many developing countries. It constitutes a positive solution to the problem of increasing rates of desertification in many areas worldwide. The production cost was found to be lower due to the lower binder requirement for the new machine. The densification of raw material into fuel briquettes is one of the routes to convert biomass into energy. This method provides uniformity to the solid fuel, better physical and energy properties, facilitating its storage and transport, in addition to more homogeneous combustion. Given the importance of these characteristics, this work presents a literature review, emphasizing the experimental levels of the variables of the briquetting process, as well as on the most relevant quality parameters for obtaining briquettes. We also carry out a survey of the main technologies used in the production of briquettes, as well as the experimental methodologies and statistical analysis used in the planning and validation of processes.

Keywords: Briquetting; Agro waste; Biomass; Manually operated.

Simulation Study of LPG Cooking Burner

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Abstract

Cooking stove is the popular household cooking device that is widely used in these days since it is easy, safe to use, and affordable. For each burner, they have their-on identical flow of flame, and the energy of flame is also different for different flames. The objective of this paper is to simulation study of the flow feature of an energy-saving cooking burner using three dimensional computational fluid dynamics (CFD). The CFD data of the flow analyses take here. This study shows the different ways of flame came out from burner with different angles or by increasing or decreasing the holes diameter, by this we can find the best condition for a burner to better output flame. In this project, we will be virtually analysing the effect to change in diameter and rearrangement of holes on the burner to study the flow pattern to establish the highest heat transfer rate

Keywords: CFD; Thermal efficiency; Flame; Combustion

Robotics Using Artificial Intelligence in Dentistry

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Abstract

AI is a next-generation technology that has already aided the medical field in achieving new frontiers. AI has given lives to the machines which are now more capable than a surgeon to operate on a living being. The use of such living machines in Dentistry has enhanced the accuracy and precision of the treatments and has reduced the chances of errors. Robotics systems continue to support doctors in the medical field with assistance in the cardiac space, orthopaedics, and neurosurgery. However, robotic systems have not as yet been altogether acquainted with dental research nor have they accomplished expense adequacy and innovative status to be completely fused into the dental market. In this paper, we will discuss Robotics & AI and their combined application in various fields of dentistry. We will also be discussing the AI technologies which are used to assist dentists.

Keywords: Artificial Intelligence; Artificial Neural Network; Dentronics; Dental Robotics

Hydrothermal hydrolisys on spirulina platensis to evaluate the obtaining of carbohydrates and proteins

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Abstract

Hydrothermal process is a promising technology for a microalgae biorefinery since this technology takes advantage of the moisture content in microalgal biomass and the water in culture medium to break down the cell walls and releasing the biocompounds inside microalgae biomass. *Spirulina platensis* was cultured in synthetic wastewater with an air flux of 373 ml/min, a light intensity of 72 umol/m^2 s, and at room temperature. It was harvested on 16 days and its final concentration biomass in culture was of 1.558 g/L. The hydrothermal hydrolysis of *spirulina platensis* was made at 120, 140, 160 °C by 15, 30, 45, and 60 min. The thermal degradation kinetic shows that the higher carbohydrates concentration was obtained at 140 °C on 30 min (316.80 mg/L) and the higher proteins concentration was obtained 120 °C on 30 min (215 mg/L). These results reveal that hydrothermal treatment is a promising technology to recovery value compounds to the inside non-edible microalgae biomass to produce biofuels.

Keywords: Renewable energy, microalgae, Biofuels.

Ultrasonic Obstacles Detection and Braking System

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Abstract

Now-a-days accidents are mostly caused by delay of the driver to hit the brake or by the negligence by the driver. The project aims to develop a prototype system that offers a collision functionality in production vehicle, a system which can operate automatically with the help of high profile sensors based on relay circuit and some changes in traditional braking system and apply the brake automatically in emergency situation. The resulting system can achieve measurements with high accuracy and improved short distance measurement also. This distance measurement is used to control smart braking system for safety applications. The brain of the system part can be developed on Arduino Nano microcontroller. The Ultrasonic sensors are the eyes of this system, which are cheaper and the system comprises of a less demanding hardware. The braking is done with the help of 3/2solenoid valve which actuates brakes and clutch. An automatic Braking system is an intelligent mechatronic system includes an Ultrasonic wave emitter provided on the front portion of a car producing and emitting Ultrasonic waves. An Ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective Ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose.

Keywords: Pneumatic cylinder; 3/2 Solenoid valve; Microcontroller; Ultrasonic sensor.

Evaluation Of Hydrothermal Pretreatment On Sorghum Bagasse For Biomass Fractionation

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Abstract

Agroindustrial wastes, such as sorghum bagasse has the potential to be exploited and produce a wide range of products, the platform which developed a strategy for recovered different wastes and reincorporate them into a process are biorefineries. Agroindustrial wastes majorly reflects the recalcitrate property and hinders the accessibility of enzymes over the internal units for that reason pretreatment is a fundamental step in the process. The objective in this investigation is evaluate the pretreatment and fermentation process to produce lactic acid using agroindustrial wastes. The methodology to be followed is: physicochemical characterization of feedstock, hydrothermal pretreatment where conditions under an isothermal regime will be evaluated (150, 170 y 190°C / 10, 30 y 50 min), to produce glucose monomers. And the enzymatic saccharification and fermentation will be evaluated in separate respectively, but there will perform an operational strategy, saccharification and semi-simultaneous fermentation, in which both operations will carry out in one system. The expected results for this research are, achieve the optimization of the pretreatment and fermentation process for the production of lactic acid using agroindustrial residues, such as sorghum bagasse, obtain a high concentration of glucose which can be fermentable, and finally obtain a product in its pure form.

Keywords: Biorefinery, sorghum bagasse, lactic acid, saccharification and semi-simultaneous fermentation

Atmospheric Water Generator (AWG)

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Abstract

Water scarcity affects 1.2 billion people on a global scale, representing nearly one fifth of the human population. In some regions, current water sources are being depleted faster than they are renewed and the majority of this depletion is being used for irrigation and agricultural purposes. At any given time, the atmosphere contains 3400 trillion gallons of water vapor, which would be enough to cover the entire Earth in 1 inch of water. Herein, we describe the design of an innovative solution to water scarcity in regions with medium to high humidity - Atmospheric Water Generators (AWG). This device converts water vapor into liquid water and is designed for agricultural and irrigation purposes in regions where water scarcity exists. More specifically, two AWG concepts were developed by our team, one utilizing Peltier devices and the other a heat exchanger, in order to allow multiple design alternatives to be considered. The Peltier-based concept works by applying current to induce a temperature gradient in order to cool and condense the surrounding air. The heat exchanger concept works by cycling a coolant that is cooled by a lower ground temperature. Both AWG concepts were designed utilizing sustainable engineering principles to minimize energy consumption and cost (particularly when compared to AWGs currently on the market). The designs are estimated to create enough water daily to grow 2 fruit trees (1 gallon a week) at an example test condition of 60% relative humidity and 85°F.

Keywords: Portable water generator; Water generation rate; Atmospheric vapours condensation; Water quality.

Intensification of glucose production from high-pressure treated agave bagasse at high solid loading biomass under biorefinery

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Abstract

Agave bagasse is a promising and interesting raw material for the development of second-generation biorefineries. However, the intrinsic resistance (recalcitrance) of lignocellulose biomass to enzymatic hydrolysis is a barrier to its effective conversion into fermentable sugars. Therefore, an autohydrolysis process under subcritical conditions is an alternative to provide the fractionation of biomass in terms of biorefinery concept. In this work, agave bagasse as a feedstock was subjected to the autohydrolysis pretreatment at controlled operational conditions (180°C — 50 min), providing fractionation of biomass > 37.5 % glucan content in the pretreated solid phase (cellulose+lignin fraction). Also, a kinetic modeling of hemicellulose fraction (liquid phase after the pretreatment) for the depolymerization has been studied, considering a linear kinetic mechanism. Kinetic modelling of hemicellulose fractionation during the autohydrolysis process predicted the fractionation of the hemicellulose which state the highest concentration of xylan reported at 160 °C was 6.4 g/L, on moving to the high temperature scale it reduces to the 4.59 g/L at 180 °C for 50 min. At high temperature and long severity, 200 °C for 50 min was able to solubilize the maximum concentration of xylan into oligosaccharides, which was reported only to be 0.65 g/L. The cellulolytic hydrolysis process improved the glucose concentration by 40.98 g/L at 72 h with a saccharification yield conversion of 82.58%. The energy efficiency (η) during the autohydrolysis pretreatment was determined (1.039 g_{sugars}/MJ). The design and development of this process will allow establishing optimal operating conditions and energy efficiency for the development of biorefineries with an impact on the circular bioeconomy.

Keywords: Subcritical pretreatment · Biomass · Hydrothermal pretreatment · Biorefinery · Xylooligosaccharides · Circular bioeconomy

Hybrid Traffic Electricity Generation with Wind Turbine and Solar Panel

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Abstract

Wind energy is one of the nonconventional forms of energy and it is available in affluence. Electricity can be generated with the help of vertical axis wind turbine (VAWT). This projects aims of utilizing this wind energy in most effective manner to get the maximum electric output, and therefore we selected highway as our installation site where we can take the advantage of the moving vehicles on both the sides of the road. In the present work, turbine is design and fabricated as per the specifications, the blades used are semi-circular shape and are connected to the disc which is connected to shaft. Shaft is then coupled with pulley with the help of bearing, and then pulley is connected to the alternator, which generates the power. The power developed is stored in battery and then can be used for street light, signal or toll. In this project a small model has been created for testing purpose. This project also aims for maximum output with minimum cost indulges, so that the government can think over this project and can implement this type of vertical axis wind turbine on highways at low cost.

Keywords: Vertical axis wind Turbine (VAWT); Turbine; Highway; Solar Panel.

Wheelchair Accessible Steps

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Abstract

In the field of providing mobility for the elderly and disabled the aspect of dealing with stairs continues largely unresolved. This project focuses on presenting the development of a wheelchair accessible steps mechanism with high load lifting capability. The mechanism is based on four hollow steel pillars where they are connected to four electric motors and they form platforms for wheelchairs and stairways to walk. The electric motors are connected to a circuit board which contains a pre-programmed chip which makes the input commands a definite action to the motor performance. This machine will be useful in schools, hospitals and other public places. Primary considerations are inherent stability, provision of a mechanism that is physically no larger than a standard platform elevator, aesthetics and being based on readily available low cost components.

Keywords: Wheelchair; elevator; Construction.

Production of fungal protein (aspergillus oryzae) from sargassum spp. Pretreated

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Abstract

Pelagic *Sargassum* has become an environmental, economic, and social problem on the beaches of Quintana Roo (Mexico). A large amount of organic matter has been transferred to the coasts, for this reason, alternatives and sustainable processes are needed for the use of these seaweed. These can be used as raw material when converting to products of food interest through different biotechnological processes. Seaweed contains proteins in the range of 5-24%, the lipid content of 1-2%, minerals of 8-40% (weight/weight), respectively [1], in addition within the chemical composition, there are other compounds such as sulfates, sugars: L-fucose, rhamnose, arabinose, galactose, glucose, xylose, mannose, and glucuronic acid content [2]. Using hydrothermal pretreatments of 150, 170, and 190 °C for 50 minutes on the pelagic *Sargassum*, and solid-state fermentation to produce fungal protein on the pretreated biomass. The objective was to evaluate the percentage of protein produced in the fermented biomass of *Sargassum spp*. The best hydrothermal pretreatment was 170 °C and it was observed that *Aspergillus oryzae*produced more fungal protein at 96 hours in the Petri dishes. For solid-state fermentation, a humidity of 70%, a temperature of 30 °C, and an inoculum concentration of 1x106 spores/g substrate were used. It was observed that the microorganisms use sugars as energy sources since the concentration of total sugars is inversely proportional to the percentage of protein (6.6%). In addition, a system with aeration and using glass columns were designed to determine the yield in the production of fungal protein, with 120 h being the one with the best productivity (8.1%). Although the filamentous fungi are complex, it follows that they use other energy sources, and help reduce anti-nutritional characteristics (heavy metals). *Sargassum* pretreated at 170°C represents an efficient carbon source for the growth of *Aspergillus oryzae*and the production of fungal protein. Likewise, this biotechnological process allows the reduction of the low proportions of heavy metals present in the seaweed. This could mean a great contribution to the pharmaceutical and food industry and a positive impact on the environment.

Big data science on viral diseases and analysis of Agricultural products

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Abstract

In the current era of big data, high volume of big data can be generated and collected from a wide variety of rich data sources at a rapid rate. Embedded in these big data are useful information and valuable knowledge. Examples include healthcare and epidemiological data such as data related to patients who suffered from viral diseases like the coronavirus disease 2019 (COVID-19), OMICRON and the diseases that may ocur in the future. In this paper, we present a data science solution for analyzing big data on awareness on cultivation and guidelines for food. The solution helps users to get a better understanding of information about the sale and purchase of agricultural products. Evaluation results show the benefits of our data science solution in discovering useful knowledge from big data on viral diseases and information about agriculture.

Keywords: big data, agriculture, viral diseases

A review on artificial intelligence based early fault detection of rolling bearings using modal decomposition of vibration data

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Abstract

The failure of the rotating machinery is primarily attributed to the failure of rolling bearings. Failure of the bearings are due to reasons such as lubrication failure, contamination, improper mounting, misalignment, false brinelling, corrosion, and spalling, overheating and excessive loads. Vibration based condition monitoring is important for improving the fault detection of rolling bearings. The condition parameters in time and frequency domains for fault diagnosis extracted from vibration signals play a significant role in early fault detection. However recent advancements in automated fault detection have given rise to several Artificial Intelligence (AI) based condition monitoring techniques in diagnosis of health of rolling bearings. This paper is focused on a review of fault diagnosis of rolling bearings using various modal decomposition techniques like Empirical Mode decomposition (EMD), Variational Mode Decomposition (VMD), Local Mode Decomposition (LMD) and the application of AI techniques in early fault detection. Application of some of the AI techniques including k-Nearest Neighbours (k-NN) algorithm, Naive Bayes, Support Vector Machine (SVM), Artificial Neural Networks (ANN), machine learning and deep learning are also reviewed

Key words: VMD; EMD; LMD; SVM; Machine learning

Evaluation of the effect of carbonate buffer and trace metal on microalgae Spirulina platensis culture

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Abstract

Biorefineries propose the use and utilization of organic wastes resulting from industrial processes for the generation of high value-added compounds under the premise of reducing pollutant emissions and using more sustainable technologies. A third-generation biorefinery uses algae biomass (microalgae-macroalgae) to generate compounds of interest and biofuels. One of the key points for microalgae cultivation is the optimization of the media. In this project, 2 treatments were evaluated, 1 with zarrouk medium replacing the carbon source with 0.1 M carbonate buffer pH 9.2, and 2 with the previous medium composition but omitting the trace metals from the medium. The kinetics of both treatments were compared against the original zarrouk culture. It was observed that the highest biomass production was obtained with the zarrouk medium with buffer, followed by zarrouk with buffer without trace metals, and finally the control with zarrouk medium without modification. Similarly, the buffer helped to maintain stable pH in both kinetics, unlike the medium without buffer. According to the data obtained, pH control is important to prevent the microalgae from inhibiting their growth due to the variations that can occur, and trace metals promote growth by acting as micronutrients.

Keywords: Microalgae Biomass, Third-generation biorefinery, Blue Biotechnology

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