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Investigation on mechanical properties of Al7075 based MMC reinforced with Fe_3O_4

Kurubara Raghavendra [a], A. Shivaramakrishna [b], Yadavalli Basavaraj [c], MJ. Sandeep [d], BK. Pavan Kumar [b]

[a] Ballari Institute of Technology and Management, Allipura, Ballari 583104, India
[b] Ballari Institute of Technology and Management, Allipura, Ballari 583104, India
[c] Principal, Ballari Institute of Technology and Management, Allipura, Ballari 583104, India
[d] Dayananda Sagar University, Kudlugate, Bengaluru 560078, India

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Metal matrix composites
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ABSTRACT

This work primarily focuses on Metal Matrix Composites due to their immense usage in the engineering industry. Metal Matrix Composites (MMCs) hold considerably improved mechanical properties with huge sort of applications from automotive to aerospace. In this investigation, aluminum (Al7075) as matrix and 3%, 6%, and 9% weight proportions of iron oxide (Fe_3O_4) as reinforced Metal Matrix Composite are prepared by the help of the stir-casting method. The stir casting process is adopted due to its rewards like easy manufacturing, low manufacturing cost, and uniform distribution of reinforced particles. The reinforcing particle Fe_3O_4 takes part in a significant function in the engineering material properties. The investigation reveal enhance in mechanical properties like Tensile, Compression and Hardness Strengths. When juxtapose with primordial Al7075 alloy, the tensile strength is recorded highest as 362 MPa and Yield strength as 262 MPa for 9% wt. reinforced Fe_3O_4. Also, micro structural studies (SEM & EDS) were done on the newly fabricated Al7075-Fe_3O_4 Metal Matrix Composite which conveys uniform distribution of Fe_3O_4 reinforced particle.

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1. Introduction

Al7075 is a precipitation hardened alloy, with specific strength and specific stiffness, good fracture toughness and corrosion resistance, and excellent molding performance, belonging to super-high strength deformation Al alloy [1–4]. It is one of the crucial structural materials in aerospace and automotive industry, whose properties are unnatural by metal compound particles, solid solution particles, gain structure and dislocation [5–6]. Compared to Solid processing technique, the liquid processing technique are attractive as they are more economical and can produce complex geometrical components. Though, a major challenge in the liquid technique is to attain even distribution of reinforcement and to gain tough interfacial bonding between the reinforcement and the matrix [7]. The improvement of $Al1_3Fe_4$ Metal Matrix composite enhances elevated hardness and tensile strength with loss of ductility as compared to the base alloy and shows ductile mode of facture [8].

Limited work has been reported in studying the Mechanical characterization of Fe_3O_4 reinforced with Al7075 matrix composite. For the present experimental study, the proposed Metal Matrix Composite is fabricated by stir casting method in an electric melting furnace.

The aim of the proposed work is to fabricated an Al7075 Metal Matrix Composite reinforced with Fe_3O_4 (weight proportions) in order to determine the optimized weight quantity of Fe_3O_4. The composite's Tensile, compression, Hardness strengths and micro structural characteristic were tabulated and shown.

2. Materials and methods

The Al7075 alloy used as a base-metal in the study for the fabrication of composite that has been reinforced with a different weight proportions of Fe_3O_4 (3%,6% and 9% wt).

The chemical composition of aluminum is shown in Table1. Fe_3O_4 300Mesh particle sizes were chosen.

The Stir casting method was employed to fabricate the Aluminum metal matrix composite. Fig. 1 shows the casting setup and the stirrer fixed to variable speed motor[8]. Fig. 2 illustrates the fabrication process flowchart.

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Influence of intermittent ratio and fruit thickness on Guava fruit drying: An experimental analysis

K. Shekar ✉; Prasad Baburao Ramapure

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Influence of Intermittent ratio and fruit thickness on Guava fruit drying: An Experimental Analysis

K. Shekar[1,a)] and Prasad Baburao Ramapure[2]

[1]*Department of Mechanical Engineering. Ballari Institute of Technology and Management, Ballari, India*
[2]*KLE College of Engineering & Technology, Chikodi, India*

[a)]Corresponding author: *sekermail10@gmail.com*

Abstract The intermittent drying behavior of guava (Sodium guajava L) fruit grown in the Ballari (15.1394 ^{0}N, 76.9214^{0}E) area of Karnataka state, India, were experimentally studied on ATMEGA328 Microcontroller-based dryer. This research aimed to explore the effects of intermittent-ratio, and thickness for guava fruit on the drying curves utilizing a Taguchi design of experiment (DoE) & ANOVA. The drying operation was carried out for 2,3,5 and 7mm thick guava at 1.5 m/sec velocities with different intermittent ratios ($\alpha = T_{off}/ (T_{on} + T_{off})$, where Ton and T_{off} are the on and off time of each 1-hour heating cycle) =1,0.25,0 and 0.75, respectively. The drying regime was observed all through a major falling rate. The study articulates that intermittent ratio and fruit thickness of fruit have an important effect on dehydration. The drying rate is found to be optimum for the intermittency ratio $\alpha = 0.25$ thereby reducing the effective drying time. Drying time increased with increased thickness of fruit. The statistical analysis shows, that the Henderson & Pabis and logarithmic model is a superior model to explain the intermittent drying nature of Guava fruit.

INTRODUCTION

Guava fruit is a Myrtaceae fruit family member considered to be originated in Central America [1] and can be cultivated in all subtropical areas. Guava is a "super-fruit" owing to its antioxidant virtue [3]. The purpose of dehydration is to remove water content to an optimal value such that no microbial spoilage and degrading reactions are encouraged. In conventional drying constant heat is delivered throughout the dehydrating process which causes surface hardening of the product. Thus, causing quality degradation and wastage of high-grade heat energy. The drying rate reduces later as fruit does not have enough moisture to be eliminated. The strategy of intermittent drying permits sufficient time for the moisture to move to the surface from the center through the tempering period.

Several constraints like medium temperature, inlet air velocity, and relative humidity, and fruit thickness of the material being dried influence drying kinetics. knowing the Heat and Mass transfer phenomena in the fruit helps in improving drying process variables and the final quality. Modern-day techniques for devising drying procedures consist of developing a numerical model of moisture transport in drying known as 'drying kinetics' [7]. Dehydration of agricultural produce is well-defined by thin layer drying mathematical models as grouped as theoretical, quasi-theoretical, and experimental [5]. Theoretical methods consider the inner resistance for moisture removal. The quasi-theoretical and experimental methods study the surface resistance to moisture transfer among the hot air and product [6]. Drying kinetics are normally evaluated experimentally by observation of drying sample mass over a period [8]. Dehydration process Mathematical models are employed in enhancing existing drying systems, devising new systems, and optimization of dehydration process [9]. Fick's law of diffusion is generally employed to explain the dehydration process. Moisture ratio models are used to study the drying curves to understand dehydration of agricultural produce. The dry basis Moisture content at varying temperatures and velocities is transformed into a Moisture Ratio to normalize the curves.

This research aimed to experimentally explore the effects of intermittent-ratio, medium temperature, hot air velocity, and thickness for guava fruit on the drying curves of guava (Sodium guajava L) fruit grown in the Ballari (15.1394 ^{0}N, 76.9214^{0}E) area of Karnataka state, India, utilizing a Taguchi design of experiment (DoE) & ANOVA. The purposes of the study were to experimentally explore the Guava fruit drying kinetics for varying drying parameters

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Data Engineering and Intelligent Computing, pp 189–200

Novel Approach to Abstract UML Use Case Diagram from Input Java Program

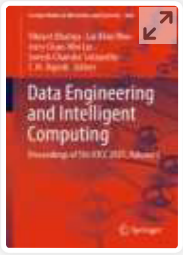
R. N. Kulkarni & P. Pani Rama Prasad

Conference paper | First Online: 06 July 2022

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 446)

Abstract

This paper proposes a novel approach to abstract the unified modeling language (UML) use case diagram from input Java program. The proposed methodology first restructures the input program and then abstracts the object class features such as class name, object name, attributes, operations, and relationships. Further, the abstracted information is stored in the table called as class table. In the next step, the class table and the restructured Java



Data Engineering and Intelligent Computing, pp 145–156

Abstraction of Activity Diagram from Sequence Diagram

R. N. Kulkarni & C. K. Srinivasa

Conference paper | First Online: 06 July 2022

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 446)

Abstract

In the recent past unified modeling language has gained popularity for its use in the software industry of the design of software systems. The UML allows to implement the software systems using an object-oriented paradigm. The pictorial graphical representation of a software system is provided to the developer as well as to the end-user. The UML diagrams are broadly classified into two types with static and dynamic diagrams. The UML sequence and activity diagrams which

Novel Approach to Detect Plagiarism in the Document

Publisher: IEEE

R N Kulkarni ; Chitriki Ganesh ; Dilip Kumar B K ; Harshitha B ; A Prathap Reddy **All Authors**

Abstract: Plagiarism is an expansive obstacle in various fields like the education sector, business technology, fashion world, etc. The writers copy the readily available material ... **View more**

Metadata

Abstract:
Plagiarism is an expansive obstacle in various fields like the education sector, business technology, fashion world, etc. The writers copy the readily available material and data and present it as their own work without providing required citations. Due to this, industries like the education system, fashion world newspaper publishers, and a lot more industries fall under immense intimidating remarks. Although there are several tools available in the market that solve the problem of plagiarism using different approaches and features. The existing plagiarism detection tools available in the market compare plagiarism only when the input document contains the text format. However, existing tools do not check for plagiarism when the input document is an image. In this paper, a tool is proposed that uses an exhaustive searching technique that searches the text and text embedded in the image. The proposed tool allows.docx, .pdf, and different image formats as input and allows users to type in or copy-paste the text manually. The tool proposed here in this project verifies the input document with the content available on the websites and gives the results concerning similarity.

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Contents

An Overview of SQL Optimization Techniques for Enhanced Query Performance

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Hayath Tm ; Usman K ; Mohammed Shafiulla ; Dadapeer **All Authors**

Abstract: According to recent trends, the size of databases is increasing rapidly, which calls for the need for larger databases that can be scaled to support future upgrades witho... **View more**

Metadata

Abstract:
According to recent trends, the size of databases is increasing rapidly, which calls for the need for larger databases that can be scaled to support future upgrades without compromising performance. Additionally, the way SQL queries are structured can have a significant impact on their execution performance. This paper proposes a set of rules for formatting SQL queries that must be followed to optimize them. The approach includes identifying any need for indexing on specific columns if the query includes filtration. By avoiding the unnecessary use of data and columns, our proposed model aims to convert user SQL queries into optimized ones, reducing query execution time which provides an in-depth analysis of SQL optimization techniques to enhance the performance of database queries. The research discusses the significance of query optimization and outlines some of the commonly used techniques in SQL optimization.

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Contents

Software Effort Estimation using ANN (Back Propagation)

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Ravi Kumar B N ; Yeresime Suresh **All Authors**

Abstract: Project managers often use Effort Estimating strategies to manage the human resources of current or upcoming software projects. Prior to project implementation, cost, tim... **View more**

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Abstract:
Project managers often use Effort Estimating strategies to manage the human resources of current or upcoming software projects. Prior to project implementation, cost, time, and personnel estimation are basically necessary. For every project of software, getting an accuracy in Effort Estimation has always been difficult. In case of this study, estimating the labor involved in developing software determined using a Back Propagation Model. This model's goal is to investigate the capabilities and potential uses of utilizing Artificial Neural Networks (ANN) as a tool for forecasting the effort required for software development. In order to estimate the software work, we are attempting to implement a machine learning technique in this research. Out of all machine learning methods, we are applying an algorithm based on Artificial Neural Networks that is Back propagation. The Desharnais dataset, a well-known publicly available dataset for estimation of software effort, is used to test the approach. The performance and accuracy of the tested model have been evaluated using three metrics: MMRE, MRE, and Pred (0.25). In the sections below that follows, I explain the algorithm and its results.

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Influence of self-healing behavior of bacteria & e-waste incorporated concrete on its mechanical properties

T.V Reshma [a,b,*], P. Chandan Kumar [b], S. Khalid [c]

[a] Department of Civil Engineering, GITAM School of Technology, GITAM University, Bengaluru, Karnataka, India
[b] Department of Civil Engineering, GITAM School of Technology, GITAM University, Visakhapatnam, Andhra Pradesh, India
[c] Department of Civil Engineering, Ballari Institute of Technology and Management, Ballari, Karnataka, India

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ABSTRACT

A substance that can restore itself to its original state is a self-healing substance. It is seen in numerous historic buildings that, despite receiving little maintenance, have endured for long periods. This discovery concludes that fissures heal when moisture interacts with cement clinker that isn't hydrated. However, modern construction techniques have reduced cement levels in current structures. The structural integrity of the building is affected by large cracks, whereas minor cracks impact the structure's durability. Additionally, cracks enhance the permeability of the matrix, raising the risk of corrosion in the reinforcement. A structure needs routine repair, which can be expensive and may further raise maintenance costs to limit the likelihood of fracture formation. Utilizing concrete with a self-healing mechanism is one option to save these expenses and improve the structure's durability. This method is based on a biological process known as bio-mineralization, which often occurs in a few types of microorganisms. These microorganisms can be used as binders to boost strength and durability. Many parts that make up electronic and electrical (E-waste) equipment are poisonous materials like lead, cadmium, chromium, mercury, etc. If not handled properly, these poisonous compounds can negatively affect human health and the environment. These dangers frequently result from faulty recycling and crude E-waste disposal techniques. Hence an attempt is made by introducing 5% bacteria into the M30 grade concrete to promote self-healing and using 5%, 10% e-waste as aggregate. Its behavior is studied considering 0, 5, and 10 mm cracks by conducting compressive strength of concrete. The results revealed significant improvement in its strength compared to the conventional mix. An optimum strength is achieved by incorporation of 10% e-waste with 5 mm crack on the surface in concrete. Also, it achieved self-healing concrete, naturally producing eco-friendly concrete. Thus, improving the concrete structure's lifespan and improvising the environment's sustainability.

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1. Introduction

Due to concrete's inherent fragility, cracks in concrete are unavoidable [1,2]. Water and other salts can seep through these fissures. It starts the corrosion process, shortening the concrete's lifespan even more [3]. Therefore, creating an intrinsic biomaterial with a self-repairing method that could fix the fractures and fissures formed in concrete was necessary. When a flaw arises, self-healing is characterized by restoring performance. In particular, enhanced durability, leakage avoidance, and prolonged functional life of concrete structures are the damage targets in bacteria-based self-healing concrete [4–6].

Concrete fractures can result from plastic shrinkage, differential settlement, creep, overload, poor design, fatigue, freeze and thaw, and fatigue. These little and large cracks cause steel to rust, which causes spalling and the collapse of concrete structures [1,7]. Traditional procedures, polymer impregnation, epoxy injections, and chemicals can remediate these cracks. But these procedures lead to increased repair costs, and the inaccessibility of crack position is also a significant downside. Therefore, concrete must be manufactured to have greater compressive strength, durability, and the ability to patch cracks automatically. The current study discusses bacterial concrete, which will meet strength and crack self-

* Corresponding author.
E-mail address: rvishwes@gitam.edu (T.V Reshma).

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Review on Durability of Geopolymer Concrete Developed with Industrial and Agricultural Byproducts

Tanu H.M. [a,b,*], Sujatha Unnikrishnan [c]

[a] Research Scholar, CHRIST (Deemed to be University), Bangalore 560074, India
[b] Assistant Professor, Ballari Institute of Technology and Management, Ballari 583104, India
[c] Associate Professor, CHRIST (Deemed to be University), Bangalore 560074, India

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ABSTRACT

High population growth has increased the requirement for infrastructure development tremendously. Building materials like ordinary portland cement which is the primary component in concrete is growing due to the increased demand for new infrastructure. Concrete is the world's second most consumed material. Special concrete called Geopolymer concrete (GPC), is grabbing the interest of researchers as substitute to ordinary portland cement concrete (OPCC). Manufacture of cement is highly energy intensive and leads to large quantity of CO_2 emission to atmosphere which in turn leads to global warming. Thus, replacement of cement with geopolymer material minimises pollution in two ways: by lowering cement consumption and utilisation and by lowering CO_2 emission. Various industrial and agricultural waste materials like fly ash, metakolin, ground granulated blast furnace slag, silica fume, rice husk ash, sugarcane bagasse ash etc. are abundantly available. These aluminosilicate sources have been widely employed to develop geopolymer concrete with high strength, thermal resistance, and durability. This article is a review of research on the durability aspects of geopolymer concrete, its most significant durability parameters like resistance to acid attack, sulphate attack, water absorption, porosity, sorptivity, rapid chloride penetration, wet and dry cycle have been reviewed to comprehend these vital issues.

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1. Introduction

Production of ordinary portland cement requires high energy and it releases mega percentage of carbon dioxide (CO_2) to the atmosphere. Carbon dioxide emission due to production of conventional ordinary portland cement and lime stone mining results in environment pollution to large extent [1]. Therefore, a substitute for cement which uses other materials instead of portland cement is a way to lower greenhouse gas emissions [2]. Geopolymer concrete is being considered as a possible replacement for portland cement (OPC). The geopolymer concrete is produced by activating an alumino-silica source using an alkaline activator (AA).By-products of agricultural or industrial waste materials such as fly-ash, metakaolin, ground granulated blast furnace slag, pulverized fuel ash, palm oil fuel ash, red mud, sugar cane bagasse-ash, rice husk ash, corncob ash etc., can replace 100% cement in concrete production [3]. Geopolymer concrete has reportedly been a durable substance, which is anticipated to lessen the durability problems associated with conventional concrete [4]. The geopolymer concrete is produced from the supplementary cementitious by-products such as fly ash, ground granulated blast furnace slag, metakolin, silica fume, sugarcane bagasse ash, corncob ash and rice husk ash. Usage of supplementary cementitious materials will not only increase strength and durability properties, but also reduces the industrial and agricultural waste disposal problems. This paper extensively reviews durability characteristics of geopolymer concrete. Fig. 1(a) demonstrates the production of geopolymer concrete [5] and Fig. 1(b) represents number of published research articles on geopolymer concrete over a decade [6].

Abbreviations: GPC, Geopolymer concrete; AACs, Alkali activated concrete; AA, Alkali activator; GGBS, Ground granulated blast furnace slag; FA, Fly ash; SF, Silica fume; MK, Metakolin; RHA, Ricehusk ash; CCA, Corncob ash; SCBA, Sugarcane bagasse ash; PFA, Pulverized fuel ash; POFA, Palm oil fuel ash; RCPT, Rapid chloride penetration; CO_2, Carbon dioxide.

* Corresponding author.
E-mail address: tanu.hm@res.christuniversity.in (H.M. Tanu).

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Performance of rice husk ash, silica fume, and quarry dust based glass fibre reinforced concrete subjected to acid attack

Sachin Patil [a,*], T.H. Patel [b]

[a] Department of Civil Engineering, RYMEC, Ballari 583104, Karnataka, India
[b] Department of Civil Engineering, BITM, Ballari 583104, Karnataka, India

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ABSTRACT

In this analysis silica fume, quarry dust, and rice husk ash were used as partial replacement for cement. To create advanced concrete, glass fibers were added. The experiment is looking into the effect of HCl and H_2SO_4 acid attack on concrete cured at 30, 60, and 90 days. Concrete mix was designed for 0.4 water binder ratio by keeping quarry dust replacement at 20 percentiles. Silica fume and rice husk ash was replaced in 10, 20 and 30 percentage each in proportions. 0.25, 0.5, and 0.75 percent of the total volume was the percentages of glass fibers added in the mix. It has been discovered that replacing cement with 20 percentage each of rice husk ash, silica fume, and quarry dust, along with 0.75 percent glass fibre, delivers the best acid resistance. Through its use, offered concrete making reduces cement production and minimizes damage to the environment.

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1. Introduction

For its stronger strength and reduced thicknesses, which marks in thinner sections and lesser construction load, HPC has seen a growth in demand as a result of development and a rising need for concrete. HPC is utilized to build many infrastructure projects, among other things, thus this is cost-effective for consumers. According to recent studies, the production of Portland cement emits greenhouse gases. In 2018, global cement production was at 4.05 BT. Investigators have proposed a number of cement substitutes that can assist reduce cement use, pollutants, and energy consumption. Furthermore, this design strengthens concrete characteristics.

Rice husk (RHA) was manufactured as a pozzolana using a unique procedure that ensured its physiochemical properties matched technical standards while keeping the silica in an amorphous condition with a small amount of carbon waste. The findings revealed that pozzolanic efficacy differs based on the fineness with which the pozzolana is crushed and the temperatures at which it is burned. The latter obtained by addition of rice husk ash (RHA) to concrete mixtures on compressive strength and volume was investigated. Compared to control mix, a significant compression strength was achievable, with a level of 40% replacement. Even though the American Standard has limited volume changes, they are well within the estimated range [1]. According to studies, adding silica fume (SF) to concrete improves water penetration resistance, which in turn improves resistance to chloride ion penetration. The outcomes of current investigations on SF concrete have affected the substantial use of SF in the building sector over the last 20 years. The outcome of utilising SF and glass fibre mixed HPC was also investigated by the authors, who discovered that the enhanced strength and durability are potential possibilities in the production of HPC [2–5].

In comparison to concrete mixes lacking GF fibre, studies indicated that incorporating GF fibre into concrete created tougher M20 graded concrete mixtures with a 15–20% improvement in compressive strength. All the possible properties has been studied in depth and found to be improved by the use of fibres, especially the light, tough, and economical fibre known as glass. The addition of GF improves the part's resistance to shrinkage-related cracks by allowing it to twist and stretch more. Even yet, if fibres are utilised at a concentration of more than 1% by volume, the concrete will be lumpy and difficult to work with. Researchers have discovered that quarry dust (QD) can improve the strength of concrete [6–11].

In comparison to normal Portland cement, the scientific group has not spent much time investigating the durability of HPC, which uses RHA, SF, and QD as replacements, as well as GF with super-

* Corresponding author.
E-mail address: sachinpatil.akruthi@gmail.com (S. Patil).

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Wi-Fi Based Positioning System for Application in Child Safety

1st Abdul Lateef Haroon P.S.
Department of ECE
Ballari Institute of Technology & Management
Ballari, India
abdul.lh@bitm.edu.in

2nd Vidya I. B
Department of ECE
Ballari Institute of Technology & Management
Ballari, India
vidya2000.ily@gmail.com

3rd Rohith R S
Department of ECE
Ballari Institute of Technology & Management
Ballari, India
ravutrohith@gmail.com

4th Vimlesh Kumar
Department of ECE
Ballari Institute of Technology & Management
Ballari, India
vk412537@gmail.com

***Abstract*— Parents and event organizers are often concerned about the safety and security of children during large-scale public events. This study addresses the crucial issue and suggests an architecture model for a smart, IoT-enabled digital system for tracking child safety. The Cloud, Mobile, and Wi-Fi modules are integrated into this IoT-enabled digital system architecture to precisely pinpoint a child's geographic location on an event map. The sophisticated IoT-enabled smart child safety tracking digital system's complex people, information, process, and technology architecture elements are described, along with their relationships, in the suggested architecture model.**

Keywords—tracking, IoT, Cloud, Mobile and WIFI module

I. INTRODUCTION

Children of all ages have long been drawn to public activities in the community. Although youngsters have found these activities to be amusing, parents must keep a constant eye out so they will not miss their children in busy areas. It is customary to put a paper label with their phone number on the child's wrists or give them a cell phone to use in case of an emergency. Despite these precautions, it may be very difficult to keep kids safe during a public event, which is a major concern for both parents and event organizers. The issue of adequately ensuring a child's safety at a significant public event then emerges.

The proposed method can provide "CHILD SAFETY WEARABLE DEVICES" that are configured to monitor the everyday activities in children because child safety is now a Priority [6]. This technology is designed to provide safety and security for the kids because there are several reports of children going missing, which makes parents panicky, anxious, and afraid till they learn that their kids are okay.

The regular activities of children also assist them in locating the Wi-Fi services that are available on the devices. However, these services are unreliable as a means of communication between children and parents, so SMS services are used to communicate things [9]. All of these daily activities are programmed into the device, which sends an alarm or SMS to the parent's mobile phone if the youngster enters any uncharted territory. This exhibit certain traits of great accuracy, rapid response, and reliability.

The suggested paradigm incorporates a number of IoT (Internet of Things), mobile-phones, cloud, and Wi-Fi module technologies from the digital ecosystem [1]. The Internet of Things (IoT) refers to a collection of hardware and software that is permanently connected to the Internet via physical sensors and actuators. IoT encompasses a wide range of systems, including automated home systems, smart cars, wearable technology, and even human implanted technology. The two fundamental elements of the Internet of Things are the actual devices and the server-side architecture that supports them. The necessity for kid safety is growing, especially in light of the possibility of a youngster getting lost in heavily populated regions, which is the inspiration behind this wearable.

Therefore, Wi-Fi is used to communicate between the caretaker and child's wearable device, as this has low risk of failing compared to other technologies. This platform on which this project will be running is on Arduino microcontroller board based on the ESP8266, and the functions of communicating by connecting to the internet which is provided by the Wi-Fi shield using private network. The other measure added is SOS buzzer and light indicator that will be programmed with ESP8266 board to display the SOS sound & signal. Existing research on this topic includes, for instance, the development of a low-cost, lightweight wristband called Vital that detects and alerts those who require quick assistance, like children and the elderly, to dangerous environments [2]. It is built using a low power Bluetooth 4.1 module and an Arduino micro-system with multiple sensors. The Mimo, Sproutling, and iSwing band are some further examples of wearable technology that are comparable yet have a number of downsides.

As a result, the suggested wearable device will have a communication link. Also, by reprogramming the Arduino system, the wearable can be tailored to our needs.

II. LITERATURE SURVEY

The creation of sensor networks is the result of recent developments in telecommunications technology. People now utilize sensor networks in their daily lives. These networks have been used to generate numerous applications. There are a variety of localization strategies that can be used, but how they are applied depends on the needs of the application. The localization method chosen for the Child Tracking application

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Wireless Charging and BMS for Optimizing Electric Vehicle Charging and Battery Management

1st Mohammed Irfan Ahamed.M
Ballari, India
ahamedbinmsq@gmail.com

2nd Syed Mateen
Ballari, India
mateensyed3615@gmail.com

3rd Arun Savadi
Mudhol, India
arunsavadi407@gmail.com

4th Abdul Lateef Haroon P S
Department of ECE
Ballari institue of technology and management
Ballari, India
abdulbitm@ieee.org

5th Syed Naushad
Ballari, India
syednaushad868@gmail.com

***Abstract*—Dynamic wireless charging is an innovative technology that enables electric vehicles (EVs) to charge their batteries wirelessly while driving on the road. This technology offers numerous advantages over traditional stationary charging methods, such as eliminating the need for frequent stops to recharge and enabling EVs to travel longer distances. In addition, Bluetooth Low Energy (BLE) wireless battery management system (BMS). have been developed to wirelessly monitor and optimize the charging process, further enhancing the efficiency and safety of dynamic wireless charging. This paper presents dynamic wireless charging with wireless BMS, which will dynamically adjust the charging power level and maintain the charging status of the battery, based on the battery state of charge (SOC) and the charging requirements. The system uses a high-frequency inverter for power transmission and an active front-end rectifier for power conversion, which improves the efficiency of the charging process. The BLE wireless BMS provides real-time data on the battery condition and enables communication with the charging system for optimal charging. The simulation results show that the proposed system can achieve efficient and stable wireless charging of EVs, and can provide a flexible and convenient charging experience for EV Proprietors.**

Keywords—Electric vehicle, RFID, WBMS Wireless Power Transfer.

I. INTRODUCTION

Dynamic wireless charging is a method of charging electric vehicles on-the-go through wireless power transfer. This technology operates on the principle of electromagnetic induction, which involves the transfer of energy between two objects through magnetic fields. [1]A charging pad or coil is installed under the road surface or embedded in an overhead structure, creating a magnetic field. An electrical current is induced in a receiving coil mounted on the underside of the EV, [2]which charges the vehicle's battery. This allows for continuous charging while driving, eliminating the need for frequent stops to recharge. In 1831, Michael Faraday and Joseph Henry autonomously found electromagnetic acceptance. Faraday conducted an experiment in which he wrapped [3]two wires around an iron torus and observed a transient current when he connected and disconnected one wire to a battery. James Representative Maxwell later planned the traditional electromagnetic hypothesis, which bound together beforehand inconsequential perceptions, investigations, and conditions into a reliable hypothesis Nikola Tesla demonstrated wireless transmission of energy in 1891 based on Faraday's discoveries.

The two principal kinds of time-differing electromagnetic field WPT advances are the close field and far-field. The close field innovation, [4]which is non-radiative, can move energy over a brief distance, ordinarily short of what one frequency. [5]Inductive power move (IPT), a famous close field innovation utilized in enlistment engines and remote charging of gadgets like oscillating brushes and mobile phones, has a restricted productive working scope of just a few centimeters because of the quick rot of moved power as the distance increments (1/r3).

Far-field [6]WPT technologies propagate electromagnetic waves to transfer energy over distances ranging from two wavelengths to infinity. For space applications, highly directional antennas and laser beams can achieve high efficiency, in any case, require direct view transmission ways and complex following systems for arrangement. In omnidirectional applications, power thickness diminishes as distance increments, making it reasonable just for signal telecom at low power levels. Moreover, for [7]charging applications, radio wires should be sufficiently huge to satisfy EMI security guidelines, making them unacceptable for EV charging.

Wireless [8] BMS eliminates the need for wired connections between battery cells and the control unit by using low-power wireless protocols like Zigbee or Bluetooth Low Energy. It operates through a mesh network where each cell is connected to the control unit and neighboring cells. The wireless BMS continuously monitors cell voltage, temperature, and state of charge and transmits this data to the control unit using unlicensed frequency bands. Licensed bands can use modulation techniques to counter interference.

This reduces wiring requirements and improves battery management accuracy, making it a cost-effective and space saving solution for electric vehicle battery management. There are three kinds of [9] WBMS: ZigBee, Wi-Fi, and Wi-Fi HaLow. ZigBee is a low-rate correspondence convention with information rates from 20Kbps to 250Kbps, working in the 2.4 GHz and 800-900 MHz groups. ZigBeeStar is an improved adaptation for huge organizations and effective for frameworks with rare correspondence and long battery duration. Wi-Fi has high power utilization for huge information moves. Wi-Fi HaLow upholds up to 8192 gadgets, works in sub-Gigahertz frequencies, has longer ranges, and decreased power utilization through obligation cycle modifications. Business Wi-Fi HaLow chipsets are right now a work in progress.

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Modelling of Perpetuating Energy Systems Using Synergy and Switched Reluctance Motor-Generator Set

1st Syed Mateen
Ballari, India
mateensyed3615@gmail.com

2nd Saleha Mahek
Ballari, India
salehamahek@gmail.com

3rd Abdul Lateef Haroon P S
Department of ECE
Ballari Institute of Technology & Management
Ballari, India
abdulbitm@ieee.org

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***Abstract*—As efforts are made around the world to reduce dependency on fossil fuels and make the transition to energy sources that are more environmentally friendly, the requirement for a power supply that is self-sufficient has become an even higher priority. This study details a self-sustaining power supply system that uses solar energy and a battery bank. The system utilizes a switching reluctance motor generator set to both discharge and recharge the battery bank. The system's goal is to function autonomously from the main power grid while providing a dependable, low-cost, and environmentally friendly electrical supply. The system can function as either a primary or secondary source of power in the event of a power outage or in places that are not linked to the main power grid.**

Keywords—Switched Reluctance M-G Set; Master Salve Architecture; Green Energy; Photovoltaic Panel; Lithium -ion Battery.

I. INTRODUCTION

The continued expansion of the human population places strain on the capacity of the world's power plants to provide electrical energy. The energy that is generated in large quantities in centralised sites and then transported over considerable distances to other communities. This leads in electrical distribution losses equivalent to 7–8 percent of the energy generated in prosperous nations. The generation of power anyplace will result in a significant reduction of these losses, resulting in an overall net energy savings. [1] Here, the aforementioned approach would be economically viable and environmentally friendly. Nowadays, energy is one of the most essential things for keeping a human life going. All sectors of an economy depend on energy production and distribution. Because of increased demand, natural resources for mining are dwindling. [2]. The last decade has seen a rapid increase in power consumption across the world. Beginning in 2012, the world's annual gross electrical power generation reached around 22K TWh, Around 70% of this total is comprised of petroleum products, such as coal/peat, gaseous gasoline, and oil. Load balancing has traditionally been managed by power plants that use fossil fuels to ensure the reliability of the electrical grid. To achieve the goal of lowering CO2 emissions, the power grid of the future will be more sophisticated, with a lower reliance on fossil fuels and a greater emphasis on renewable energy and environmental consciousness. [3]. Nevertheless, there are currently only a small number of viable sustainable energy options. [4].

II. LITERATURE SURVEY

Self-sustaining power supply refers to a system's capacity to create its own energy without external input. This It has the potential to generate new options for renewable energy and improve the efficiency and dependability of power systems, making it an essential topic of study. In this literature survey, we will explore the current state of research on self-sustaining power supply and identify some of the key areas of research in this field. A sustainable process is one that can return the system and environment to its original condition without altering the thermodynamic features of the universe [5]. The fact that the sustainable process may be sustained indefinitely with no unintended consequences suggests that the framework has undergone thermodynamic change. Continually viable conditions are required for the system to function forever [6]. As the process evolves towards sustainability, all of its constituent parts must be brought into thermodynamic equilibrium with one another. Hence, two necessary circumstances exist for the long-term development of the procedure. To begin with, the process must take almost no time at all, and secondly, most of the system's initial and final states must be in agreement with one another [7] . If the system's charge level stays constant throughout time, we know that we have a sustainable process, and we may safely assume that we have an isentropic system in the long term [8]. Sustaining such change through time is a miracle in and of itself and is sometimes referred to as self-sustainable. A viable system is exceedingly difficult to execute in the real world, yet it has enormous potential to benefit the world in the long run.

The suggested energy harvesting system consists of an uninterruptible power supply, motor, voltage stabilizers, pendulum, controller, dynamo, solar panel, and gearbox. [9] Typically, motor rotation drives the dynamo. A combination of a pendulum and a gearbox acts as a source of supplemental power. Smart controls dynamically monitor the entire system. The many components cooperate to produce energy automatically. [10] This research investigates the effects of the technology on the speed of the electric vehicle, the regenerative braking, and the amount of energy that can be given by this invention. In addition to discussing the design of a Field Oriented Control for electric. This study also includes the design of a DC-DC Boost converter with two PID controller loops for AC motors. [11] The observation lends credence to Ohm's law, which asserts that the greater the voltage in a circuit, the greater the current. Based on the findings, future research into the self-induced power producing set employ new direct current motor and alternator for improved reliability and performance [12]. An important field of research that has the potential to generate new options

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Transient Analysis of Motor Terminal Voltage, Common Mode Voltage and Bearing Voltage in 2-level and Multilevel PWM Inverter Fed Induction Motor with Long Cable

1st Sharana Reddy
Electrical and Electronics Engineering
Ballari Institute of Technology and Management, Ballari
Ballari, India
reddysharan035@gmail.com

2nd Basavaraja Banakara
Electrical and Electronics Engineering
UBDT College of Engineering, Davangere
Davangere, India
banakara36@gmail.com

3rd Abdul Khadar A
Electrical and Electronics Engineering
Ballari Institute of Technology and Management, Ballari
Ballari, India
khadar.hms@gmail.com

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***Abstract*—The long motor cable contributes to overvoltage and higher common-mode voltage (V_{cm}) at the motor terminals fed by the PWM inverter due to the voltage reflection phenomenon. Higher the V_{cm}, higher the induced bearing voltage (V_b) and the bearing currents. Overvoltage at the motor terminals is due to two reasons, the impedance mismatch between the cable and the motor. Another reason is the PWM inverter output pulses travel at approximately half the speed of light. If the output pulses take longer than 1/3rd of the pulse rise time, voltage reflection occurs. The rise time of the inverter output pulses can be increased by using multilevel inverters. Hence, the magnitude of motor terminal voltage, V_{cm}, V_b is reduced significantly. In this paper, transient analysis of motor terminal voltage, V_{cm} and V_b in a multilevel inverter (MLI) fed induction motor with a long cable has been presented. The simulation modeling and analysis are carried out using MATLAB Simulink. The work presented in this paper provides the solution to improve the reliability of the ASD system for long motor cable applications and also to avoid downtime costs due to bearing failure.**

Keywords—Bearing voltage, common mode voltage, dv/dt, motor cable length, motor terminal voltage.

I. INTRODUCTION

In the recent years, induction motors fed by PWM inverters are extensively utilized because of several benefits in energy efficiency and control. However, the PWM inverters use IGBTs that induce bearing voltage (V_b) and bearing currents which lead to bearing damage within a short period of time [1].

As per the standards of IEEE 112, the permissible value of V_b is $0.7V_{pk}$, IEC60034-25 standard gives a V_b limit of $0.5V_{pk}$ and as well as the manufacturer's allowable voltage of $2V_{pk}$ for Adjustable Speed Drives(ASDs) [2].

If the propagation delay of the PWM inverter output pulse is less than 1/3rd of its rise time, voltage reflection occurs and the motor terminal voltage and common-mode voltage (V_{cm}) get approximately doubled [6].

A. Literature Review

Passive filters like RC, RLC, LC and GaN-based ASD sinusoidal filter at the inverter output and also at the motor terminals were implemented to suppress overvoltage and V_{cm} by the impedance matching in two-level inverter-fed IM [6][7][8] [7] [8] [13] [14]. Presented a 2-level, Q3LT-type PWM converter to mitigate the voltage reflection [18].

To reduce V_{cm}, simulation and experimental work using a three-level H-bridge inverter was implemented [10]. Phase Disposition-SPWM diode clamped multilevel inverters (up to 9-level) were employed to reduce the V_{cm} and %THD by simulation [11]. Space Vector Modulation (SVM) schemes for the total elimination of V_{cm} in a 3-phase, five-level multi-string inverters were presented [12]. The effectiveness of a multiphase motor drive system for V_{cm} mitigation was presented and analyzed [15]. The SVPWM technique for both symmetrical and asymmetrical 6-Ø induction motor drive with a 3-level inverter was implemented to eliminate V_{cm} [16]. To minimize the V_{cm}, voltage vector switching sequences based on SVPWM technique for a 2-level, 5-Ø voltage source inverter were implemented [17].

In the references [6]-[9][13][14][18] the effects of motor cable length on V_b were not addressed and employed only a two-level inverter.

The multilevel inverters were installed to minimize the V_{cm} and V_b however, the influence of cable length on V_{cm} and V_b was not considered in the references [10]-[12][15][16][17].

In this paper, both the effects of long motor cables and multilevel inverters have been considered for transient analysis of the motor terminal voltage, V_{cm}, and V_b in PWM ASDs. The results presented in this work are useful in the protection of motor stator windings and bearings against voltage transients. The reliability of the ASD system for long motor cable applications can be improved and downtime costs can be avoided.

B. Rise time of the PWM pulse

If the allowable overshoot for the motor terminal voltage is 15%, then critical rise time of the pulses can be calculated by using the eqns. (1) and (2)[8]

$$\frac{V_{LL,p}}{V_{dc}} = \frac{3l_c\,\Gamma_M}{v_p t_r} = 0.15 \tag{1}$$

$$t_r = \frac{20 l_c \Gamma_M}{v_p} \tag{2}$$

Considering a 5HP, 415V IM fed by inverter through a 20m (l_c) cable with the reflection co-efficient of motor Γ_m=0.9(for motors <20HP) [8] and the pulse velocity v_p=1.6X10^8 m/s. Then, the value of rise time

An Analysis of the Performance of a Grid-Connected Hybrid Power Generation System Combining Wind and SOFCs, with an Ultracapacitor Storage Unit

Dr. Santhosha Kumar A
Department of Electrical and Electronics,
Central University of Karnataka,
Gulbarga, India
0000-0002-3336-6215

Ramakrishna S S Nuvvula
Department of Electrical and Electronics,Engineering
GMR Institute of Technology
Rajam, India
nramkrishna231@gmail.com

Hasan Koten
Mechanical Engineering
Istanbul Medeniyet University
Istanbul, Turkiye
0000-0002-1907-9420

Raghavendra P
Department of Electrical and Electronics,Engineering
Ballari Institute of Technology and Management,
Ballari, India
0000-0002-3874-7033

Polamarasetty P Kumar
Department of Electrical and Electronics,Engineering
GMR Institute of Technology
Rajam, India
praveenindia.p@gmail.com

***Abstract* - This paper explores the usage of hybrid power generation system based on a Solid Oxide Fuel Cell (SOFC), Wind, and an Ultra-Capacitor (UC) in a grid-connected scheme. The UC acts as an energy storage system to compensate for the slow dynamic response of the SOFC. This combination of components effectively maintains a stable output of power from the Wind system. Control systems are implemented to manage the power converters associated with the energy system to meet the expected demand. The SOFC needs to increase its power in the face of changes in the inverter power or a decrease in Wind power, and in both cases, the UC supplies energy until the SOFC reaches the desired power output level. Recharging of the UC is done using Wind power. The hybrid system is capable of providing constant power irrespective of fluctuations in wind speed. Results obtained from simulations are presented to demonstrate the performance of the hybrid system with respect to the changing wind speed and load.**

Keywords—component, formatting, style, styling, insert (*key words****)***

I. INTRODUCTION

The demand for electrical power is increasing rapidly while meeting the increasing demand at the same pace is difficult due to economical, environmental and time constraints associated with building new power plant. The strive for clean power generation has became a priority for energy sector due to increased awareness regarding environmental issues on using fossil fuels. Clean energy generation and reducing the demand-generation gap can be achieved using small scale generation placed near the load centre. The power generation in range of few kilowatts to a megawatts are termed as distributed generation (DG) [1]. The distributed generators are placed near load centre and have advantages like utilization of local resources, reduction of stress on distribution system, voltage support. However the DG can affect the system adversely if proper care is not taken in sizing and placement [1]. The distributed generation based on renewable resources uses naturally available resources to produce electricity such as PV (photo voltaic), wind, tidal, geothermal. The fuel cell and micro-turbine are the DG's gaining importance nowadays due to high efficiency and combined heat and power applications.

Among the renewable based distributed power generation the PV and wind has gained more importance and has well established technology. The wind system is one of the old technology utilizing wind power to generate electrical power. The wind based power generation has disadvantage as the output is fluctuating as wind speed varies widely, seasonally and timely [2]. However the load requirement is constant hence wind systems are associated with energy storage systems. The batteries are commonly used as storage system with wind system to store the energy when the wind power is available and release it as per load requirement. The system output is limited by wind power availability, battery capacity and it's state of charge. The batteries are high energy density devices and suitable for constant output requirements. However as wind varies widely the battery also undergoes uneven charging and discharging cycle which affects the life of battery [3]. In order to support the battery life the UC are used [4]. The ultra- capacitor is a high power density device, able to deliver the burst of power instantly and can undergo high number charging/discharging cycles. The better way to tackle the issue with wind system is to combining different resources to supply constant power. The combining different resources leads to hybrid generation system.

AI-based technologies are gaining prominence as a means

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Trends in Development of Nanomaterial-Based Sensing Devices

B. Chethan*, V. Prasad, A. Sunilkumar, V. S. Veena, and S. Thomas

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conventional electrochemical sensors require the bulk samples, macro electrodes and sophisticated instruments to fabricate the sensor device. The integration of the electrochemical sensing and microelectrode provide a single platform to fabricate a miniaturized, eco-friendly, reusable, less cost, more sensitive, rapid detection and multiplex sensing device. These type of micro devices uses versatile materials, to draw electrodes using suitable fabrication technique. In this chapter, different trends to fabricate miniaturized electrochemical sensing device has been deliberately discussed. This chapter focus on the miniaturized device fabrication, plenty of applications in real time, interfacing automation, identifying of research gaps and the methods to fulfill them. The present chapter give complete details about the modern approaches of the device fabrication methods of the electrochemical sensors.

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Heat and mass transport nature of MHD nanofluid flow over a magnetized and convectively heated surface including Hall current, magneto and thermo diffusions impacts

Jitendra Kumar Singh[1,2] · **Suneetha Kolasani**[1,3] · **G. S. Seth**[4]

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Abstract
The key interest in this paper to examine the heat and mass transport nature of Ti_6Al_4V–H_20 based nanofluid flow and its interaction with a strong magnetic field. In this study significances of Hall current, magneto and thermo diffusions on the flow behavior are included. The induced magnetic field (IMF) and its consequences on the flow-field are also examined. The non-dimensional flow model is solved analytically by use of perturbation method. In order to scrutinize the effects of relevant flow parameters to the flow nature, the numerical values of flow behaviors corresponds to these parameters are depicted, and graphically and tabuly presented. This kind of a study has significant applications in nano science to explore the heat and mass transport characteristic of electrically conducting nanofluids. An important result noted from this study that, on incrementing the volumetric concentration of nanoparticles in the fluid employing resistance force which cause to reduce the flow velocity and enhance the temperature. The mass diffusion factor grows the flow velocity while it reduces the IMF along the main flow. A key fact noted that Hall current generates IMF by modifying the existing magnetic field.

Keywords Nanofluid · Heat and mass transport · Hall current · Magneto diffusion · Thermo diffusion

✉ Jitendra Kumar Singh
s.jitendrak@yahoo.com

1 Department of Mathematics, Vijayanagara Sri Krishnadevaraya University, Ballari 583105, India

2 Present Address: Department of Mathematics, Siddharth University Kapilvastu, Siddharthnagar 272202, India

3 Department of Mathematics, Ballari Institute of Technology and Management, Ballari 583105, India

4 Department of Applied Mathematics, Indian Institute of Technology (ISM), Dhanbad 826004, India

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