



Comparison of Antimicrobial, Antioxidant and Anticancer Activities of ZnO Nanoparticles Prepared by Lemon Juice and Citric Acid Fueled Solution Combustion Synthesis

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Abstract

In the present work, combustion synthesis of ZnO nanoparticles using lemon juice and citric acid as fuels has been carried out. A comparative analysis of the obtained powders has been conducted to understand the strategic advantages of using lemon juice over citric acid as the combustion fuel for the synthesis of ZnO nanoparticles. The X-ray diffractograms of both the samples revealed the presence of wurtzite hexagonal structure with the standard JCPDS pattern of zincite [36-1451] with varying crystallite sizes. Surface morphology of the samples was studied by scanning electron microscopy. Particle shapes and sizes were determined by transmission electron microscopy. Although wurtzite hexagonal structures were seen in both the synthesis methods, their morphology and sizes differed significantly with samples prepared by lemon juice presenting smaller size. The band gap energy value determined by Wood-Tauc method was found to be ~ 3.2 eV for both the samples. DPPH assay revealed the antioxidant activity of the samples at varied concentrations. Further, antimicrobial studies were greater for those prepared by lemon juice. Furthermore, trypan blue and MTT assay evaluation of nanoparticles against PC-3, HCT116, A549, and MDA-MB-231 cancer cell lines indicated enhanced anticancer activity of ZnO nanoparticles prepared by lemon juice. It was found that the sample prepared using lemon juice exhibited IC_{50} values of 78.80 $\mu\text{g/mL}$, 28.75 $\mu\text{g/mL}$, and 10.7 $\mu\text{g/mL}$, whereas the sample prepared using citric acid as fuel exhibited IC_{50} values of 103.6 $\mu\text{g/mL}$, 41.52 $\mu\text{g/mL}$, and 20.06 $\mu\text{g/mL}$, towards PC-3, HCT 116, and MDA-MB-231 respectively.

Keywords Combustion synthesis · Bio-fuel · Antimicrobial · Antioxidant · Cytotoxicity

1 Introduction

Nature has elegant and ingenious ways of creating the most efficient miniaturized functional materials. An increasing awareness towards green chemistry and use of green route for synthesis of metal nanoparticles (NPs) lead a desire to develop environment-friendly techniques. Self-propagating high temperature solution combustion synthesis (SCS) is a simple yet reliable technique for the preparation of NPs. Conventionally, organic compounds such as citric acid, urea, and glycine have been used as fuels for the preparation of NPs [1–4]. Recently, the use of naturally available organic materials as fuels has seen upswing owing to the innovative, cheaper, and environmentally neutral implications as opposed to their conventional (chemical) counterparts. Furthermore, naturally extracted entities serve as both reducing and stabilizing agents during the synthesis of NPs [5]. The use of environmentally benign materials, namely, plant extracts,

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Sketchai: using FCNS to Extract Line ART Drawings



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Abstract: *The digital revolution has improved every field of human lives. And field of ART is no exception. The rapid development of modern technology and techniques has made an impact on the work of painters, sketch artists and even comic book writers. One would be hard pressed to find artists in this day and age who haven't heard of modern tools and applications such as Adobe Photoshop, GIMP, etc. But though these applications have undoubtedly made the lives of artists better, the use of AI for art is still at a nascent stage. The current work aims at developing a web-based application called SketchAI which uses Artificial Intelligence to simplify rough sketches or art work and extract the simplified line drawing. Fully Convolution Networks or FCNs are used to automate the task of sketch simplification. Dataset of rough sketches and corresponding line art drawings are used to train the system to extract line art. Different parameters such as number of epochs, loss functions etc. are considered for experimentation along with different subsets and augmentations of the data. Finally, comparisons of different methods are done to integrate deep learning models with a web application.*

Keywords: *Line Art Extraction, Sketch Simplification, Sketch Shading, Fcn*

I. INTRODUCTION

SketchAI is a web-based tool that aims to use AI to help make the life of artists easier by automating certain tasks. SketchAI uses Deep Learning to automate the task of line art extraction and sketch simplification. Every artist first draws a rough sketch to express his ideas and design rather than focusing on fine details. Using the rough sketch, artists physically trace the jagged draft to create a smooth drawing. But, it's a wearisome and prolonged method. Thus, the system uses a Fully Convolutional Networks to try and automate the task of Line Art Extraction.

Sketch AI system performs the following tasks:

1. Sketch Simplification: Rough raster sketches such as pencil sketches are taken and fully clean drawing can be obtained by using Fully Convolutional Network which is a completely automated process.
2. Comic Colorization: Colorized comic books are often more visually appealing than non-colored ones, and with the advent of digital distribution methods, color printing costs aren't an issue. But actual colorization requires skilled artist. A tool for automatic comic colorization will therefore be highly helpful for comic writers. The system automate a subset of this task, specifically, colorization of individual characters, using a type of neural network known as Generative Adversarial Networks or GAN.
3. Sketch Shading: The task of shading a picture after drawing it is a hard and cumbersome one. The system uses GAN for the task of auto shading of cartoon characters.
4. Landscape Generation: Creating beautiful paintings of landscapes or scenery such as beaches, forests, mountains etc. is something which artists have been doing since time immemorial. The SketchAI tool designed uses GANs to help you automatically generate landscape images of mountains based on doodles.

II. RELATED WORK

Edge detection is one of the research areas where most researchers are contributing on. Many researchers have proposed Edge detectors such as Canny Edge Detector [5] which uses multi stage algorithm that can detect edges in images, and Laplacian of Gaussians (LoG) which is used to detect edges as well as any noise in the image. But, these detectors rely heavily on the gradients and thus some of the high contrast black and white images create confusions during edge detection. The authors of [4] and [3] have made an attempt to detect boundaries in natural images. However, these detectors are designed to detect the complete structure of objects and hence do not perform well in extracting fine structural lines.

For extraction of structural lines, [1] proposes a method using manga which is based on FCNs with skip connections. Adoption of this technique is limited since the method uses CNN structure and training data is composed of manga image which are mostly black & white images with high screen tones. However, on the other hand most of the rough sketches have very low screen tones. Edgar Simo Serra et.al, [2] have proposed CNN-based sketch simplification. Accordingly, this involves creation of a network structure to train the dataset which is intended to simplify the sketch. The system designed in this paper is built upon FCN network structure.

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AN Effective PHR Based Secure Data Distribution using KC-ABE in Cloud Environment

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Abstract The objective of the research work is focused on cloud computing which is a developing design to give secure change among continuous applications. Secure information sharing is characterized as transmission of at least one documents profitably this procedure is utilized to share data's, characteristics, records among different clients and associations in secure mode and verifies from outsider clients. Usually it is finished by encryption and unscrambling process over private system. This kind of information sharing is finished by new innovation of key cipher text KC-ABE. It can give secure record transmission by having confined access innovation. This developing procedure has been checked in tolerant individual wellbeing record upkeep. These documents are recorded and recovered safely without access by unapproved clients. KC-ABE encryption framework is material to produce for adaptable and secure sharing of information's in distributed computing, which will reinforcement persistent wellbeing creating records in increasingly defensive manner. In KC-ABE strategy, the subtleties of patient are put away in KC-ABE server farm. In KC-ABE, Key backer just legitimize the entrance control and can't issue by the encryption. Along these lines the relating tolerant just reserve the options to get to this KC-ABE innovation. It gives more secure information sharing than other encryption framework. The fundamental utilization of this technique are High key age time and encryption time. It can accomplish less encryption time and key age time to improve productivity of KC-ABE.

Keywords: KC-ABE, key issuer, Public key, cipher text, master key analysis.

I. INTRODUCTION

In the era of cloud computing, to shield information from spilling, clients need to encode their information before being shared. Access control is vital as it is the principal line of safeguard that avoids unapproved access to the mutual information. With the thriving of system innovation and versatile terminal, online information sharing has turned into another "pet, for example, Facebook, MySpace, and Badoo[1]. Similarly cloud is one of the most encouraging application stages to fathom the unstable growing of information sharing. In distributed computing, to shield information from spilling, clients need to scramble their information before being shared.

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Access control is central that counteracts unapproved access to the mutual information. As of late, characteristic based encryption (ABE) has been pulled in considerably more considerations since it can keep information security and acknowledge fine-grained [2], one-to many, and non-intelligent access control. Cipher text-approach quality based encryption (CPABE) is one of doable plans which has substantially more adaptability and is more reasonable for general applications.

In distributed computing, authority acknowledges the client enlistment and makes a few parameters. Cloud service supplier (CSP) is the administrator of cloud servers and gives different administrations to customer. Information proprietor encodes and transfers the created cipher text to CSP [3, 4]. Client downloads and unscrambles the intrigued cipher text from CSP In existing system techniques are built using many encryption approaches like Attribute Based Encryption etc. If we maintain the data in cloud data Centre, it is so absolutely secured. Health and medical records are so complex. It needs more secure system to product from third parties. Otherwise it leads many illegal activities [5]. The existing system of using ABE in cloud computing is done by encrypt data using keys and attributes. Through internet anyone can download the details of patient. To avoid this drawback ABE technology is used to protect data by matching access user attributes with defined attributes [6]. If the scenario is matched only it will be accepted to access the data. That is, it is concluded that person is only the authorized user. Otherwise it will be rejected to access the data of health records.

Client downloads and unscrambles the intrigued cipher text from CSP. The common documents for the most part have progressive structure. That is, a gathering of documents are partitioned into various progression subgroups situated at various access levels. If the records in the equivalent various leveled structure could-based encoded by a coordinated access structure, the capacity cost of cipher text and time cost of encryption could be spared. distributed computing, a patient partitions his PHR [7] data M into two sections individual data m1 that may contain the patient's name, government disability number, phone number place of residence, and so forth. The medicinal record m2 which doesn't contain touchy individual data, for example, therapeutic test outcomes, treatment conventions, and activity notes. At that point the patient receives CPABE plan to encode the data m1 and m2 [8] by various access strategies dependent on the genuine need.

THE CONCEPTS OF *DEŚĀNTARA* AND *YOJANA* IN INDIAN ASTRONOMY

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Abstract: In this paper we discuss in detail the concepts of (i) the *deśāntara* correction to the mean longitude of a heavenly body, and (ii) the linear distance, called *yojana*. We consider the definitions and procedures given in classical Indian astronomical texts like the *Āryabhaṭīyam*, *Brāhmasphuṭasiddhānta*, *Khaṇḍakhādya*, *Laghu-Mahā-Bhāskarīya*, *Siddhānta Śiromaṇi*, *Grahalāghavam* and *Tantrasaṅgraha*. From our findings we notice that there were apparently two distinct schools (*pakṣas*), which were led by Āryabhaṭa (b. CE 476) and Brahmagupta (ca. 628), who used 1050 and 1581 *yojana*, respectively, for the diameter of the Earth.

Keywords: Indian astronomy, *deśāntara*, *yojana*

1 INTRODUCTION

Since the Earth rotates about its own axis from west to east sunrise takes place earlier for places with eastern longitudes and later for those with western longitudes. In classical Indian astronomical texts, the time during a day was reckoned from the instant of local sunrise. But the procedures for the computation of the mean positions of the heavenly bodies were given in the texts with reference to the mean sunrise for the prime meridian of Ujjayinī (in present-day Madhya Pradesh). The meridian through Ujjayinī was assumed to pass through a few more important places, like Kurukṣetra, and intersect the terrestrial equator at Laṅkā.

Therefore while computing the mean positions of the heavenly bodies for a given local time at a given place a correction, called the *deśāntara saṃskāra*, had to be applied to account for the longitudinal difference between that place and Ujjayinī. The computation of the *deśāntara* correction needed the longitudinal difference between the given place and the prime meridian through Ujjayinī. In the classical texts this distance was expressed in terms of the linear difference between the two places. For this purpose, the Earth's circumference in *yojanas* was required. At that time, there were two main schools (*pakṣas*), and they took the

Earth's circumference to be about 3300 *yojanas* and 4800 *yojanas* respectively

2 THE *DEŚĀNTARA* ACCORDING TO DIFFERENT TEXTS

In Indian astronomy linear distances were measured in *yojanas*. In Figure 1 *PQAC* is the prime meridian through Ujjayinī. *PDBQ* is the meridian

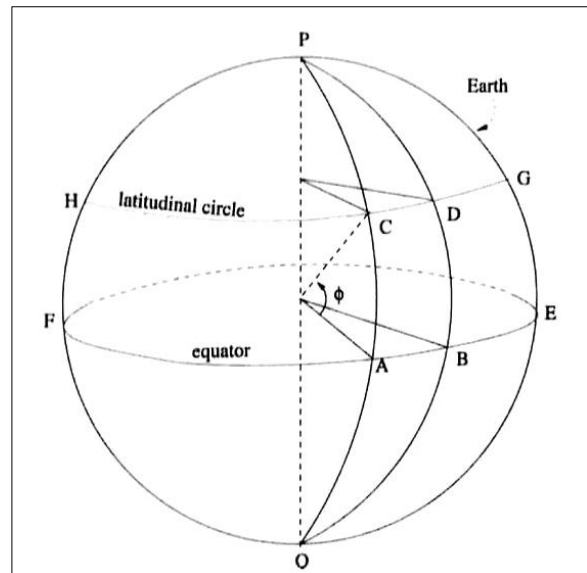


Figure 1: The longitude and latitude lines of a given place (diagram: Padmaja Venugopal).

Novel Analytical Framework for harnessing Cognitive Radio Resource Optimization in 5G Networks

Vani B P, R. Sundaraguru



Abstract: *The adoption of cognitive radio technology is characterized by various beneficial characteristics that can facilitate better spectrum sensing performance in a 5G network and thereby acting as a boosting element towards a high data transmission rate. However, it is also characterized by various challenges that limit the significant development in resource utilization in 5G. Therefore, this paper introduces a novel and simplified mechanism that facilitates the 5G network to perform better in data transmission and its associated quality of it. The proposed system also performs modeling using practical constraints associated with the usage of cognitive radio over 5G networks using a convex optimization approach. The model is simulated using practical environmental parameters to prove that the proposed system excels better performance in faster processing and quality signal in contrast to the existing resource allocation scheme exercised in 5G networks.*

Keywords: *Cognitive Radio, Internet of Things, 5G networks Resource, Cost.*

I. INTRODUCTION

5G network is basically meant for supporting the connectivity among the applications that demand higher data transmission capabilities [1] [2]. It consists of the transmission and communication area that ranges in the geographic area called cells. All the devices of wireless form in 5G cells performs data transmission with each other using radio waves that are facilitated by an array of the local antenna as well as sophisticated transceivers [3]. There is an ongoing study that discusses the usage of millimeter waves to further improve the transmission rate in 5G.[4]. It is believed that the adoption of 5G offers supportability towards millions of communication devices, which offers an appropriate communication bridge in Internet-of-Things (IoT) networks [5][6]. However, apart from the beneficial aspect of a 5G network, it has associated challenges, too [7]. The first challenge is associated with the usage of the frequency band in 5G networks as there is less number of higher spectrum band availability.

The second challenge is associated with the coverage and the deployment aspect of 5G network as it has a restricted range of operation. For higher range, beamforming is used for supporting higher frequency; however, still, the challenges remain, which are the usage of 5G antenna. The third problem is associated with building cost and purchasing costs associated with initial network construction, which is quite higher. The fourth problem is associated with the supportability of the device, which is extremely less in present times. The fifth challenge is associated with security issues in 5G. In the present time, it has been seen that the adoption of cognitive radio offers a significant advantage to improve the performance of a 5G network [8]. The biggest capability of cognitive radio technology is its potential to address the scarcity problems of the spectrum with the aid of accessing dynamic spectrum as well as sharing spectrum [9]. Interestingly, this process of cognitive radio technique has absolutely no dependency on increasing the expenditure of surplus resources of radio frequencies. It can significantly control the cost, capital, and overall expenditure. The existing research trend is basically to ensure that there is a presence of multiple spectrums with multiple heterogeneous wireless networks considering multiple attributes of it viz. space, frequency, time, polarization, etc. There have been various survey work carried out on the cognitive radio network on 5G, where various environmental scenarios have been considered viz. presence of microcells and small cells, ii) presence of communication system and radar, iii) the presence of different satellite services, etc. [10]. By including intelligence towards different types of wireless networks, cognitive radio technology can offer various beneficial information to the 5G networks. Moreover, harnessing the capability of the smart antenna with better beam forming capacity can actually boost the performance of 5G networks. Apart from this, usage of Licensed Shared Access over cognitive radio technology dynamically can facilitate better sharing of spectrum, time, and frequency. Finally, cognitive radio also assists in integrating various devices of self-organizing capability that can be built with more potential to further assists in forming a network with self-optimized wireless nodes in the 5G network. However, it is not that simple to incorporate cognitive radio in the 5G network as it has its own challenges that are required to be explored and investigated. The biggest challenging factor associated with the usage of the cognitive radio over the 5G network is the resource constraint, which is quite difficult. Hence, the proposed system has introduced a novel analytical solution that is meant for overcoming the performance tradeoff associated with resource allocation in a 5G network when cognitive radio is incorporated.

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ATM Crime Prevention and theft Detection model by Wireless Technologies RFID and GSM



G Ahmed Zeeshan, R Sundaraguru, Anjya Naik Vadithya

Abstract: *The Implementation of Advanced ATM theft avoidance System is brought into world with the perception of ATM wrong doing occurring far and wide. This paper manages the counteractive action of ATM wrongdoing. At whatever point burglary happens, MEMS module is present to detect crime happening at ATM machine. Proposed framework is done by ARM controller based installed framework designed for constant information gathered utilizing a MEMS module. When the theft happens this, designed system automatically alerts alarm such as buzzer, dc motor control gate, GSM sends SMS to authorized person and the status is displayed in LCD to monitor. Simultaneously this framework additionally manages the well being of the client by cautioning the encompassing individuals and close-by police headquarters at whatever point the client is in risky circumstance. Here we utilize RFID module to verify ATM Card. RFID discovers ATM card can swipe anyplace. It naturally sends burglary alert through GSM, buzzer ready individuals, DC motor entryway lock and all the status is displayed on LCD. Keil software is used to implement programmatically and execute the project successfully.*

Index Term: ARM Microcontroller, ATM, GSM, MEMS, RFID

I. INTRODUCTION

ATM was turned into indispensable correspondence & administration tool among money bank and cash card persons because of quick, comfort and human asset sparing favorable circumstances. Presentation of ATM in 1967, culprits has concocting approaches which attempt to take money from inside. Since a machine called ATM wipe out that requirement to nonstop individual inclusion, will in general be situated in spots that make them increasingly powerless against assault.

The quantity of ATM machine being used increments, due to that recurrence & modernity of safety, dangers, designing the advanced wrongdoing avoidance estimates the peek requirement for ATM makers, monetary organizations. Because of huge misfortune for card holders and banks, we fabricate secure ATM violations avoidance system for quick and simple user friendly money transactions between banks and human being with safety and security.

II. LITERATURE OVERVIEW

In 1975, Korea trade bank presented the main ATM, trailed By Shinhan bank in 1982 by ATM Industry Association (ATMIA).

There are currently near 2 million ATMs in this World [1]. As of now, the ATM machines are not verified that much. Those are just having the card swapping office [2] at the passage at the entryway. Be that as it may, this office doesn't control the quantity of clients entered at a specific example. Number of ATMs are additionally secured under this framework are likewise not many. Another proposed verified framework is to put vibration sensor [3] into the ATM machine. In any case, in the event that the total machine is stolen, at that point it has not so much physical use. For that circumstance we need a GPS beacon on that machine, which isn't being used at this point. ATM burglary and extortion event is discernible increment in most recent couple of years.

III. EXISTING SYSTEM

In past activities, numerous analysts have built up a framework for programmed ATM security utilizing Microcontroller 8051 without any wireless data transfer system. Practically all frameworks are wired, yet now we have attempted the equivalent by the utilization of remote.

IV. PROPOSED SYSTEM

In proposed framework we are utilizing ARM7 to actualize this task, and we are utilizing GSM innovation to send the security data through SMS. We are utilizing MEMS Technology to distinguish the breakage of ATM machines and that data would be send to microcontroller then it will send to security framework. We are utilizing smoke sensor to recognize the flame mishaps. Advantage of Proposed system is Cost productive and Low Power utilization

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Design of 12-Bit SAR ADC using Split Capacitor Based DAC Architecture at 45nm CMOS Technology

Naveen I .G, Savita sonoli

Abstract: Nowadays, there is an increasing demand for Successive Approximation Register (SAR) based Analog to Digital Converter (ADC) in long battery applications like medical application, Sensors and many more. In this paper DAC circuit is designed using multiple capacitor and Multiple MUX for switching. A split based capacitor is used for boosting the speed of the architecture. In split based DAC no common mode voltage required and dynamic offset can be removed as well. In this work, 12-Bit DAC and encoder is designed using 2 Transistor MUX and 18 Transistor Full adders (12B-2TM-18TFA). 2T and 18T is used to design the MUX and FA. This entire architecture is implemented in Cadence Virtuoso 45nm CMOS technology. Simultaneously, 10B-12TM-36TFA architecture also implemented in this paper. The performance parameters like area, power, and delay, current is evaluated for both architectures. Result showed that 12B-2TM-18TFA architecture consumed less area, less power, less delay, and less current compared to 10B-12TM-36TFA.

Keywords : Analog to Digital Converter, Digital Analog Converter, Successive Approximation Register, 18T MUX, 2T MUX.

I. INTRODUCTION

SAR - ADC have become more preferred design for many low power VLSI applications in which design of capacitor based DAC play a very vital role. Analog and mixed circuit designs are too difficult to work under low voltages [1-2]. Normally, SAR-ADC is not preferred for high bandwidth applications, because it requires more clock cycle to obtain the N resolution (bit) [3]. In recent years, different techniques have been designed to lower the switching energy of capacitive DAC array [4-5] For example, Vcm based [6], switchback scheme [7], and Zhu [8] these achieve an average speed and average power of the entire design. Conventionally, Counter based digital control design [9], Capacitor switching technique [10], split capacitor DAC [11-12], histogram based [13] methods have been used earlier. But, each and every methodology have some limitation like oldest technology (180nm,90nm,65nm), require more area, consume more power (in mW), high current (mA), less resolution (less than 8-bit), architecture occupies more critical path and more number of transistors require to design the internal blocks. To overcome these

problems, 12B-2TM-18TFA design is implemented in this paper. This work is implemented on 45nm CMOS technology. Compared to existing architecture (10B-2TM-36TFA), 12B-2TM-18TFA architecture gives less area, power, delay and speed at higher resolution.

This research work is composed as follows, section 2 gives a literature survey of papers from earlier research works. The section 3 explained the proposed methodology with internal block of the entire design. The section 4 presents a brief discussion about the experimental setup and schematic outputs. The conclusion of this research work is given in section 5.

II. LITERATURE SURVEY

Xing *et al.* [14] proposed a 7-bit MS/s four-way time interleaved SAR ADC. In this paper, a partial Vcm based switching technique was implemented that requires a digital overhead from the SAR controller and achieved better conversion accuracy. This methodology has reduced the common mode variation by 50%. Reduction of noise, comparator offset and input parasitic was analyzed and verified by simulation. In this research work, the prototype fabricated in the 65nm technology, which occupies 0.025 mm² of active area. But, the usage of the external common mode voltage during DAC reset could be a problem with this technique. Large switching power and more area is required to run the entire architecture.

Zhang *et al.* [15] presented a 14-bit kS/s SAR-ADC used for biomedical application. In order to achieve enhanced linearity, a uniform geometry non-binary weighted capacitive DAC was implemented. Furthermore, in this method, a secondary bit method was used in dynamically shift decision levels for error correction. This method was implemented in 65nm CMOS technology. The ADC has consumed 1.98 μ W Power and 0.28mm² of active area. This Architecture requires number of stages to implement that increases complexity of the ADC.

Mao W, Y *et al.* [16] implemented Non-Fractional Binary Weighted Capacitive Array with Attenuation (NFBWA) capacitor method for SAR ADC. The proposed DAC method has improved the Walden Figure-of-Merit performance by 1.67 and 5.45 times. This method minimized the area and power of the capacitive array compared to Binary Weighted Attenuation (BWA) technique. The operation of the NFBWA method requires more time, which is the main limitation of this method.

Shakibae *et al.* [17] proposed a power-efficient SAR ADC system.

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Insights on Significant Implication on Research Approach for Enhancing 5G Network System

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ABSTRACT

With the exponential growth of mobile users, there is a massive growth of data as well as novel services to support such data management. However, the existing 4G network is absolutely not meant for catering up such higher demands of bandwidth utilization as well as servicing massive users with similar Quality of service. Such problems are claimed to be effectively addressed by the adoption of 5G networking system. Although the characteristics of 5G networking are theoretically sound, still it is under the roof of the research. Therefore, this paper presents a discussion about the conventional approach as well as an approach using cognitive radio network towards addressing the frequently identified problems of energy, resource allocation, and spectral efficiency. The study collects the existing, recent researches in the domain of 5G communications from various publications. Different from existing review work, the paper also contributes towards identifying the core research findings as well as a significant research gap towards improving the communication in the 5G network system.

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1. INTRODUCTION

At present, the usage of the fourth generation or 4G network is prevalent everywhere globally [1]. However, there are increasing demands of maximized mobile broadband in order to cater up the dynamic application and services e.g., interactive media, 4K video streaming, real-time collaboration, remote working environment, virtual reality, etc. However, with the exponential rise of mobile users as well as application the inefficiency of the 4G network has already surfaced in commercial markets. This leads to hope of fifth generation (5G) network [2], which is claimed to overcome the limitation of 4G. It is claimed that usage, as well as the adoption of the 5G network, offers a new range connection e.g., safer transportation system, smart cities, homes, school, smart manufacturing units, etc. [3]. Apart from this, it is believed that the 5G network will offer a better form of connectivity between machine-to-machine and device-to-device. As 5G network offers adoption of machine learning, it is possible to make the network quite smart and decisive with evolving smart appliances. It also offers tangible advantages to society by supporting novel IoT technologies, ubiquitous connection, reduced energy consumption, larger coverage, and smart data management [4]. It offers the capability of massive machine type communication as well as an ultra-reliable communication system with low latency. It is interesting to know that the user plane of 5G encapsulates the control plane of 4G, which will mean that both 4G and 5G work together. It is also known that 5G offers a completely standalone operation. The frequency of the 5G network supports less than 1 GHz coverage for device-to-device communication. The complete architecture of the 5G network is composed of a radio access network as well as the core network. The radio access network comprises of towers, cells that bridges communication between the user with the wireless device and the core network. Basically, the core network will consist of the data network to manage different communication/connection [5]. It is also believed that the core network of 5G is integrated with cloud-based services as well as the internet in order to offer distributed servers. The complete 5G technology is designed

Centralized Street Light Energy Control and Monitoring System Over IoT



G Ahmed Zeeshan, R Sundaraguru, Suresh Kothapalli

ABSTRACT--- Energy saving is very necessary need in now a days. We are introducing Energy efficient centralized energy monitoring as well as controlling automatically through Internet of things. This proposed system demonstrates energy saving street light intensity control system with low maintenance. This is done by sensing the light intensity from surroundings by LDR Depends on the LDR status street light automatically controlled. Digitization of Energy meter readings in LCD and IoT module for status monitoring. We can control the street light loads though server if in case emergency. Proposed system saves the energy in day mode and it made system is automation. Digitalization of energy meter data through server. We can monitor and control very easily, simple fast access. All input and out modules are interfaced to ARDUINO Microcontroller which process input data and provide output with help of 5V regulated power supply. In this project we used Arduino ide software to write c program and compiling.

Index Term :— ARDUINO, Energy Meter, IoT, LDR

I. INTRODUCTION

Electricity demand is increasing day by day for increasing population for need of hospitals, agriculture industrials, Household. It's very difficult to handle power distribution and maintenance. Due to that energy saving is very huge requirement in current generation. To save power or maintain we need improved technology. The proposed system Centralized energy Control Monitoring system using IOT provides better saving of energy. We can avoid this power or energy waste by implementing smart energy meters. This implemented system having smart energy meter which consume low power and current and voltage data transfer through server. We implement automated street light ON/OFF System using LDR. Due to the proposed innovative system digitalized energy meter readings, optimized, power wastage reduced and data will displayed in web page. Easy to access and control. Arduino microcontroller and arduino IDE software is used for implementation this system.

II. LITERATURE OVERVIEW

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"ARM-based association framework utilizing unbelievable meter and Web server", 2011. He proposed that designing application using ARM7 microcontroller. By using this microcontroller its not a robustness, interfacing modules are complex and cost effective, due to complex operation of working is hanging the microcontroller. Iot is interfaced to ARM controller due to that high power consuming. an insignificant performing its having.

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III. EXISTING SYSTEM

Present existing system of energy monitoring system is consuming more power. This system is controlled automatically but there is no digitalization of energy data transfer from the installation place to monitoring. Due to this existing system have many limitations that are power wasting more in day times there is no emergency mode control of system. It takes more time to transfer data to monitoring station this delay leads to may limitations. No smart metering system which deals no exact particular data of current or voltage consumed by the load.

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Wearable Wireless Sensor System with RF Remote Activation for Industrial Applications

G Ahmed Zeeshan, R Sundaraguru, Fahmeeda Naaz



Abstract—These days, Sensors are playing a very important role in the world with combination of Wireless Technology. Wireless Sensor System makes human life simpler and smarter. This emerging Technology helps in Industrial Applications. Safety and Security standards for employee position observation and industrial premises monitoring is also important towards safety Industrials. In this paper we are introducing an advanced sensor system called Wearable Wireless Sensor System. It is the combination of Wireless Sensors and Wearable Technology for significant safety enhancement in Industrials. We built up a wearable wireless sensor framework which is appended in a consistent wearable format & utilized to work environment observation. Wireless Sensors are temperature, smoke sensor and LPG Gas sensor. The fundamental element of the designed framework is likelihood could be actuated wirelessly through a RF module with radio signal at a frequency of 850MHz to 865MHz. It performs different wearable sensing module frameworks, for example, changing the framework from rest, estimation, and information transmission modes when outside RF sign is accessible. The exploratory information exhibit that the actuation separation distance is 2.8 m to a RF module with an intensity of 28 dBm. Advanced Wearable System framework can signalize about worker nearness in connection to offices. If any alert through high temperature, smoke or gas leakage RF wireless module alerts us through a buzzer and we control the same thing through Wireless Technology. All info and out modules are interfaced to ARDUINO Microcontroller with procedure input information and furnish yield with assistance of 5V controlled power supply. In this task we utilized Arduino IDE programming to compose a program and accumulating.

Index Term: Arduino, LPG, Smoke, RF, Wearable Wireless Sensor.

I. INTRODUCTION

Present day level of hardware and data innovation permits fusing electronic parts legitimately into work garbs or regular citizen garments without carrying a bodily distress towards the wear. The wireless innovation furnishes dressable gadgets with RF association, additionally this is an association with significant system administrations for capacity and handling information of each wearer. This innovation additionally gives remote observing element, the information of dressable could be detected by equipped staff distantly and connection

to elements of dressable gadgets is done. There are great deals of calling in industry and administration parts which are influenced by various risks. Simultaneously, the security benchmarks for modern plants become harder as for representative state observing and checking of working ecological conditions. Along these lines, it is important to give ongoing wireless observing of both worker state and working environment natural conditions. Different kinds of Wireless Sensor Networks (WSN) have been grown as of late. These systems comprise of little hubs and are furnished with handsets, chips and sensors. They can be utilized in various everyday issues such as ecological, human checking, home computerization and so on. With the help of the proposed system, advanced safety and security in Industrial Applications is a new era in the present and also the employee safety and monitor is observed wirelessly through this system.

II. LITERATURE OVERVIEW

Writing a survey to neutralize the perilous impacts of gas spillage, critical endeavors were completed in manipulative and scaling down the gas break locating procedure. The events of gas release related occurrences are contemplated by a few analysts and have distributed factual information episodes. In 2012, some vital detailed "Vitality Aware Gas Sensing Using Wireless Sensor Networks" concentrating on a sensor hub, hand-off hub, remote sensor system and a system organizer [1]. System organizer is a principle element of WSN. Bolsters system activity by wireless correspondence dependent on the IEEE 802.15.4 standard and the ZigBee determinations. The system organizer is additionally in charge of alarming a system administrator or a crisis administration utilizing the internet system or alerting a SMS using GSM modem. Indeed, after accepting the alarm with the sensor hub, a system facilitator can be able to carry out the primary oppose activity by switching off harmful gas emanation by means of the remote sensors. Similar creators have additionally added to the additional vehicle security through a truck lodge, air excellence screen utilizing CO & O₂ gas modules, framework structured is created and on-street tried. The consistent observing gases of CO & O₂ gives included vehicle wellbeing a caution and can be put off perilous gas focuses, driver's weariness / sleepiness and fumes hazardous gas result suicides. CO groupings of 30 ppm & O₂ gas levels less than 19% practiced when driving. A "GSM Based Gas Spillage Detection System" by Srivastava and Prabhakar gives a practical and profoundly precise framework,

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Agriculture Field Monitor and Auto Control Over Wireless Network IOT



G Ahmed Zeeshan, R Sundaraguru, Perumandla Ramya

Abstract — Agribusiness assumes to be a significant job in creating nations. In India, most of the population depends upon the country development. Accordingly, the Project goes for impacting horticulture business to splendid using computerization and IOT deployment. Rather than checking the scenario through Web View application in any mobile phone. In this scenario paper, we are using three sensors. The Moisture sensor, estimates the Moisture level of particular plants. The Moisture level is under check continuously and passes data to the Arduino board. It controls the Water Pump ON and OFF according to the Moisture Level of water to the plant. Another primary part of this venture is Light power sensor. It detects the Light Intensity of it, and it sends the data to the microcontroller. Temperature and Moisture sensor procure the information which will be displayed on the LCD and information moves to web server using WIFI module. IoT gets the data and settle on real basic leadership processed by getting various qualities from sensors like soil Moisture, Temperature and light power, water quality and so on. This paper revolves basically around using less water, & limiting the manual work for agriculture, with the goal that we can save time and money.

Index Term: Arduino, Agriculture, IoT, Relay, Soil Moisture

I. INTRODUCTION

The World is growing smartly with advanced implementations in different sectors as well as agriculture. Smart irrigation and agribusiness is the present trending business in the world to reduce the water usage in the fields and reduce manpower, easy works and quick access mode. To make smart irrigation and agribusiness, we attached advanced sensors along those wireless modules to implement same parameter as said above. Remote sensors or web of things is successfully utilized in the horticulture field for observing and controlling the diverse soil parameters of the land towards expanding the efficiency and sparing the electric power, water use and labor. Various sorts of sensors are utilized to distinguish different sign of soil level, yields and condition correspondence strategies are utilized in conveying the information gathered and transmitting the control signals. Smart or intelligent Agriculture system deals with some wireless sensors with auto water control, plough, seed releasing, control water level.

II. LITERATURE OVERVIEW

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The new situation of diminishing water, evaporating of waterways and tanks, flighty condition, present a pressing need of legitimate liquid usage. Sensing modules are used to observe to determination of different parameters of Harvesting [1]. Following investigate in the farming ground. Be that as it may, utilization of innovation in the field of agribusiness assumes a significant job in expanding the creation just as in lessening the labor. A portion of the examination endeavors are accomplished for the improvement of ranchers that give frameworks which utilize advancements accommodating for expanding the farming yield [2]. In previous researches done in irrigation system that is all implemented in the machinery in advance due to which only collecting data but no smart operation. The evolution of the irrigation system increased step by step, it reached the advance wireless Server and remote operated system [3]. In proposed system a minimal effort and effective wireless sensor arrange strategy to secure the soil Moisture, temperature from different areas of field and according to the need of harvest water engine is empowered [4], it proposes a thought regarding how robotic irrigation framework was created to enhance water use for farming purposes.

III. EXISTING SYSTEM

In India, horticulture is the need of the greater part of the Indian business, and it is one of the primary wellsprings of vocation. Farming likewise majorly affects financial system of the nation. Liquid utilization builds step on step that leads to prompts the issue water level shortage. On account of conventional irrigation framework agriculture system is a doing of operation in manual mode and water usage for that is immeasurable and there is no updating of weather conditions in the surrounded field. We don't know the condition of the soil, temperature, light intensity in that filed. Because of the traditional agriculture system water wastage is huge, time-consuming for completion of work is high and lot of cost is increasing day by day. To avoid all the limitations of this system we implemented a new system which improves all to make smart and simple and cost effective.

IV. PROPOSED SYSTEM

Enthusiastic irrigation frameworks offer an assortment of favorable circumstances over customary irrigation Frameworks. Brilliant irrigation frameworks can upgrade water levels dependent on things, for example, soil Moisture and climate expectations. Also, the savvy irrigation controlled gets nearby climate information that can enable it to decide when a landscape ought to be watered.



Research of Algorithms used for Routing and Assigning Wavelength in WDM Networks



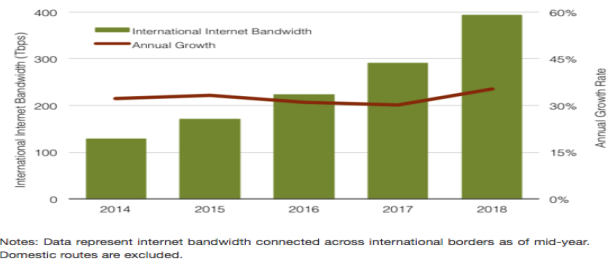
Hamsaveni M, Savita Choudary

Abstract—The telecommunications department is the most difficult in today's communication offering the highest amount of bandwidth. With the finest prototypes and test rigs to form optical WDM technology, many companies have appeared for a particular link request, a wavelength and a path must be allocated in the WDM network. Routing and Wavelength Assignment (RWA) problem is called the assignment of a wavelength and a path to the link request, with accessible resources. The aim of this article is to analyze the algorithms for any WDM networks for efficient wavelength assignment routing protocols. As a researcher, we plan to suggest a comprehensive literature study for the development of a new algorithm for efficient allocation and appropriate wavelength usage and the routing of data packets from source to destination to overcome all failures. Before allocation, we use simulations and analyze optic fiber communication methods, various losses depending on dynamic wavelength allocation with minimum and maximum.

Keywords: Bandwidth, wavelength assignment, WDM networks, efficient allocation, routing.

I. INTRODUCTION

We're in wireless era. Wireless communication's backbone is wired network. In network communication, optical fiber plays a very significant role. Internet use has grown quickly as the use of multimedia communication applications is also increasing and needs enormous bandwidth. Online conferences, on-demand videos, lots of devices used in day-to-day operations such as smart home, intelligent cars, etc. also require internet connection. Many of the applications require information from a high-speed internet, leading to bandwidth development. The bandwidth development in the order of Tbps per year is shown in Figure 1. With today's Internet and Asynchronous Transfer Mode (ATM) network, we don't have the ability to satisfy the growing bandwidth requirements. [1,7].



Notes: Data represent internet bandwidth connected across international borders as of mid-year. Domestic routes are excluded.
Source: TeleGeography © 2018 PriMetrica, Inc.
Figure 1. International Internet Bandwidth Growth, 2014–2018

Fiber optical technology is commonly used to meet the bandwidth requirements for excellent link speed, buffering, audio / video download and gaming, etc. All optical networks with multiplexed wavelength division are popular due to their limitless capacities, excellent bandwidth and low signal distortion, signal attenuation, material utilization, energy requirements and, most importantly, low cost space requirements [11]. Using separate channels (wavelengths), several optical signals are sent simultaneously to the same fiber in the WDM network. Communication occurs via WDM channels in a WDM network called light paths [12]. Multiple wavelengths are used to transmit information on each fiber in WDM networks. Figure 2 shows a multi-channel transmission over the WDM scheme, each channel having a distinct wavelength and all multiplexed at one end into a single fiber line and demultiplexed at the other end [2].

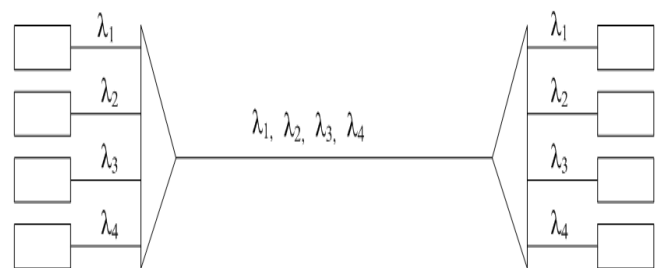


Figure 2. A basic transmission configuration system used in WDM networks

II. LITERATURE REVIEW

In wavelength WDM networks, users communicate with each other through WDM channels called light paths. The lightpath is used to support links to the WDM network [13]. The light-path will have the same wavelength for all the fiber links it passes through. Figure 3 shows the development of light paths in the WDM network.

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Predicting Harmonic Centrality In Aodv For Wireless Sensor Networks Using Machine Learning

Pallavi R., Vishal V., Tushar Sharma, G.C. Banu Prakash

Abstract - The Ad Hoc On-Demand Distance Vector routing protocol is the ideal protocol for routing in dense wireless networks. The metrics used to evaluate centrality for such networks include betweenness, closeness, degree, harmonic etc. The harmonic centrality is a better metric at leadership recognition. The authors propose an optimal machine learning approach to predict the harmonic centrality for each node based on few network parameters. The hypothesis that the distance from the source to destination contributes to the harmonic value is investigated. Regression models and Artificial Neural Networks were used to find the equation that fits the feature columns with minimum error. From the experiments, the authors concluded that the distance (closeness) does not contribute significantly towards leadership recognition in the network. Among the various approaches experimented with to predict the harmonic centrality, linear models showed a better fit and minimum error even in the case of scaling up the network.

Index Terms - AODV, Harmonic Centrality, Regression, Neural Networks

1 INTRODUCTION

The AODV routing protocol is used for in dense wireless ad hoc networks. Such Wireless Sensor Networks (WSN) can self-deploy rapidly and use the protocol to scale on demand. Hence, they can be used in self-scalable applications with rapid growth potential, especially in large scale social networks. This could also lead to a concern regarding the uncertainty in the topology especially when the scale is unprecedented. Thus there is a need for predictive metrics to identify the critical nodes that ensure a connection between clusters of nodes. Such nodes also known as leaders can be discerned effectively using harmonic centrality over closeness and betweenness. Computing the harmonic values can be computationally intensive and uncertain owing to the steep scalability index during the network growth. Hence, a predictive model that can predict the harmonic or h-values with minimum error percentage can enable monitoring of the system. The paper shows the NS2 simulation of a large network in which nodes range from 100 to 1000 in number.

Each node is characterized by its throughput, delay, energy, neighbor count, neighbors, the average number of hops, and the destination node. Our investigation is based on the hypothesis that the “closeness factor” or vicinity plays a statistically significant role in predicting the H value. The protocol attempts to predict the H value using various machine learning techniques to find an equation that predicts the value with the least absolute error. The rest of the paper is organized as follows, Section I contains the introduction of the problem, Section II contain the related work, Section III describes the methodology used, Section IV describes results and discussion, Section V concludes the key factors of the paper with conclusion and also enhances the future directions.

2 RELATED WORK

Recent papers [16] based on AODV protocol deals with the study of the creation of the dataset and the evaluation metrics for the Harmonic centrality values which are useful for the computation of the distance vector parameters for AODV protocol. D. Bhattacharyya, T.-H. Kim and S. Pal [1] suggest the idea of transferring the data based on a cluster approach for the wireless network’s path detection. D. Acemoglu, G. Como, F. Fagnani, and A. Ozdaglar [2] deal with the study of a tractable opinion dynamic model that generates long-run disagreements and persistent opinion fluctuations. The model involves an inhomogeneous stochastic gossip process of continuous opinion dynamics consisting of regular agents and stubborn agents that shows the uncertainty in the growth of the network. N. E. Friedkin [3] gives a brief description of the calculation of the centrality example and helps to obtain one for the AODV protocol which helps for the optimal path detection. M. Marchiori and V. Latora [4] give a brief about the use of social networks in great depth and helps with the study of energy and throughput which is also used by our model. A. Bavelas [5] deals with the connectivity of the group networks i.e. connectivity when many tasks are associated with the same network and the throughput is altered and optimal paths are chosen for the efficient implementation of the model. Xiaodong Wang, Daxin Zhu [6] suggests the use of A* algorithm for the dynamic allocation of the total distance values for the easier computation of the model and limit the GPU usage of the model for calculating the distance from one hop to another. [7] Suggests the use of the linear regression

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Original Research | [Published: 02 November 2019](#)

Crop yield prediction: two-tiered machine learning model approach

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International Journal of Information Technology **13**, 1983–1991 (2021)

494 Accesses | **13** Citations | [Metrics](#)

Abstract

Nutrient deficiency analysis is essential to ensure good yield. The crop yield is dependent on the nutrient contents and drastically affects the health of the crop. In this paper the nutrient deficiency of a paddy crop is considered. Tensor Flow's (Google's Machine Learning Library) is used to build a neural network to classify them into nitrogen, potassium, phosphorous deficiencies or healthy independently. It is necessary to have an optimal balance between nitrogen, potassium and phosphorous content.

Tensor Flow's model identifies the deficiency using a set of images. The result is fed to "machine learning driven layer" to estimate the level of deficiency on a

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SPECIAL ISSUE PAPER

Compact in-memory representation of large graph databases for efficient mining of maximal frequent sub graphs

K Lakshmi ✉, T Meyyappan

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Citations: 1

Summary

Complex networks have been used in many scientific disciplines like sociology, microbiology, and telecommunication to represent the interactions among them. Graphs are generally used for representing such complex networks. Mining significant frequent patterns from graph databases has been a challenging area of research. A number of sub graph mining algorithms have been proposed for finding frequent fragments in molecular databases. A very few algorithms have been proposed for mining frequent patterns from large communication networks. All these algorithms perform well on medium size networks and fail on very large graphs. The scalability of these algorithms has been an issue because of the enormous memory requirements and also due to the exponential number of frequent sub graphs possible. In this paper, we propose a compact way of representing graph databases and also use it in a maximal frequent sub graph mining algorithm. The algorithm is found to be efficient and scalable to very large graph databases.

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Starting torque and torque ripple reduction using SVPWM based vector control of induction motor with nine-level cascaded multilevel Inverter fed with solar PV power

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ABSTRACT

This paper is an attempt to develop an Induction Motor Drive System with Multilevel Inverter topology for reduced torque ripple application. A Nine level-cascaded multilevel inverter is developed for the induction motor drive with SVPWM control powered by boost converter fed using solar PV supply. The SVPWM control based implementation of vector control using a multilevel inverter topology needs a multilevel SVPWM control technique, which is implemented in this paper. The Solar power supplied is applied with the MPPT technique and the supplied DC power is fed to the three phase cascaded 9 level multilevel inverter. The vector control of induction motor is carried out using the SVPWM technique on the multilevel topology. The torque ripple reduction in the output is observed and compared with the vector control of induction motor. Matlab based implementation is carried out and the results are tabulated and inferred.

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1. INTRODUCTION

Higher Electromagnetic compatibility in Multilevel Inverter and extensive use of Induction motors in the industries has brought in a higher demand of the multilevel inverter based induction motor drives. Solar based supply for these induction motor drives would increase the cost effectiveness of the induction motor drive systems since the power charges are going to be nullified except for the capital charges. A Five Level Inverter controlled by carrier based SPWM technique is used with open end winding 1HP induction motor [1]. Two three level inverter each comprising two 2 level inverters are placed each at one end of the open-ended induction motor. In [2] the number of switches are reduced but increasing the number of levels to six. A six level output is obtained by using a combination of a three level inverter with the two level inverter on either side of the open-ended induction motor. This topology needs three isolated power supplies as there are three two level inverters comprised in it.

A proposal of a structure for multilevel inverter topologies for stand alone PV system is seen in [3]. The multi-winding topology inverter gives better results compared to other types of multilevel inverters. The literature has presented the single phase PI controller based multilevel inverter for grid connection with lesser THD [4]. It has been presented a hexagonal and 12- sided polygonal voltage space vector with cascaded two-level with induction motor drive in [5]. The THD value is minimized in this literature also. It has been introduced hybrid multilevel inverter topology for open-end winding induction machine using two level inverter in series with a capacitor-fed H-bridge cell, which eliminates 18 clamping diodes in [6].

Routing Protocols for Underwater Wireless Sensor Networks

Seema S, R. Ambika

Abstract: Underwater wireless sensor networks (UWSNs) are extensively used in ocean exploration applications, such as ocean monitoring, pollution detection, ocean resource management, underwater device maintenance, etc. In underwater acoustic sensor networks, routing protocol design is an attractive research topic since it guarantees reliable and effective data transmission from the source node to the destination node. Out of many routing algorithms that have been proposed in recent years, energy efficient routing protocols are the challenge. In this paper, the challenging issues in designing the routing protocols that have been discussed, which can provide researchers with clear and direct insights for further research. In addition, this paper provides a survey of different simulation tools available for UWSN simulation.

Index Terms: Energy efficient, Routing protocols, Simulation Tools, Topology Control, Underwater wireless sensor networks.

I. INTRODUCTION

Underwater wireless sensor networks (UWSNs) are newly emerged wireless networks, by providing the most promising mechanism for discovering the underwater environment very efficiently. UWSNs are used for scientific, military and commercial applications [1]. These applications range from tactical surveillance to the study of marine life and include unmanned vehicle communication, pollution monitoring, oil extraction monitoring and aquaculture monitoring. UWSNs are self-organized networks, which consist of sensors that perform collaborative monitoring tasks over a body of water. The data collected by the sensor nodes are sent to sink and then gets forwarded to the base station through radio waves. Electromagnetic waves, optical waves and acoustic waves have been successfully used in UWSNs. Nevertheless, radio frequency (RF) waves are affected by high attenuation in water (especially at higher frequencies), thus requiring high transmission power and large antennae. Optical waves can to achieve ultra-high data-rate communications (Gbit/s), but are rapidly scattered and absorbed in water, so they are used for short-distance links. In contrast, acoustic waves enable communications over long-range links because they suffer from relatively low absorption loss.

The major challenges in the design of UWSNs are limited on-board storage, limited battery power as batteries cannot recharge and solar energy cannot be exploited, limited bandwidth, dynamic network topology as nodes tend to be mobile due to their self-motion capability or random motion of water currents. High propagation delay, Connectivity loss and High bit error rates (shadow zones), the impaired channel due to multipath and fading. Energy efficiency has also been a

major design concern for UWSNs since all sensor nodes used in UWSNs are battery operated and it is difficult to accomplish battery replacement and the sensors acoustic modems usually consume much energy on data transmission.

In UWSNs, one of the hot research areas is routing protocol design. A routing protocol guarantees reliable and effective data transmission from the source node to the destination node. Considering the differences between the terrestrial and the underwater environment, UWSN routing protocol design is more difficult and restricted than that of Wireless Sensor Networks (WSN) [2]. First, the continuously movement of nodes with water currents makes underwater routing highly unreliable; second, the high propagation delay in the underwater environment is inefficient; thirdly, the special characteristics of underwater acoustic waves and channels limit the application of UWSN technologies. Advance arrangements in the area of deployment is not possible, so the routing protocols should build highly reliable and effective communication links without any pre-arranged devices. Whenever the routing is broken during the data transmission, the routing protocol should able to repair or rebuild the routing in a timely way. The routing protocol must be robust and self-adaptive to operate in harsh underwater environments.

There are different aspects of the designing routing protocols, such as the network architecture, the data forwarding method, and the protocol operation data copies, the transmission method, clustering vs. non-clustering, single/multiple sinks, the cross-layer design routing and the non-cross-layer design routing. the control packets, etc.

II. ROUTING PROTOCOLS IN UWSNs

The process of forwarding data from source nodes to a sink when nodes are mobile is a very challenging task. And the major concern is to save energy and to handle the node mobility. Routing protocols are divided into three categories proactive, reactive and geographical. Proactive type effect a large overhead to create the routes, either periodically or every time when the topology modified. Reactive protocols cause large delays and require the source to initiate flooding of control packets to create the paths and are more appropriate for the dynamic networks. This makes both types of routing protocols unsuitable for UWSNs. Geographic routing considered the promising routing protocol for UWSNs. Geographical routing relies on geographic position information; hence the data packets are sent using its geographic location of the destination instead of the destination network address.

A. Efficient depth-based forwarding protocol (EDBF)

The communication in the UWSN faces many challenges and it consumes



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Title: [PR-LRU: partial random LRU technique for performance improvement of last level cache](#)

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Abstract: As chip multiprocessors (CMP) have become eminent in all areas of computing, it is inevitable for the operating system to schedule processes efficiently on different cores. These multi-cores pose different challenges of which shared resource contention is the dominant one, as cores share resources like last level cache (LLC) and main memory. This can lead to poor and unpredictable performance of the threads running on the system. The cache replacement policy of LLC becomes critical in managing the cache data in an efficient way. Though prominent, least recently used (LRU) algorithm has some issues with applications which do not follow the temporal locality pattern. This study proposes a modification to the LRU algorithm where a random selection of the victim from 'N' LRU blocks yields better results than the conventional method. The evaluation of the algorithm is carried out using Multi2sim simulator using Parsec and Splash2 benchmarks. The results show an overall performance improvement in hit ratio up to 6% and 2% over LRU for PARSEC and SPLASH2 benchmarks respectively.

Keywords: multi-core; last level cache; LLC; least recently used; LRU; multi2sim; parsec; splash; hit ratio; performance.

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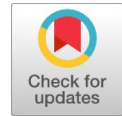
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Autonomous Crop Irrigation System using Artificial Intelligence



Savita Choudhary, Vipul Gaurav, Abhijeet Singh, Susmit Agarwal

Abstract: Agriculture plays a significant role in the economy and its contribution is based on measurable crop yield which is highly dependent upon irrigation. In a country like India, where agriculture is largely based on the unorganized sector, irrigation techniques and patterns followed are inefficient and often lead to unnecessary wastage of water. This calls for the need of a system which can provide an efficient and deployable solution. In this paper, we provide an Automatic Irrigation System based on Artificial Intelligence and Internet of Things, which can autonomously irrigate fields using soil moisture data. The system is based on prediction algorithms which make use of historic weather data to identify and predict rainfall patterns and climate changes; thereby creating an intelligent system which irrigates the crop fields selectively only when required as per the weather and real-time soil moisture conditions. The system has been tested in a controlled environment with an 80 percent accuracy, thus providing an efficient solution to the problem.

Index Terms: artificial intelligence, irrigation, internet of things, prediction algorithms, machine learning, and water conservation

I. INTRODUCTION

India follows traditional agricultural methods in irrigation practices [1]. Irrigation is a significant factor in determining the crop yield and largely varies with the geographical, climatic, and topological factors. Farmers primarily depend on personal monitoring and their experience in irrigating the fields, and as a result, irrigation becomes largely inefficient and irregular. India, therefore requires a simple irrigation solution on which the farmers can depend indefinitely, which can adapt to the local climatic conditions, and accurately predict the quantity of water required by the crops in real time to ensure judicious use of water resources, and also a better crop yield. The main concern in India is not water shortage but water wastage, and poor utilization of the resources due to lack of awareness, facilities, and infrastructure. Due to wastage of water, the country has already suffered through immense drought conditions, varied rainfall patterns, and huge economic losses due to the destruction of crops [2].

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Traditional automatic irrigation systems are not suitable for India, as they cannot adapt to the changing rainfall patterns and do not respond well to geographical changes. Thus, we have developed an intelligent system which can study the patterns of rainfall in a region, and predict weather conditions in order to adapt to the geography, thus predict the quantity of water needed for irrigation, to minimize wastage and increase the crop yield [3]. To achieve this, we make use of Node MCUs, and soil moisture sensors, placed inside waterproof boxes and spread evenly throughout the area to be irrigated. All these nodes are connected to a Raspberry Pi 3B+ via wireless LAN [4]. The system analyses soil moisture content through the deployed sensors, which is used to predict the quantity of water required to irrigate the area with an appreciable accuracy. It is a highly autonomous system which requires little to no human intervention once deployed in a field. The system developed makes use of Random Forest Regressor to predict the weather [5]. It makes use of the traditional data of rainfall patterns and weather data. It has the ability to slowly adapt to the region-specific climatic conditions and its accuracy improves with every prediction made. The system is designed to be updated every 30 minutes as a small regular interval which makes it power efficient as well. After every such regular interval, it updates the dataset as per the new sensor data provided. The system switches on the motor or pump if the soil moisture content detected is insufficient and based on the sensor data we make use of Partial Least Square Regression (PLSR) algorithm to predict the quantity of water required [6]. With this, we are able to calculate the time interval for which the motor should pump water. Also, in case the system detects sufficient soil moisture or rain is predicted then the pump is not switched on while the sensor measures the soil moisture capacity after the precipitation.

The system designed is power efficient, water efficient and low on maintenance. The systems are scattered throughout the area of the farm. Thus, we can switch on the drip or sprinkler for a particular area rather the entire farm in order to increase efficiency [7]. This helps in minimization of water wastage, a better understanding of crop water capacity and patterns required for efficient irrigation. Also, the nodes work on a response based system so it makes identification of any malfunction easier. The health of the nodes can be monitored through a mobile app based on the mapping of the farm and area specified for the irrigation. Thus, the system promotes low maintenance and proves to be effective.

2. METHODOLOGY

The system designed consists briefly of two major components:



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