TECHNICAL MAGZINE

Department of
Electronics & Communication Engineering

A.Y. 2020-21

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)
(Sponsored by Siddhartha Academy of General & Technical Education)
Estd.1977

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Department Vision

To produce globally competitive and socially sensitized engineering graduates and to bring out quality research in the frontier areas of Electronics and Communication Engineering.

Department Mission

To provide quality and contemporary education in the domain of Electronics and Communication Engineering through periodically updated curriculum, best of breed laboratory facilities, collaborative ventures with the industries and effective teaching-learning process.

To pursue research and new technologies in Electronics and Communication Engineering and related disciplines in order to serve the needs of the society, industry, government and scientific community.

PROGRAM OUTCOMES

Program outcomes examine what a program or process is to do, achieve, or accomplish for its own improvement and/or in support of institutional or divisional goals: generally numbers, needs, or satisfaction driven. They can address quality, quantity, fiscal sustainability, facilities and infrastructure, or growth.

After completion of the Electronics & Communication Engineering programme, the students will be able to have:

PO1: Engineering knowledge: An ability to apply k nowledge of mathematics, science, fundamentals of engineering to solve electronics and communication engineering problems.

PO2: Problem analysis: An ability to identify, formulate and analyze electronics and communication systems reaching substantiated conclusions using the first principles of mathematics and engineering sciences

PO3: Design/development of solutions: An ability to design solutions to electronics and communication systems to meet the specified needs.

PO4: Conduct investigations of complex problems: An ability to design and perform experiments of complex electronic circuits and systems, analyze and interpret data to provide valid conclusions

PO5: Modern tool usage: An ability to learn, select and apply appropriate techniques, resources and modern engineering tools for modeling complex engineering systems.

PO6: The engineer and society: Knowledge of contemporary issues to assess the societal responsibilities relevant to the professional practice.

PO7: Environment and sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development

PO8: Ethics: An understanding of professional and ethical responsibilities and norms of engineering practice.

PO9: Individual and team work: An ability to function effectively as an individual, and as a member in diverse teams and in multidisciplinary settings.

PO10: Communication: An ability to communicate effectively with engineering community and with society at large.

PO11: Project management and finance: An ability to demonstrate knowledge and understanding of engineering and management principles and apply these to manage projects.

PO12: Life-Long Learning: An ability to recognize the need for, and engage in independent and life-long learning in the broadest context of technological change.

Technical Magazine 2020-21

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

Department of Electronics & Communication Engineering

Editorial Board	ISSUE	Academic Year
Dr D. Venkata Rao, Mr. K V Prasad	JUNE- APRIL	2020-21

TABLE OF CONTENTS

ABOUT THE DEPARTMENT

Established in the year 1977, the department of ECE offers B. Tech Programme in Electronics & Communication Engineering with an intake of 240 and two M. Tech Programmes in Communication Engineering & Signal Processing and VLSI Design & Embedded Systems . The department has been accredited by NBA of AICTE four times. More than 40% faculties are with Ph.D. qualification. Led by a team of highly qualified experienced faculty with specializations such as RF &Microwave, Antennas, Digital Signal Processing, Wireless Communications, Digital Image Processing, VLSI and Embedded systems. The department provides excellent academic and research environment to the UG, PG and research students. A Centre of Excellence (TIFAC CORE- DST) in Telematics was established in the year 2009 with the state of the art facilities. Having successfully completed many research projects funded by UGC, AICTE, DST, NRSC-ISRO DLRL & ANURAG-DRDO etc., it is also recognized by JNTUK as "**Research Center.**" Faculty members extend guidance to research scholars, produce Ph.D.'s and publish their findings in peer reviewed national and international journals and conferences.

Message by HoD

As a part of nurturing the students with qualities like teamwork, ***technical*** skills and a glimpse of the competitive world of ***engineering*** and ***technology we are encouraging students to publish articles in the frontier areas of electronics and communication engineering.***

I am confident that all the faculty members and student community involved with this magazine have put their efforts in this in a way that the magazine both entertains and ignites the reader's mind.I would like to thank the editorial team members for bringing out this magazine regularly.. I express my considerable appreciation to all the authors of the articles in this magazine. These contributions have required a generous amount of time and effort. It is this willingness to share knowledge, concerns and special insights with fellow beings that has made this magazine possible.

Dr Venkata Rao Dhulipalla

WEARABLE TECHNOLOGY

A.S.T. Aditya Bharg Ch. Narendra Kumar

Wearable technologies can be defined as "the technological devices that are worn on a user's body". Wearable technology (WT or wearable computing) encapsulates a plethora of devices worn directly on or loosely attached to a person. Commonly, the latter comprises smart phones, which have become integral to the popularity and functionality of WT. Although there is a debate defining smart phones as WT, their existence has seen the demise and rebirth of WT as useful aids to assist daily living. This is primarily due to the rise of third-party applications which have nurtured innovation but at the expense of well-organised app development, leaving the end-user overwhelmed with choices. Indeed, the mobile computing power of smart phones is so influential that they will likely play a key role in ongoing WT innovations such as performing quick, robust and easy bioassays anywhere and at any time.

In short, WT can be subdivided into two categories: (i) primary, those operating independently and functioning as central connectors for other devices and/or information and; (ii) secondary, capturing specific actions or executing a measurement offloading to a primary wearable device for analysis. Additionally, those categories may include smart textiles where the physical properties of the material can measure or react to stimuli from the user or environment. Smart textiles currently lay beyond the scope of normal daily use as the concept of wearing electronic or uncommon tailoring materials interwoven within clothes or directly on the skin remain the vernacular of technological idealists.

TYPES OF WEARABLE TECHNOLOGIES

Wearable Health Technologies:

The most important contribution of wearable technologies in the health sector is enabling continuous monitoring of a patient's health status and gathering real-world information about the patient. Thus, the doctors may monitor the heart rate, blood pressure, fever, and other health indicators ubiquitously and times independently while the patients performing their daily routine activities. Wearable technologies can be used for diagnoses and treatments of several diseases. Other applications of wearable technologies in the health sector are Cardiovascular Disease, Rehabilitation, Applications in Parkinson's Disease, Functional Assessment After Stroke. However, today the wearable technologies in the health sector are mostly focused on data gathering, monitoring and diagnosis of health problems.

Wearable Textile Technologies:

Integrating the technologies into textile products is a recent concept, which enables the development of wearable electro textiles for sensing / monitoring body functions, delivering communication facilities, data transfer, control of the environment, and many other applications. Especially, the emergence of nano-fibres and nano-coatings provide an unusual characteristics and lead breakthrough changes in the textile industry. One of the most significant applications of wearable technologies in the textile industry is the clothes which can change their colours on demand or based on the biological indicators of the wearer. In order to enhance the popularity and social acceptance of the wearable textile technologies, the designers should take some key attributes into considerations. These attributes are "thermal management, moisture management, mobility, durability, flexibility, and sizing and fit, as well as the psychological areas of cognitive load and attention".

Wearable Consumer Electronics: Wearable consumer electronics can be defined as the electronic devices that are worn on a user's body to catalyse the daily activities. Today, the big electronic companies such as Google, Apple, Samsung, Nike, Qualcomm and Microsoft make strategic investments in wearable consumer electronics. Although there are several types of wearable consumer electronics such as wristband,

headbands, rings etc., the most promising products are smart glasses and watches. Smart watches enables users to make and receive calls, read SMS's, receive instant notifications, take pictures, monitor exercises and heart rate, listen to music. Besides all other wearable devices, when they complete their evolution, smart glasses are expected to lead a paradigm shift in users' everyday life. Today, the most respectable smart glasses are the Google Glass. It is a device that is worn like conventional glasses, and composed of computerized central processing unit, integrated display screen, high-definition camera, microphone, bone conduction sound transducer, and wireless connectivity. Designers should solve several issues such as the battery, heating, comfort, aesthetic and fashion etc.

THE FUTURE OF WEARABLE TECHNOLOGIES

The advances in the development of wearable and remote monitoring devices are growing exponentially. These platforms will provide more accurate measurements of physical status and physiologic parameters in more convenient ways and will soon influence different aspects of health care practices, including prevention (e.g., activity and eating behaviour tracking, stress-level monitoring, dehydration warning), diagnosis (e.g., early detection), and disease management (e.g., drug dose monitoring and reminders). In particular, efforts are underway to build the next generation of wearable sensors to detect cancer-related chemical and biomarkers. For example, wearable bandage and micro needle electrochemical sensing platforms have been developed to detect the presence of the tyrosinase enzyme biomarker on the skin surface and within skin moles for rapid screening of skin melanoma.

Artificial intelligence would also be able to keep refining and optimizing the messages from continuous learning as more data feed in. Although the possibilities of what one could do with the ever evolving wearable technologies seem to be unlimited, one of the caveats is that we have to rely on the assumption that the devices will be working reliably as intended. Nevertheless, not all wearable devices are regulated in the same way. The majority of consumer-facing wearable products have no published data about their accuracy values. Wearable devices and digital health software are regulated by the U.S. Food and Drug Administration (FDA) if they claim medical use intent. For example, the Apple Watch has featured heart rate measurement since its Series 1 model was released in 2016. Because the intended use for the heart rate measurement is for wellness-related purposes (e.g., to estimate workout intensity) rather than for medical purposes, it is not under FDA's regulation. In late 2018, the release of Apple Watch Series 4 marked the first direct-to-consumer product that comes with FDA-approved built-in electrocardiogram functionality. Shortly after, Alphabet announced that its Verily Study Watch had been cleared by the FDA as a medical device that can record, store, transfer, and display electrocardiogram data.

The race to have an FDA stamp on their wearable products signals a high interest from the technology companies entering the health care market, which further speeds up medical device use among regular consumers. Recognizing this rising trend, the FDA is working on updating and refining their plan in guiding and regulating digital health-related products. Wearable devices and digital health software will change the way we practice medicine and perform clinical research. Primary care clinicians and cardiologists have begun seeing patients with self-detected arrhythmia.

REFERENCES:

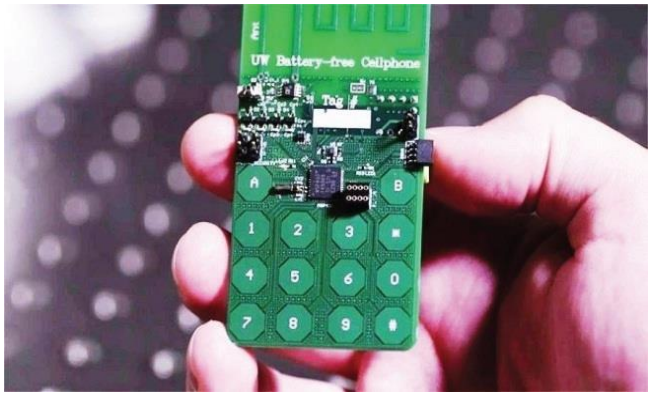
Binkley, P. F. (2003). Predicting the Potential of Wearable Technology. IEEE Engineering in Medicine and Biology Magazine, (May/June), 23–27.

Nugroho, J. (2013). A Conceptual Framework for Designing Wearable Technology. University of Technology Sydney

BATTERY LESS PHONES

Aluri.M.V.S.S.N.Eswar

The smart phones we are using these days are indeed smart, however, are they really that smart as the companies claim? The answer to this question is yes, but aren't those really dumb if discussed in terms of battery life? Yes, they are. Even the companies that sell smart phones at phenomenal rates have the issue of battery's performance. The performance is better as compared to others, but it is still a mystery if discussed in terms of long life. The idea of battery less smart phones was initiated by a group of researchers from "The University of Washington", who invented the phone with a dial pad, and to the next level of astonishment, the phone was designed so that it could harvest energy from "Radio Signals". The phone developed, features a dial pad, a small led light, and will also include an E-ink display.



The perspective for battery less phones is to get a solution for draining of the batteries. Lot of discrepancies about the battery's performance were going on around the world. The issue about the battery's anomalous drain lead to the research of innovative stuff, which furthermore lead to the invention of these Battery Less Mobiles.

The multi task calculating apps can increase your battery's life, but to a very small extent. These apps maintain your phone's battery life by clearing other apps from the background and by suggesting you the precautions about how to use your phones effectively, but battery less phones are way different as the battery doesn't exist and hence they will be greatly helpful in the future, especially for upcoming generations.

Framework for Battery Free Phones

The prototype invented a few months back, yields energy from ambient sources, and surprisingly those ambient sources are "Radio Signals or Radio Waves", and the device uses a minute photo diode to harvest energy from the ambient light or RF sources. It consumes only 3.5 microwatts of power from these energy sources. The device has a limited range of just 31 feet from the base station and the range can be expanded to 50 feet with the help of a small "Solar Cell".

Procedure for Fetching Energy from Ambient Sources

Harnessing Energy

In order to harness energy from the ambient sources, a base station is required and the base station is placed as per the range specified(31feet-50feet), RF energy can be transmitted in unlicensed bands or grids ranging from 868MHz to 5.4GHz from their respective base stations [7]. It is then, that this RF energy is transfigured into DC power through some energy harnessing devices such as "Powercast's Power harvester Receivers", these receivers also contain criterion or conventional antennas having an average resistance of 40-50 ohms.

How is Power Saved?

If we head back again towards the mobiles and devices of today's generation, the phenomenon behind the battery's hunger for power is the process of converting analog signals into digital data packages that a phone can interpret. This process consumed the highest amount of power in smart phones that we are operating at present; however that's not the case with battery free cell phones as the battery free prototype takes the dominance of minute vibrations that occur in the phone's microphone and speaker when the user speaks into the microphone or listens to an incoming call. An antenna connected to the shell and speaker components receives the analog radio signals, which are emitted by the cellular base station and then these signals are transmitted back to the cellular base station by the use of a "backscatter" in order to maintain a cycle of transferring digital packages that furthermore helps in retaining signal strength so that the call doesn't hang up in an insufficient manner.

Objective

Design a practical battery less cell phone

Take your cell phone anywhere for any length of time and never worry about recharging it

Never allow your cell phone to run out of battery

Never bother with your phone charger

Advantages

Conserves electricity, saves time, no charging issues

Limitations

Limited range, connecting to calls with ear/head phones, use of solar cell, lacking multiple operational Features

Future Scope & Possible Enhancements

The team of researchers already explained the major pros and cons of the battery free cell phone and demonstrated the model with a hope of making major enhancements in the future. The prototype lacked multiple features and in-fact, the phone was limited to a capacitive dial pad which was made upon a plane mother board with all the crucial parts (photo diodes and solar cell) exposed. Hence, some of the betterments that can be implemented are increasing range, encryption, video streaming and internet access, low power e-ink display.

REFERENCES:

Shin, Choonsung, Jin-Hyuk Hong, Anind K. Dey, "Understanding and prediction of mobile application usage for smart phones", In Proceedings of the 2012 ACM Conference on Ubiquitous Computing, pp. 173-182. ACM, 2012.

Goodenough, John B., Kyu-Sung Park,"The Li-ion rechargeable battery: A perspective." Journal of the American Chemical Society 135, No. 4, pp. 1167-1176, 2013.

Cuervo, Eduardo, Aruna Balasubramanian, Dae-ki Cho, Alec Wolman, Stefan Saroiu, Ranveer Chandra, Paramvir Bahl. "MAUI: Making smartphones last longer with code offload." In Proceedings of the 8th international conference on Mobile systems, applications and services, pp. 49-62. ACM, 2010.

NATURAL LANGUAGE PROCESSING USING AI

B. Jayaram

Traditionally, Natural Language Processing (NLP) systems have been mostly based on techniques that are inherently explainable. Examples of such approaches, often referred to as white box techniques, include rules, decision trees, hidden Markov models, logistic regressions, and others. Recent years, though, have brought the advent and popularity of black box techniques, such as deep learning models and the use of language embeddings as features. While these methods in many cases substantially advance model quality, they come at the expense of models becoming less interpretable.

Currently, there is a trend of building large AI systems in a distributed, agent-oriented manner. The complex tasks performed e.g. by systems with multimodal user interfaces or by systems tackling the processing of spontaneous speech often require more than one computer in order to run acceptably fast. If pure speed is not the primary motivation, the incorporation of several modules, each of them possibly being realized in a different programming language or even a different programming paradigm, demands complex interfaces between these modules. Furthermore, only modularization makes it possible to develop applications in a truly distributed manner without the need to copy and install versions repeatedly over.

The actual realization of the interfaces should ground on a sound theoretical framework and it should be as independent as possible from the module implementations. Typically, when an interface between two subcomponents of a system is needed, at first very simple means e.g. file interfaces or simple pipes are considered. This does not only lead to a variety of different protocols between components which is natural to a certain degree, due to the different tasks performed by the components and the purpose of the interface data but also to a number of different implementation strategies for interfaces. The Intarc Communication Environment, ICE an implementation of a channel-oriented, multi-architecture, multi-language communication module for large Al-systems, which is particularly useful for systems integrating speech and language processing. A channel-oriented model for interaction relations between software modules seemed to be the most suitable system for our needs. We adopted the CSP-approach and its actual realization in the transporter hardware. This core functional model was slightly modified to satisfy the needs emerging from experiences with actual systems.

Verbmobil and applications

Verbmobil, the primary application for which ICE was built, aims at developing an automatic interpreting device for a special type of negotiation between business people. The dialogue situation is as follows: Two business persons, speaking different languages, are involved in a face-to-face dialogue trying to schedule an appointment. They both have at least; some knowledge of English and use English as a common language. In case one of the dialogue partners runs into problems, he or she activates the interpretation system by pressing a button and switches back to his or her mother tongue. The system interprets the respective utterances into English. Therefore, it interprets the dialogue on demand in certain situations.

The Verbmobil system consists of a large number of components, each of them designed to cope with specific aspects of the interpretation process. Among them are a recorder for speech signals, a HMM-based word recognizer, and modules for prosodic, syntactic and semantic analysis, dialogue processing, semantic evaluation as well as components for both German and English synthesis. There are several interfaces between the individual parts of the application which are used to forward results or to realize question-answering behaviour. The interchanged data between components is very heterogeneous with regard to both type and quantity: Speech information as it is sent from the recorder to the speech recognizer consists of a stream of short integer values which may amount to several megabytes. The objects exchanged

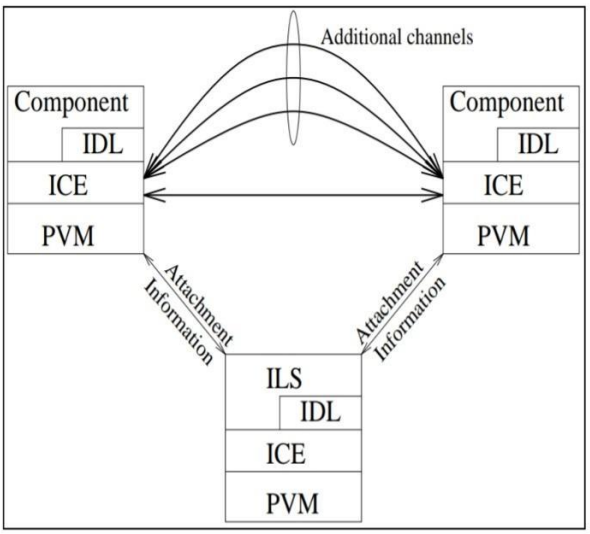
between semantics construction and transfer are relatively small, but highly structured: Semantic representations with several embedded layers.

ICE Design Structure

The Intarc Communication Environment ICE is a software environment for the development of distributed AI-systems. It is designed to give a flexible and efficient communication means that is oriented at an abstract model suitable for such purposes. It uses a publicly available communication software (PVM) that is widely used and realizes interface for several programming languages used in AI.

The global architecture of a system designed and constructed using ICE is shown in fig.1. A system consists of several components which may be written in any programming language. Each component gets a unique name and may communicate with all other components of the system. A special component (ILS,Intarc License Server) acts as a "conferencier" which introduces new components to the system and handles informational requests. After having attached to the ILS, components communicate with one another using channels.

Of the most common available communication methods, namely shared memory, Remote procedure calls and Message passing we assume the last one to be the most appropriate for distributed AI-systems. One doesn't run into memory contention problems when working with many components on the same shared memory segment and doesn't get access right problems. Remote procedures work synchronously and eventually produce waiting periods. Message passing on the other hand lends itself easily to a task-oriented system that asynchronously issues requests and answers requests from other components.



The overall structure of an ICE-system

The interior structure of a component is layered as far as the communication parts of the software are concerned. The low-level communication routines are provided by PVM (see above). Next, a software layer defines the functions of ICE. This is comprised of the basic functionality of ICE itself and a set of interface functions for different programming languages.

Component structure

At the moment ICE supports six languages with different dialects

- C
- C++
- Allergo common Lisp

- CLSIP
- LUCID Common Lisp
- Sicstus Prolog
- Quintus Prolog
- Tcl/Tk

These software layers suffice to communicate basic data types like numbers and strings. Additionally, a separate layer (IDL) is present to allow the exchange of more complex data types. One may specify routines to encode and decode user-defined data types which can then be transmitted just as the predefined scalar types. At the moment, this schema is used for a few dedicated data structures, e.g. for speech data or arbitrary prolog terms, which may be even cyclic.

REFERENCES:

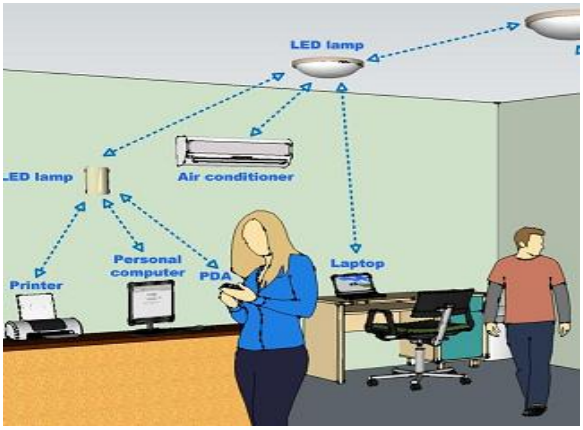
Jan W. Amtrup ICE INTARC Communication Environment Users Guide and reference Manual Version 1.4

VISIBLE LIGHT COMMUNICATION

D. Parameswara Reddy

A data communications variant which uses visible light between 400 and 800 THZ (780–375 nm). VLC is a subset of optical wireless communication technologies. The technology uses fluorescent lamps (ordinary lamps, not special communications devices) to transmit signals at 10 kbits/s, or LEDs for up to 500 Mbit/s over short distances. Systems such as RONJA can transmit at full Ethernet speed (10 Mbit/s) over distances of 1–2 kilometres (0.6–1.2 miles).

The history of visible light communications (VLC) dates back to the 1880s in Washington, D.C. when the Scottish-born scientist Alexander Graham Bell invented the Photo phone, which transmitted speech on modulated sunlight over several hundred meters. This pre-dates the transmission of speech by radio. In December 2010 St. cloud, Minnesota, signed a contract with LVX Minnesota and became the first to commercially deploy this technology. The VLC standardization process is conducted within the IEEE 802.15.7 group.



In order to send data, a modulation of light is required. A modulation is the form in which the light signal varies in order to represent different symbols. In order for the data to be decoded. Unlike radio transmission, a VLC modulation requires the light signal to be modulated around a positive dc value, responsible for the lighting aspect of the lamp. The modulation will thus be an alternating signal around the positive dc level, with a high-enough frequency to be imperceptible to the human eye. Due to this superposition of signals, implementation of VLC transmitter usually require a high-efficiency, higher-power, slower response DC converter responsible for the LED bias that will provide lighting, alongside a lower-efficiency, lower-power, but higher response velocity amplifier in order to synthesize the required ac current modulation.

There are several modulation techniques available, forming three main groups:] Single-Carrier Modulated Transmission (SCMT), Multi-Carrier Modulated Transmission (MCMT) and Pulse-Based Transmission (PBT).

The Single-Carrier Modulated Transmission comprises modulation techniques established for traditional forms of transmission, such as radio. A sinusoidal wave is added to the lighting dc level, allowing digital information to be coded in the characteristics of the wave. By keying between two or several different values of a given characteristic, symbols attributed to each value are transmitted on the light link. Possible techniques are Amplitude Switch Keying (ASK), Phase Switch Keying (PSK) and Frequency Switch Keying (FSK). Out of these three, FSK is capable of larger bit rate transmission once it allows more symbols to be easily differentiated on frequency switching. An additional technique called Quadrature Amplitude Modulation (QAM) has also been proposed, where both amplitude and phase of the sinusoidal voltage are keyed simultaneously in order to increase the possible number of symbols.

Multi-Carrier modulated Transmission works on the same way of Single-Carrier Modulated Transmission methods, but embed two or more sinusoidal waves modulated for data transmission. This type of modulation is among the hardest and more complex to synthesize and decode. However, it presents the advantage of excelling in multipath transmission, where the receptor is not in direct view of the transmitter and therefore makes the transmission depend on reflection of the light in other barriers.

Pulse-Based transmission encompasses modulation techniques in which the data is encoded not on a sinusoidal wave, but on a pulsed wave. Unlike sinusoidal alternating signals, in which the periodic average will always be null, pulsed waves based on high-low states will present inherit average values. This brings two main advantages for the Pulse-Based Transmission modulations:

- It can be implemented with a single high-power, high-efficiency, dc converter of slow response and an additional power switch operating in fast speeds to deliver current to the LED at determined instants.
- Once the average value depends on the pulse width of the data signal, the same switch that operates the data transmission can provide dimming control, greatly simplifying the dc converter.

Due to these important implementation advantages, these dimming-capable modulations have been standardized in IEEE 802.15.7, in which are described three modulation techniques: On-Off Keying (OOK), Variable Pulse Position Modulation (VPPM) and Color Shift Keying (CSK).

On the On-Off Keying technique, the LED is switched on and off repeatedly, and the symbols are differentiated by the pulse width, with a wider pulse representing the logical high '1', while narrower pulses representing logical low '0'.

Variable Pulse Position also switches the LED on and off repeatedly, but encode the symbols on the pulse position inside the data period. Whenever the pulse is located at the immediate beginning of the data period, the transmitted symbol is standardized as logical low '0', with logical high '1' being composed of pulses that end with the data period.

Color shift keying (CSK), outlined in IEEE 802.15.7, is an intensity modulation based modulation scheme for VLC. CSK is intensity-based, as the modulated signal takes on an instantaneous color equal to the physical sum of three (red/green/blue) LED instantaneous intensities. This modulated signal jumps instantaneously, from symbol to symbol, across different visible colors; hence, CSK can be construed as a form of frequency shifting.

REFERENCES:

T. Komine and M. Nakagawa "Fundamental Analysis for Visible-Light Communication System using LED Lights" IEEE Trans. Consumer Electronics vol. 50 no. 1 pp. 100-07 Feb. 2004.

J. Vucic "513 Mb/s Visible Light Communications Link Based on DMT-Modulation of a White LED" IEEE/OSA J. Lightwave Tech vol. 28 no. 24 pp. 3512-18 Dec. 2010.

DETECTION OF LUNG CANCER ON CHEST CT IMAGES USING CONVOLUTIONAL NEURAL NETWORKS

V. Bhuvana Sahithi, Y. Anitha, V. Yogitha, P. Reshma Valli

Cancer is a disease in which some of the body's cells grow hysterically and spread to other parts of the body. It is a noteworthy general health issue worldwide with increasing mortality rates. For the year 2020, the expected incidence of cancer patients in India was 679,421 (94.1 per 100,000) for men and 712,758 (103.6 per 100,000) for females. One in 68 males (lung cancer), 1 in 29 females (breast cancer), and 1 in 9 Indians will suffer from cancer throughout their life. The predicted 5 most common cancers in 2020 for males (lung, mouth, prostate, tongue and stomach) comprises 36% of all cancers and for females (breast, cervix uteri, ovary, corpus uteri and lung) comprises 53% of all cancers. In the study conducted in 2018, it is anticipated that 18.1 million cancer cases will be added to the available cancer cases in the world and around 9.6 million cancer cases will result in death.

There are over 100 diverse cancers that affect humans. Lung cancer is the most common type of cancer in the world with a rate of 13%. The survival rate of lung cancer patients combining all stages is roughly 14% with a time span of about 5-6 years. The main problem with lung cancer is that most of these cancer cases are diagnosed in later stages of cancer making treatments more problematic and significantly reducing the survival chances. As a result, early and precise lung cancer diagnosis is critical. Lung cancer diagnosis can be done by using various imaging modalities such as Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and Chest X-rays. CT scan images are chosen over other imaging modalities because they are more reliable, have better quality and have less distortion. The diagnosis process can be supported by utilizing existing technological means and deep learning is one of the common models preferred recently, so as to reduce the cost and diagnosis effort significantly.

Datasets:

The term dataset refers to a file with one or more records in it. A dataset is a named group of records. Datasets can hold information such as medical records or insurance records, to be used by a program running on the system. Usually a dataset is divided into three types:

Training set: In dataset, a training set is implemented to build up a model. We can extract features and train to fit a model.

Validation set: We can divide the training set into a train set and validation set. Based on the validation test results, the model can be trained which helps to get the most optimized model.

Testing set: Testing data is used to test the trained model.

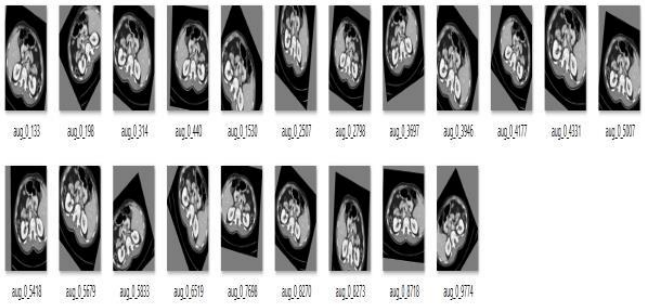
Python:

Like many fields of engineering, electronics and communication engineering also involves data science applications. However python is quite popular programming language in data science. Python is extensively used in various applications such as Signal processing, image processing, control system engineering, embedded systems, data visualization, automation, IoT etc.

Image Augmentation Techniques:

The various data augmentation techniques can increase the classification accuracy for CNN and Convolutional machine learning algorithms. The Keras package in Python is used to implement picture augmentation techniques.

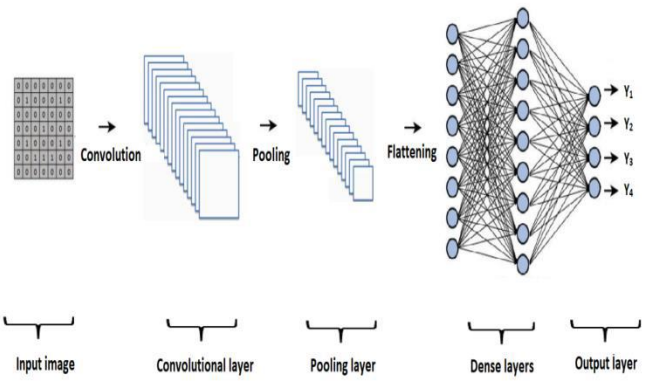
Original image



New images obtained from original image using augmentation techniques

Convolutional Neural Network (CNN):

Many tasks involving intelligence and pattern recognition are performed very easily by humans but are extremely difficult to automate. For instance, we recognize various objects and make sense out of the large amount of visual information in our surroundings, requiring very little effort. This task is performed by our neural network. The neural network is part of the nervous system containing a large number of interconnected neurons. A Convolutional neural network (CNN) is a neural network with one or more Convolutional layers that is mostly used for image processing, classification, segmentation and also for other auto correlated data. There are various architectures of CNNs available which are essential in building algorithms. They are LeNet, AlexNet, VGG – 16, GoogLeNet, ResNet and ZFNet. In this study, LeNet, AlexNet and VGG – 16 are used.



Convolutional Neural Network Model

Optimization Techniques:

One of the main reasons for using optimization methods is to update the weights at every single stage until the best learning in CNN architecture is realized. The optimization methods used in deep learning are: Gradient Descent, ADAM method, Stochastic Gradient Descent (SGD), RMSprop and AdaGrad.

Machine Learning Methods:

Machine learning is a method that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, recognize patterns and make decisions with minimal human intervention. The algorithms that can be applied to data problems are: Linear Regression, Logistic Regression, Linear Discriminant Analysis, Decision Tree,SVM, Naive Bayes, kNN, K-Means, Random Forest, Dimensionality Reduction Algorithms, Gradient Boosting algorithms.

Feature Selection:

The process of picking a subset of relevant characteristics for use in model creation is known as feature selection, also known as variable selection, attribute selection or variable subset selection. Feature selection is used before modelling the data because it reduces over fitting, improves accuracy, reduces training time. In this study, the extraction of features is performed by using Minimum Redundancy and Maximum Relevance (mRMR) algorithm and Principal Component Analysis (PCA).

REFERENCES:

B. Karthiga, M. Rekha, “Feature extraction and I-NB classification of CT images for early lung cancer detection”, Elsevier Journal, 30 April 2020.

A. Thomas, P. Pattanayak, E. Szabo, P. Pinsky, “Characteristics and Outcomes of Small Cell Lung Cancer Detected by CT Screening”. Chest Journal 2018; 154:1284-90.

iranjana, Dr. M. Ponnavaikko, “A Review on Image Processing Methods in Detecting Lung Cancer using CT Images”, International Conference on Technical Advancements in Computers and Communications, 2017.

ANALYSING PROBABLE SOLUTIONS ON IMPACT OF 5G COMMUNICATION REGARDING HUMAN HEALTH

V.Bhargava Sandeep, L. Sree Sowjanya, V.Venkata Abhinav

In telecommunications, 5G is the forthcoming revolution of mobile technology. It is a new global wireless technology after 1G, 2G, 3G, and 4G networks. Like its previous technologies (1G, 2G, 3G, and 4G networks), 5G networks are cellular networks, during which the area is split into small hexagonal areas called cells. All 5G wireless devices in a cell are connected to the web and telephone network by radio waves through an antenna within that cell.

The main advantage of the 5G networks is that they're going to have larger bandwidth, giving higher uploading and downloading speeds up to 10 gigabits per second (Gbit/s). It's expected that the networks will increasingly be used as general internet service contributors for desktop computers and laptops. 4G mobile phones aren't capable of new networks, which require 5G enabled hardware wireless devices.

The increased speed is achieved partially because of using additional higher-frequency radio waves than the low and medium band frequencies used in previous cellular networks. However, higher-frequency radio waves have a shortest physical range, which requires smaller geographic cells. A 5G network is going to be up to three differing types of cells, each requiring specific antenna designs and also giving higher uploading and downloading speeds up to 10 gigabits per second.

Low-band 5G uses a same frequency range as 4G technology, 600–850 MHz, giving download speeds a little higher than 4G networks 30–250 megabits per second . Low- band cell towers have a range and coverage area as same as 4G towers. Mid-band 5G uses microwaves 5–3.7 GHz, allowing speeds of 100–900 Mbit/s, with each cell tower providing service up to many kilometres in radius.

This level of technology is most generally developed, and was installed in many metropolitan areas in 2020. High-Band 5G uses frequency range of 25–39 GHz, although higher frequencies could also be utilized in the longer term. However, millimetre waves (mm Wave) have very limited range, requiring many small cells and they are blocked by materials in walls or windows.

The advancing in 5G wireless communication is leading for the further developing of human life, but in the context of environment and human health we are not focusing the hazard effects of wireless communication. To meet our future requirements, we now started research on a new generation 5G which can be of great use to enable fast connectivity between the devices, vehicles, robots, sensors, drones, etc.But on the other side there are many challenges to be solved like it can affect human health, temperatures, plants and animals. So, we should try to come with some handy solutions which help in preventing some damages of 5G at least to some extent.

Performance of 5G:

Speed: The wave length of 5G waves is in millimeter range. So, it’s also known as mm Waves. Its speed ranges from 50 Mbits/s to gigabits/s. The Sub-6 GHz 5G or mid-band 5G, will usually have range between 100 and 400 Mbit/s, but this has a farther reach than mm Wave, especially outdoors.

Low-band spectrum delivers the greatest range, thereby having a best coverage area for a given site, but its slower than the others.5G speeds in the less common millimeter wave spectrum, it has much more profuse bandwidth and shorter range, so, there will be greater frequency reusability, can be significantly higher.

Error Rate: Adaptive signal coding system is used in 5G to keep the bit error rate low. The transmitter will switch to a less error prone coding mechanism if the error rate is too high. So, to ensure a low error rate it sacrifices bandwidth.

Range: The range of 5G depends on multiple factors. A key factor is the frequency being used in 5G. The millimeter Wave signals have a range of couple of hundred meters, but in the right circumstances we have theoretical range up to couple of hundreds of kilometers.

Methods:

In this telecommunication era we cannot stop using of smart devices which run on internet or cannot prevent the usage of cell phones as we all are hooked and crooked to them and in these extraordinary situations past 2 years we are still more dependent on smart devices. So it is necessary situation to think about methods by which we can reduce the impact of radiofrequency radiation caused due to cellular networks and internet services.

So, one method to reduce the impacts of RF radiation is to block some unwanted amount of RF waves that are transmitting from cellular towers i.e. for example when a person in near to a cell phone tower he is prone to more radiation so to protect them we can use methods such as

- Faraday Cage
- Lead Shielding

Faraday Cage:

A Faraday cage is an enclosed space used to block electromagnetic fields. A Faraday shield may be formed by a incessant covering of conductive material, or in the case of a Faraday cage, by a network of such materials. Faraday cages are named after scientist Michael Faraday.

Faraday Cage

A Faraday cage operates based on exterior electrical field which causes the electric charges within the cage's conducting material to be distributed so that they cancel the field's effect in the cage's interior this occurrence is used to protect susceptible electronic equipment from external radio frequency interference (RFI) often during taxing or arrangement of the device.

They are also used to defend people and equipment against actual electric currents such as lightning strikes and electrostatic discharges, since the inserting cage conducts current around the exterior of the enclosed space and none passes through the interior.

Faraday cage protect the interior from outer electromagnetic radiation if the conductor is thick enough and holes are notably smaller than the wavelength of the radiation. They provide less attenuation of outgoing transmissions than incoming: they can block Electromagnetic pulse waves from natural phenomena very effectively, but a tracking device, especially in upper frequencies, may be able to penetrate from within the cage for example some devices operate at various radio frequencies so while one frequency may not work, another one will.

The response or transmission of radio waves, a form of electromagnetic radiation, to or from a transmitter within a Faraday cage is heavily attenuated or blocked by the cage; on the other hand, a Faraday cage has mixed attenuation depending on wave form, frequency, or distance from receiver/transmitter, and receiver/transmitter power. Near-field, high-powered frequency transmissions like high frequency radio frequency identification signals are more likely to penetrate. Solid cages generally attenuate fields over a broader range of frequencies than mesh cages.

Lead Shielding:

In lead shielding we use lead as a radiation guard to shield individuals or objects from radiation so as to reduce the effective impact. Lead can effectively attenuate certain kinds of radiation because of its high density and high atomic number.

Lead brick type structures for radiation protection

Lead's high density is based by the blend of its high atomic mass and the relatively small size of its bond length and atomic radius. The high atomic mass means that many electrons are needed to maintain a neutral charge and the small bond length and a small atomic radius means that many atoms can be packed into a particular lead structure. Because of lead's density and large number of electrons, it is well suited to scattering radiation. Eventually though, the lead will degrade from the energy to which it is exposed. However, lead is not effective against all types of radiation.

Electroplating:

Electroplating is the procedure of coating a metal with a thin coating of another metal by electrolysis to improve the metal's corrosion resistance. Electroplating is also known as electrode position and electroplated coating. Electroplating prevents oxidation of a substance, improves wear resistance and improves corrosive resistance.

The main purpose of electroplating is to improve:

- Appearance
- Protection against corrosion
- Special surface properties
- Engineering or mechanical properties

REFERENCES:

Cindy. L. Russell., “5G wireless telecommunications expansion: Public health and environmental implications”, Environmental Research, Volume 165, pp. 484-495, 2018.

L. Chiaraviglio et al., "Planning 5G Networks Under EMF Constraints: State of the Art and Vision," in IEEE Access, vol. 6, pp. 51021-51037, Sept. 2019.

Y. A. Sambo, F. Héliot and M. A. Imran, "A Survey and Tutorial of Electromagnetic Radiation and Reduction in Mobile Communication Systems," in IEEE Communications Surveys & Tutorials, vol. 17, no. 2, pp. 790-802, second quarter 2016

.

A MILLIMETER WAVE ENERGY HARVESTER FOR IOT DEVICES IN 5G NETWORK

D.Lakshmi Parvathi, A.Rajeswari

Low-power Internet of Things (IoT) sensors will be deployed at a large scale as the 5G technology evolves and becomes more accessible [1]. Battery maintenance and replacement for billions of IoT sensors will not be an easy task to manage. It is highly desired to replace batteries with energy harvesting circuits, particularly for low power IoT devices [2]. Radiative Wireless Power Transfer (WPT) is a promising solution that can be used to energize IoT devices. 5G technology utilizes millimeter-waves (mmWaves) to enable high-speed communications in 5G networks. A high-gain directive antenna can enhance the transition range in a 5G network [3][4]. Beam forming and beam steering techniques can be employed to deliver power to multiple IoT sensors in different locations in a 5G network [5]. The block diagram of a conventional RF energy harvesting system is shown in Fig. 1 in which the received signal (Rx) passes through an impedance matching circuit. Then a rectifier converts the RF signal to a DC voltage to supply the load. A control circuit is utilized to generate timing signals to maximize efficiency [6]. A DC-DC boost converter is also implemented after the rectifier to elevate the output voltage level. The Power Conversion Efficiency (PCE) and the sensitivity of the rectifier play a critical role in the overall efficiency of the energy harvester. PEC defines the ratio of the output power (Pout) to the available received power (PInput) [7]. Sensitivity is a critical parameter in applications with wake-up circuitry. It is defined as the lowest available input power to turn on a rectifier circuit in an energy harvesting device.

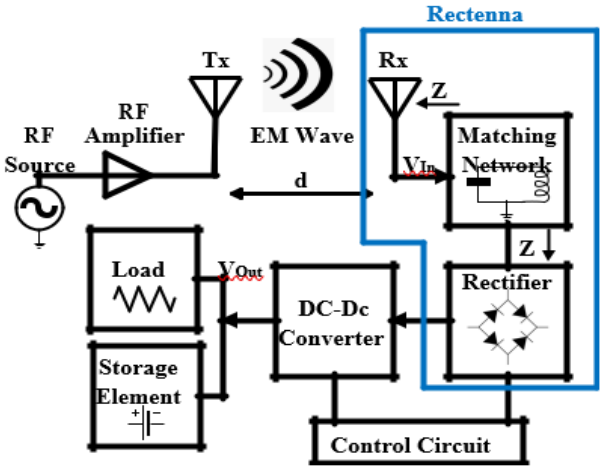


Fig. 1. The conventional RF energy harvesting system

Most of the current communication system operates in a relatively low-frequency band ranging from a few hundreds of megahertz to less than 6 GHz. Therefore, it is not possible to have a high Q and high gain matching circuit. The operating frequency of a typical millimeter-wave 5G network is much higher and spans from 24 GHz to 52 GHz. The larger bandwidth and the higher frequency of 5G networks present new challenges to the design and implementation of energy harvesters. A key element in an energy harvester for 5G networks is the antenna. It can be designed as a rectifying antenna called rectenna to ensure a high efficiency [10]. In this, an efficient energy harvesting solution is presented in which a microstrip patch antenna is utilized to harvest RF energy from incoming high frequency signals. A rectifier, operating at 11GHz frequency, has also been designed to convert RF waves to DC signals. A three-switch single inductor dual output boost converter is implemented after the rectifier circuit to supply the load and charge the storage element. Fig. 9 shows the schematic diagram of the proposed boost converter circuit. The electric energy stored on the capacitor, C1, is converted to the magnetic energy by the inductor, L at the first switching cycle, Clk1. The energy is then transferred to the load at the second switching cycle, Clk2. If the energy is more than what is needed, the surplus is transferred to the storage element. The load is powered during t1 and t2 when the inductor current goes to zero.

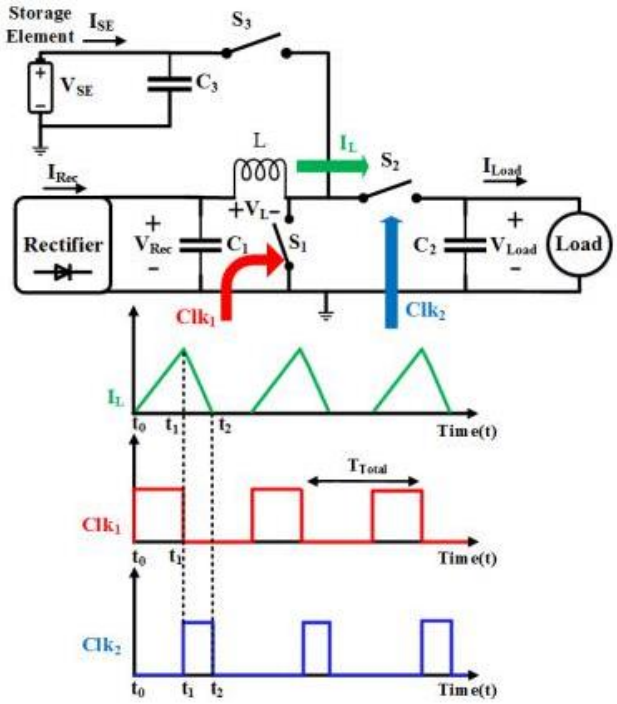


Fig. Block diagram of the three-switch single inductor dual output boost converter for the proposed RF energy harvesting system.

References

[1] N. Wang, P. Wang, A. Alipour-Fanid, L. Jiao, K. Zeng, "Physical-Layer Security of 5G Wireless Networks for IoT: Challenges and Opportunities." *IEEE Internet of Things Journal*, vol. 6, no. 5, 2019.

[2] S. E. Hassani, H. E. Hassani, N. Boutammachte, "RF Energy Harvesting for 5G: An Overview." *2017 International Renewable and SustainableEnergy Conference (IRSEC)*, 2017.

[3] A. Massa, G. Oliveri, F. Viani, and P. Rocca, ``Array designs for longdistance wireless power transmission: State-of-the-art and innovative solutions,"Proc. IEEE, vol. 101, no. 6, pp. 1464-1481, Jun. 2013.

[4] Khan, Talha Ahmed, and Robert W. Heath. "Wireless Power Transfer in Millimeter Wave Tactical Networks." *IEEE Signal Processing Letters*, vol. 24, no. 9, pp. 1284–1287, 2017.

[5] Z. Ding, C. Zhong, D. W. K. Ng, M. Peng, H. A. Suraweera, R. Schober, and H. V. Poor, ``Application of smart antenna technologies in simultaneous wireless information and power transfer," IEEE Commun. Mag., vol. 53, no. 4, pp. 86-93, Apr. 2015.

[6] P. H. Hsieh, C. H. Chou, T. Chiang, "An RF Energy Harvester With 44.1% PCE at Input Available Power of -12 DBm." *IEEE Transactionson Circuits and Systems I: Regular Papers*, vol. 62, no. 6, pp. 1528–1537,2015.

[7] Y. Cao, X. Hui, E. C. Kan, "An RF-to-DC Rectifier Based on Tunable Threshold Diodes." *IEEE Journal of Radio Frequency Identification*, vol. 3, no. 3, 2019.

[8] H.-M. Lee and M. Ghovanloo, "An integrated power-efficient active rectifier with offset-controlled high speed comparators for inductively powered applications," IEEE Trans. Circuits Syst. I, Reg. Papers, vol. 58, no. 8, pp. 1749–1760, Aug. 2011.

[9] Y. D. Kim, I. O. Lee, I. H. Cho, G. W. Moon, "Hybrid Dual Full-Bridge DC–DC Converter With Reduced Circulating Current, Output Filter, and Conduction Loss of Rectifier Stage for RF Power Generator Application." *IEEE Transactions on Power Electronics*, vol. 29, no. 3, pp. 1069–1081, 2014.

[10] P. Efthymakis, “A rectenna for 5g energy harvesting,” M.S thesis, Virginia Commonwealth University,Richmond, Virginia, 2018.

[11] Hong, Kai-Dong, et al. “Slot Loading Effect on the Impedance and Radiation Performance of the TM03-Mode High-Gain Square Patch Antenna.” 2019 IEEE MTT-S International Microwave Biomedical Conference (IMBioC), 2019.

[12] Mansour, Mohamed M., and H. Kanaya. “High-Efficient Broadband CPW RF Rectifier for Wireless Energy Harvesting.” *IEEE Microwaveand Wireless Components Letters*, vol. 29, no. 4, 2019.

[13] T. Paing, J. Shin, R. Zane, and Z. Popovic, “Resistor emulation approach to low-power RF energy harvesting,” *IEEE Trans. Power Electron.*, vol. 23, no. 3, pp. 1494–1501, 2008.

ARDUINO BASED SMART ENERGY METER USING GSM

N. Venkatesh, K. Ahrron

A system that removes human intervention in meter readings and bill generation thereby reducing the error that usually causes chaos and energy related corruption. The proposed system is implemented using a GSM shield module on microcontroller (Arduino) together with LDR sensor and relay. Existing metering system can be minutely modified to implement the proposed meter. The proposed scheme is to connect an LDR sensor with the blinking LED and send the data to microcontroller via GSM shield. RTC provides delay and acts an interrupt. The system includes a provision of sending an SMS to user for update on energy consumption along with final bill generation along with the freedom of load re-configuration via SMS. The disconnection of power supply on demand or due to pending dues was implemented using a relay. Hardware implementation results suggest that the accuracy of the proposed system is slightly greater than that of existing smart meters. The cost of system has been estimated to be less than the available smart meters, offering the same functionality. Bilateral communication between user and system sets it apart from the commonly available smart meters. The system brings smartness in terms of bilateral communication and controlling of load. The proposed IEEE system senses the number of LED blinks of a conventional metering system which are 3200 blinks per 1 kilowatt-hour, which can be altered only at the time of implementation depending on the metering system used. The proposed system uses LDR as sensor and an amplifying circuit to provide the necessary input signal to the microcontroller. The system waits for the output of RTC thereby serving as an interrupt for the microcontroller and updates the user and server through GSM shield. In case the user wants any information regarding the energy or wants to deter the load from the supply in between the period, it can be communicated easily through GSM shield by simply sending a text message which will generate an interrupt to the microcontroller and it will revert accordingly. User can also refer to the server for necessary information. There are number of ways through which data can be communicated. For using wired technology, fiber optics or co-axial cables can be used. Whereas for wireless, GSM, Wi-Fi, or Zigbee technology can be used [2] [3] [4] [5]. Once bill is generated user has 15 days to pay his bill or else his supply will be disconnected using relay [6].

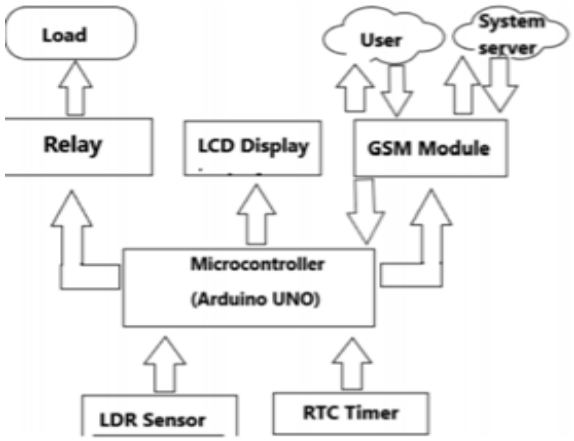


Fig: Functional Block diagram of complete system.

REFERENCES

[1]. Md. Masudur Rahman; Noor-E-Jannat; Mohd. Ohidul Islam; Md. SerazusSalakin, Arduino and GSM Based Smart Energy Meter for Advanced Metering and Billing System, Pabna University of Science &

Technology, 2nd Int'l Conf. on Electrical Engineering and Information & Communication Technology (ICEEICT) 2015.

[2]. Chongjin Xie, Fiber Nonlinearities in Coherent Optial Communication Systems, 10th International Conference on Optical Communications and Networks (ICOCN 2011).

LIGHTWEIGHT CRYPTOGRAPHY

Nagella Srija,, Pannangi Sri Vidya Gayathri, Putti Sree Latha, Javvaji Gopi Chand

While our conventional cryptography methods, such for AES (encryption), SHA-256 (hashing) and RSA/Elliptic Curve (signing), work well on systems which have reasonable processing power and memory capabilities, these do not scale well into a world with embedded systems and sensor networks. Thus, lightweight cryptography methods are proposed to overcome many of the problems of conventional cryptography. This includes constraints related to physical size, processing requirements, memory limitation and energy drain. This paper outlines many of the techniques that are defined as replacements for conventional cryptography within an Internet of things space and discuss some trends in the design of lightweight algorithms.

Objectives:

Lightweight cryptography targets a very wide variety of resource-constrained devices such as IoT end nodes and RFID tags [6] that can be implemented on both hardware and software with different communication technologies. It is very difficult for resource-limited environment to implement the standard cryptographic algorithms due to the implementation size, speed or throughput and energy consumption. The lightweight cryptography trade-offs implementation cost, speed, security, performance and energy consumption on resource-limited devices. The motivation of lightweight cryptography is to use less memory, less computing resource and less power supply to provide security solution that can work over resource-limited devices. The lightweight cryptography is expected simpler and faster compared to conventional cryptography. The disadvantage of lightweight cryptography is less secured.

Hardware Implementation:

In hardware implementation of the lightweight cryptography primitives, the code size, the memory consumption (RAM) and energy consumption are the important metrics. To well evaluate the lightweight cryptography, the exact type of circuit (such as the clock), memory, storing of the internal states and key states should be taken into consideration. However, it does not mean that shorter block and key size are better since it may cause insecure against related-key attacks [6]. In some case, the read-only 'Mask' technology is used to burn keys into devices (chips) to reduce the key space. In recent, in [7], an energy efficiency of hardware implementation metric is proposed, in which the latency is used to evaluate the time taken to perform a given operation.

Software Implementation:

In software implementation case, the implementation size and RAM consumption and the throughput (bytes per cycle) are preferable metrics for the lightweight applications. The smaller, the better. In software cases, the unified Fair Evaluation of lightweight Cryptographic Systems (FELICS) framework is proposed to evaluate the performances of lightweight block or stream ciphers' performances in implementation size, RAM consumption and time taken to perform a given operation. This shows the FELICS results of popular lightweight cipher algorithms for three different implementations: 8-bit AVR, 6-bit MSP and 32-bit ARM.

Lightweight Cryptography Design trends:

Based on metrics discussed both in hardware case and in software case, most lightweight algorithms are designed to use smaller internal states, short block and key sizes. Indeed, most lightweight block ciphers use only 64-bit blocks (AES is demanded a 128-bit block and a 128-bit key). The lightweight implementation usually leads smaller RAM consumption, and it is good at processing smaller messages as well. In designing lightweight cryptography solutions, following trends are noticed: (1) Short block and key size will bring problems: short block can cause problems such as CBC erodes faster than other part when the number of *n*-bit blocks encrypted approaches $2^{n/2}$, meanwhile the short key size can increase the risks of key-related attacks;(2) The number of operations in symmetric lightweight cryptography roughly doubles when the

input size of a symmetric-key primitive double. In PHOTON family, the number of rounds is always 12, and the number of S-box doubles if the size doubles. Similarly, in AES 256, the number of rounds is 14, and the number of S-box doubles if the block size doubles; (3) The lightweight cryptography always is driven by the applications; as a result, lightweight primitives should be designed to apply new academic insights as well as to best match existing protocols.

References

[1] McKay KA, Bassham L, Turan MS, Reportonlightweight cryptography.

[2] Lo O, Buchanan WJ, Carson D. Power analysis attacks on the AES-128 S-box using differential power analysis (DPA) and correlation power analysis (CPA). J Cyber Secur Technol. 2016;1(2):1–20.

[3] Li S, Da Xu L, Zhao S. The internet of things:asurvey. Apr;17(2):243–259.

[4] Bogdanov A, Knežević M, Leander G, et al. The design space of lightweight cryptographic hashing. IACR CryptologyePrint Archive, 2011:697.

[5]Biryukov A, Perrin L. State of the art in lightweight symmetric cryptography. IACR Cryptology ePrint Archive, 2017:511.

[6] Mouha N. The design space of lightweight cryptography. NIST Light CryptographyWork. 2015;

[7] Banik S, Bogdanov A, Isobe T, et al. Midori: a block cipher for low energy. In: Proceedings, Part II, of the 21st international conference on advances in cryptologyASIACRYPT2015, 2015. 411– 436.

[8] Avanzi R. The QARMA block cipher family. Almost MDS matrices over rings with zero divisors, nearly symmetric even-Mansour constructions with non-involutory central rounds, and search heuristics for low-latency S-boxes. IACR TransSymmetric Cryptol. 2017 Jan;2017.

FACE BIOMETRIC WITH ANTI-SPOOFING

M. Kiranmayi

User authentication is an important step to protect information and in this field face biometrics is advantageous. Face biometrics is natural, easy to use and less human-invasive. Unfortunately, recent work has revealed that face biometrics is vulnerable to spoofing attacks using low-tech equipments. This article assesses how well existing face anti-spoofing countermeasures can work in a more realistic condition. Experiments carried out with two freely available video databases (Replay Attack Database and CASIA Face Anti-Spoofing Database) show low generalization and possible database bias in the evaluated countermeasures. To generalize and deal with the diversity of attacks in a real-world scenario we introduce two strategies that show promising results. **Face biometrics** is the second largest **biometric** used, with **fingerprint** being the first. Hence, it is more open to **spoofing** attacks or direct (presentation) attacks in which intruders use synthetically produced arte fact or try to mimic the behaviour of genuine users, to fraudulently gain access to the **biometric** system. **Anti-spoofing** is a technique for identifying and dropping packets that have a false source address. ... **Spoofed** packets can be detected by setting up rules on a firewall, router or other network gateway that examines incoming packets. This is focused on face biometrics, the various spoofing and anti-spoofing methods. Face biometrics is the second largest biometric used, with fingerprint being the first. Hence, it is more open to spoofing attacks or direct (presentation) attacks in which intruders use synthetically produced artefact or try to mimic the behaviour of genuine users, to fraudulently gain access to the biometric system. Certain countermeasures have to be implemented in the form of anti-spoofing methods in order to make biometric verification more secure. An anti-spoofing technique is normally acknowledged to be any procedure, which can consequently recognize genuine biometric attributes displayed to the sensor from fake biometric characteristic.

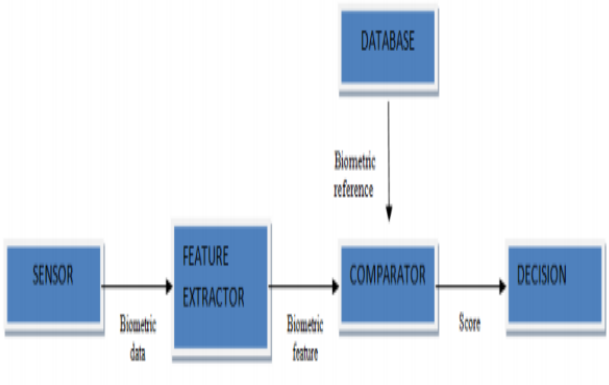


Fig: Biometric System

ANTI SPOOFING TECHNIQUES:

A. Sensor-Level Techniques: Otherwise referred to as hardware-based techniques where a specific device is integrated in the biometric sensor which helps to detect specific properties of a living trait. It measures one of three characteristics, namely: • Intrinsic properties of a living body - which could include properties like physical, electrical, spectral or visual properties. • Involuntary signals of a living body eg. blood pressure, perspiration, electric heart signals • Responses to external stimuli, also referred to as challenge-response methods, which requires the cooperation from the user as these responses are based on detecting voluntary or involuntary (reflex reactions) to an external signal. e.g., When light is switched on the pupil contracts (reflex), or the head moves following a random path determined by the system (behavioural). Multi biometric anti-spoofing is based on the assumption that the blending of various biometrics will decrease the vulnerability to assaults, as, in principle, producing multiple fake characteristics is more difficult than generating an individual fake characteristic. Based on this assumption, multimodal approaches fuse different modalities. The strategy is using complementary traits for e.g. Finger print and finger veins, this strategy require additional hardware devices, therefore, these techniques may be included in the sensor-level group of anti-spoofing methods. The above assumption of fooling a multi biometric system has already been shown to be untrue as, in many cases, bypassing just one of the unimodal subsystems is enough to gain access to the complete application. Hence, multi biometric by itself does not necessarily guarantee a higher level of protection against spoofing attacks.

B. Feature-Level Techniques: Otherwise referred to as software-based techniques, here, the biometric data is acquired with a standard sensor and the distinction between fake and real faces is software based. Under Software based techniques there are two methods for anti-spoofing - static and dynamic. Static features may present some degradation in performance but is still preferred over dynamic techniques because it is faster and less intrusive as they require less cooperation from the user. Static anti-spoofing methods work on single images while dynamic anti-spoofing methods work on video sequence. In feature level technique, multimodality can be implemented. From just one single high-resolution image of a face, both face and iris recognition can be performed. It not only detects spoofing attacks but it also is capable of detecting other types of illegal break-in attempts. For e.g. Feature level techniques protects the system against the injection of reconstructed or synthetic samples. The advantages of Feature-level dynamic are - It has high accuracy level. It exploits spatial and temporal features in a video sequence. It is known to bevery effective against photo attacks. The disadvantages are – cannot be used in single image scenario instances. It is comparably slow. Accuracy is lost against video attacks. The advantages of Feature-level static are – It can not only be used with a video sequence but also can be used for single images. Faster when compared to Feature level dynamic technique. It is totally transparent to the user. The disadvantages are – It is based only on image spatial information which reduces the accuracy.

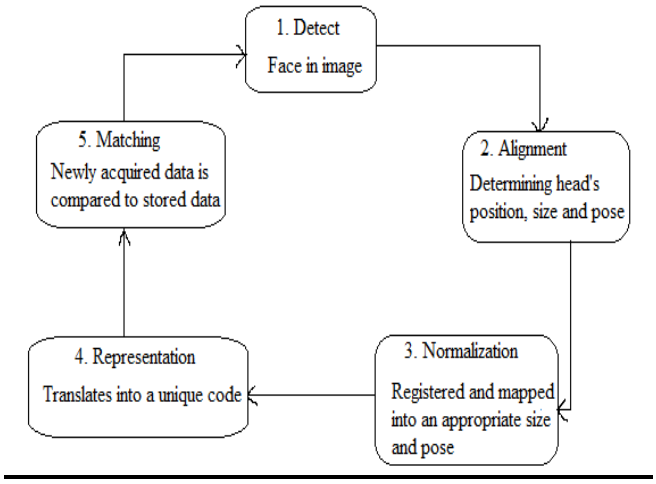


Fig: Steps to perform Anti-spoofing

In the anti-spoofing techniques, the sensor level presents a higher fake detection rate, whilst feature level techniques are less expensive, less intrusive and more user friendly, since their implementation is hidden from the user. The score level protection technique presents a much lower performance when compared to the sensor level and feature level protection measures.

FULL DUPLEX COMMUNICATION

K. Srihita Vasantha

Recent years have witnessed a proliferation of battery-powered mobile devices, e.g., smart phones, tablets, sensors, and laptops, which leads a significant demand for high-capacity wireless communication with high energy efficiency. Among technologies to provide the efficiency is full-duplex wireless communication. Full-duplex wireless enhances capacity by simultaneously transmitting uplink and downlink data with limited frequency resources. Previous studies on full-duplex wireless mostly focus on doubling the network capacity; whereas in this paper we discuss that full-duplex wireless can also provide higher energy efficiency.

Full-Duplex is a mode of communication in which data is simultaneously transmitted and received between stations. Full-duplex communication is twice as fast as half-duplex communication, and typically uses two separate pairs of wires (or two channels for wireless networking) for supporting simultaneous transmission and reception by a host. In full duplex transmission mode, the communication between sender and receiver can occur simultaneously. The sender and receiver can both transmit and receive at the same time. Full duplex transmission mode is like a two-way road, in which traffic can flow in both directions at the same time.

For example, in a telephone conversation, two people communicate, and both are free to speak and listen at the same time. Examples of full-duplex communication include cellular telephone technologies and full-duplex Ethernet. This paper focuses on power consumption of wireless full-duplex communication. Low power consumption of wireless full-duplex communication was investigated in [19]. The full-duplex power saving mode (FDPSM) in [19], which turns media on and off according to a beacon cycle similar to IEEE 802.11 power saving mode (PSM), reduces power consumption. However, the power consumption of FDPSM is just lower than that of full-duplex communication, but higher than the power consumption of existing half-duplex IEEE 802.11 PSM [20]. Additionally, FDPSM cannot achieve high throughput because number of transmissions is limited as one in a beacon cycle. From the perspective of power consumption, we propose low power wireless communication with full-duplexing and control packets (LPFD-PKT) and low power wireless communication with full-duplex and frequency bitmap (LPFD-FBM).

LPFD-PKT reduces power consumption by scheduling bi-directional full-duplex, two-directional full-duplex, and half-duplex communication using buffer information and inter-user interference information at an access point and each user terminal. LPFD-FBM reduces the packet exchange overhead of LPFD-PKT by using a frequency bitmap. In addition, scheduling scheme in LPFD-PKT and LPFD-FBM enables user terminals to communicate multiple packets in a beacon cycle. In the simulation results, LPFD-FBM achieved up to approximately 9.0 times higher energy efficiency than existing full-duplex communication, and up to approximately 7.0 times higher energy efficiency than IEEE 802.11 PSM.

METHOD-BIDIRECTIONAL TRANSMISSION:

Almost all digital networks are bidirectional full duplex links, in which transmission takes place simultaneously in both directions. Full duplex transmission is accomplished differently in different situations. For long-distance transmission using either ATM or Ethernet, it is common to use different fibres for transmission in the two directions. Because of the high volume of transceivers for these applications, it is possible to buy low-cost, very small transmitters, sometimes called GBICs in the Ethernet world, specified for different distances to be covered.

TIME-DIVISION DUPLEXING:

In ***time-division Duplexing*** (TDD), time rather than frequency is used to separate the transmission and reception of the signals, and thus a single frequency is assigned to a user for both directions. TDD provides quasi-simultaneous bidirectional flow of information. Duplexers are therefore not required, and the cost of a TDD system is not very high, the reason lies in the fact that the transmitter and receiver use the same components, such as filters and mixers.

SYSTEM MODEL:

Wireless Full-duplex: This paper assumes a star topology wireless network consisting of one access point (AP) and N user terminals (UTs) equipped with a wireless full-duplex function. The access point and each user terminal communicate by wireless half-duplex communication, wireless bi-directional full-duplex communication, and wireless two-directional full-duplex communication.

In wireless half-duplex communication, the access point transmits one frame to the user terminal, or the user terminal transmits one frame to the access point in a communication period. Wireless half-duplex communication is currently used in normal wireless local area networks (LANs). In wireless bi-directional full-duplex communication, the access point and user terminal transmit data to each other simultaneously. When performing bi-directional full duplex communication, both the access point and user terminal must have a frame for each other. In wireless two-directional full-duplex communication, the access point and two user terminals exchange two frames. One user terminal transmits a frame, and the other user terminal receives a frame. The transmitting user terminal must have a frame for the access point. The access point must have a frame for the receiving user terminal. In wireless two-directional full-duplex communication, an inter-user interference problem occurs. The inter-user interference problem is when the transmitting user terminal interferes with the receiving user terminal, which then cannot receive the frame from the access point. In this, proposed LPFD-PKT and LPFD-FBM to reduce energy consumption and enhance energy efficiency (Bits-per-Joule) of user terminals in wireless networks. Both LPFD-PKT and LPFD-FBM enhance energy efficiency by scheduling bi-directional full-duplex communication, two-directional full-duplex communication, and half-duplex communication. Additionally, LPFD-FBM reduces the overhead of exchanging buffered packet information in LPFD-PKT by using a frequency bitmap. Performance evaluation shows that both LPFD-PKT and LPFD-FBM achieve higher energy efficiency compared to the IEEE 802.11 PSM and existing full-duplex MAC protocol.

REFERENCES:

[1] D. Bharati, E. McMillan, and S. Kati, “Full duplex radios,” in Proceedings of the Annual Conference of the ACM Special Interest Group on Data Communication (SIGCOMM’13), Hong Kong, China, August 2013, pp. 375–386.

[2] J. I. Choi, M. Jain, K. Srinivasan, P. Levies, and S. Kati, “Achieving single channel, full duplex wireless communication,” in Proceedings of the 16th ACM Annual International Conference on Mobile Computing and Networking (MobiCom’10), Chicago, Illinois, September 2010, pp. 1–14.

[3] E. Everett, A. Sanai, and A. Sabharwal, “Passive self-interference suppression for full-duplex infrastructure nodes,” IEEE Transactions on Wireless Communications, vol. 13, no. 2, pp. 680–694, 2014.

[4] M. Jain, J. I. Choi, T. M. Kim, D. Bharati, S. Seth, K. Srinivasan, P. Levies, S. Kati, and P. Sinha, “Practical, real-time, full duplex wireless,” in Proceedings of the 17th ACM Annual International Conference on Mobile Computing and Networking (MobiCom’11), Las Vegas, NV, September 2011, pp. 301–312.

[5] J. Bai and A. Sabharwal, “Distributed full-duplex via wireless side-channels: Bounds and protocols,” IEEE Transactions on Wireless Communications, vol. 12, no. 8, pp. 4162–4173, 2013.

[6] D. Kim, H. Lee, and D. Hong, “A survey of in-band full-duplex transmission: From the perspective of phi and mac layers,” IEEE Communications Surveys and Tutorials, vol. 17, no. 4, pp. 2017–2046, 2015.

[7] M. Duarte, A. Sabharwal, V. Aggarwal, R. Jana, K. K. Ramakrishnan, C. W. Rice, and N. K. Shankaranarayanan, “Design and characterization of a full-duplex multiantenna system for wifi networks,” IEEE Transactions on Vehicular Technology, vol. 63, no. 3, pp. 1160–1177, 2014.

[8] W. Choi, H. Lim, and A. Sabharwal, “Power-controlled medium access control protocol for full-duplex WiFi networks,” IEEE Transactions on Wireless Communications, vol. 14, no. 7, pp. 3601–3613, 2015.

SMART ELECTRONIC GLOVE FOR DISABLED PEOPLE

N. Akanksha, Y. Naga Kundana

Smart glove is an electronic device that converts their way of expressing into meaningful form like text or voice. The processing of these hand gestures is in Arduino Mega board which is advanced version of microcontroller. We can create various combinations using switches for different needs. So that we can include and display a message for each combination or each switch pressed so that we can know what they are trying to communicate with us easily. So our project aims at this problem to help physically challenged people to communicate with others using hand gestures with technical electronic support. This is used to interpret the feelings of that person which facilitates the guardian to respond quickly in case of urgency.

A gesture may be a specific movement of the hands with a selected form employed by the dumb and deaf to convey their thoughts to the general public. There are several sign languages accessible; they are American, British, Turkish, Indian Sign languages etc. In recent years, there has been a rapid increase in the number of people with hearing loss and inability to speak. This project aims to facilitate people by means of a glove-based communication interpreter system. The glove consist of switches produces a message that they want to express. According to the combination that message is sent to guardian of that person using GSM module. So that he could know what the guy wanted to communicate with us. The guardian after seeing that message received through lcd or mobile, he immediately takes his action according to the received message. This may also be used in applications like sending message to hospital.

BLOCK DIAGRAM IMPLEMENTATION:

The block diagram represents the complete architecture of Smart Gloves for Disable People where it includes components such as Flex Sensors, Arduino Mega, 16*2 LCD Screen, APR33A3 Voice Playback module, Transmitter, Receiver with Electronic Switches. The Arduino Mega Microcontroller Board is the heart of smart gloves device, it has interfaced with flex sensor, voice module, transmitter, and LCD screen. This whole assembly works on voltage of 5 volts and 9 volts supplied by power supply block.

The work starts from movement of hand gloves where the flex sensors are attached, and the value of sensor changes when its experiences the bending. The flex sensor is another type of potentiometer is attached to the fingers when we bend the figure the value of the sensor gets changes. The changing value of the sensor is depended upon the resistance and applied angle of the bending when we bend the sensor at some particular angle, we can see the value of the resistance is increase and accordingly the output gets reduced. On the other way we can say that it’s like an inversely proportional when the resistance of the sensor is increase at that instant the value of output decrease and accordingly, we can make project by getting the advantage of this process.

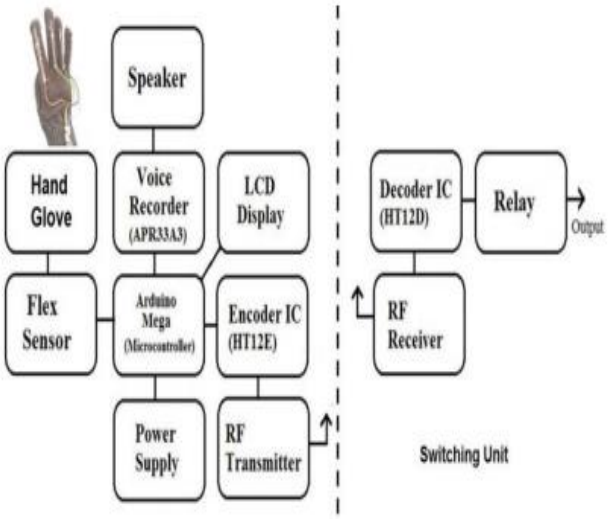


Fig: Block Diagram Implementation

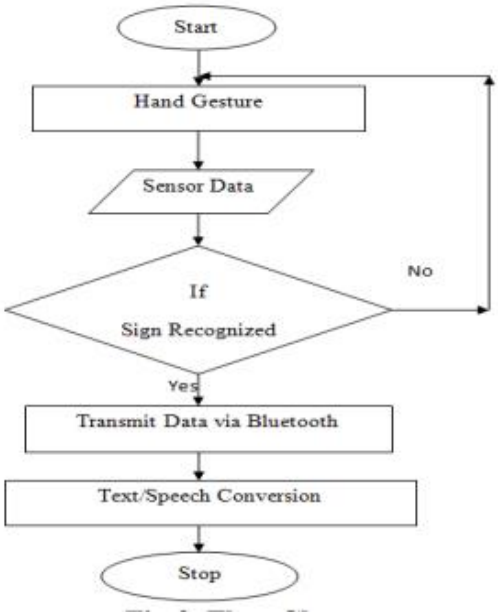


Fig: Flow chart representation for Smart Glove

The signing gloves are seamed with five flex sensors over the thumb, index, middle, ring; little fingers on the hand, Arduino nano and also the measuring system therefore acknowledge the precise movement of the fingers. Every flex device is provided with the initial voltage as per the movement of the fingers there'll be a dip thanks to the modification within the resistance because of the bending of the flex device on the fingers. The voltages therefore obtained are analogous, which is then reborn to digital voltage mistreatment an analog to digital convertor using Arduino Nano. The Digital output is then compared with the preloaded values of device within the system for the Alphabets and numbers, if the digital output matches the preloaded values, then the popularity takes place of the Gestures and also the compared output is given as a text output on the mobile screen which can facilitate a standard person to browse and perceive. An equivalent output is transmitted over a Bluetooth module and so via Bluetooth link output is distributed to mechanical man Smartphone or a private laptop that is connected to the Bluetooth module and consisting of Text to Speech (TTS) conversion package (application) the serial input is received via the Bluetooth link on the connected device and a text output is received on the appliance with speech output from the speakers.

This may facilitate traditional folks to browse the output and perceive the gesture alternatively hear the audio and communicate simply with the dumb and deaf folks.

REFERENCES

[1]. “Smart Speaking Glove for Deaf and Dumb”, P. Mohan, M. Mohan Raj, M. Kathirvel, P. A. Kasthurirngan, S. Musharaff, T. Nirmal Kumar, International Journal of Engineering Research & Technology (IJERT), 2020

[2].Bijay Sapkota, Mayank K Gurung, Prabhat Mali, Rabin Gupta, “SMART GLOVE FOR SIGN LANGUAGE TRANSLATION USING ARDUINO”.

[3].Vismaya A P, Sariga B P, Keerthana sudheesh P C, Manjusha T S, “SMART GLOVE USING ARDUINO WITH SIGN LANGUAGE RECOGNITION SYSTEM”, IJARIIE

[4]. Abhinandan Das, Lavish Yadav, Mayank Singhal, Raman Sachan, Hemang Goyal, Keshav Taparia Raghav Gulati, Ankit Singh, Gaurav Trivedi, “Smart Glove for Sign Language Communications”, IEEE

[5]. Pravin Bhalghare, Vaibhav Chafle, Ameya Bhivgade, Vaibhav Deokar, “Multipurpose Smart Glove for Deaf and Dumb People”, International Research Journal of Engineering and Technology (IRJET), 2020.

[6].Tushar Chouhan, Ankit Panse, Anvesh Kumar Voona and S. M. Sameer, “Smart Glove With Gesture Recognition Ability For The Hearing And Speech Impaired”, IEEE Global Humanitarian Technology Conference

[7]. Walid K A Hasan, Nadia Naji Gabeal, “Implementation of Smart glove for Deaf and Dumb”, International Science and Technology Journal

ARCHITECTURE FOR LOST MOBILE TRACKER APPLICATION

P. Teja Venkata Sai, P. Ravindra Kumar

In this, analysing existing mobile application's architecture and design a new one based on it, in addition, it seeks to implement the application prototype as a proof of concept of the designed architecture. The main benefit of this research is to provide a base architecture for java mobile developers in order to develop a tracking application for lost mobile phones. The observations gathered on existing mobile applications show that most of the mobile applications in tracking lost phones are focused on three characteristics, which are client to server communication, SIM card data retrieval, and mobile application activation event. The result of this research is the application prototype that tracks lost mobile phones. The application prototype implements the architecture analyzed from the characteristics of existing mobile applications which are used to track lost mobile phones.

Problem Analysis

Analysis on current studies means any techniques or studies that have been conducted by a person or a company. GSM Europe, one of the companies that represent the interests of mobile operators worldwide, has studied about possibilities in securing a mobile phone from theft. Analysis on device-oriented structure means any technique or architecture to overcome a lost mobile device that has no connection with software. It is focused more on the implementation of the hardware Analysis on device-oriented structure is considered as important for the authors because they believe that by learning the current available technique or architecture; itcan help them to consider about the hardware instead of only focusing on software. Analysis on existing mobile applications is conducted because this research will focus on making a mobile J2ME application, which means, analysing existing application might help the authors to create a better application by learning from each advantage and disadvantage. The selection of existing mobile applications was chosen based on platforms. The analyzed platform was conducted in Android, iOS, and Black Berry.

System Model

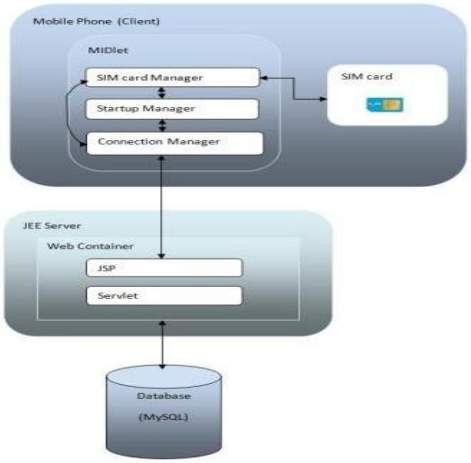
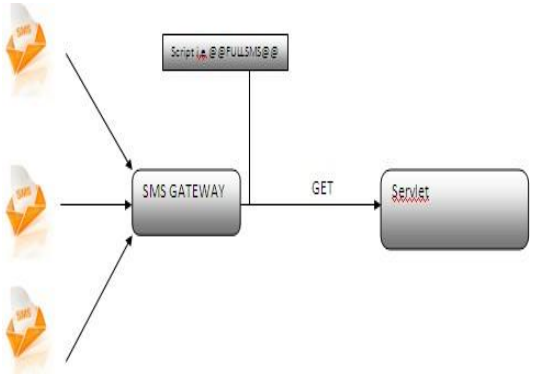


Fig.1. Design and architecture of application prototype

The figure above shows the global architecture of the prototype based on the analysis. The architecture consists of two important components, which are, the mobile application and the server. In order to develop the mobile application, the authors used J2ME technology. The mobile application component itself consists of the SIM card manager component, the connection manager component, and the start-up manager component. For the server component, the authors used J2EE server which consists of JSP and Servlet technologies. The server also communicates with the MySQL database server to store data. Below is the detailed design and description for sending and receiving SMS using SMS gateway.



REFERENCES

[1] J. O'Deli, Survey shows we're too lazy about mobile phone security,2011. [Online] Available:http://mashable.com/2011/03/25/mobile-phone-security/

[2] *MobilePhoneTheft*,MobilePhoneInsurance,2009.http://www.mobilephoneinsurance-uk.co.uk/mobileinsurance-theft/

[3] Chern et al., "System and Method For forcasting and Tracking Mobile Telephone Devices Via the Internet," White Paper, United States: Patent,2002.

[4] V.Harringtonetal.,"MobilePhoneTheft",*WhitePaper,HomeOffice Research*, Development and Statistics Diretorate,2001

MOLECULAR COMMUNICATION INTERCONNECTING TINY NANOBIO DEVICES

Ajitha Boyapati

Recent advances in the fields of bioengineering and nanotechnology have resulted in the emergence of tiny devices of sub millimetre and even micron or less dimensions that can perform sensing and actuation. In many cases, the main challenge is moving these devices out of the laboratory and into the real world is not production cost, as they can be produced coarse-effectively in large volumes, but rather a communication problem. For many applications, these tiny devices need to communicate and collaborate in swarms, or they need to transmit their measurements to other devices. Inspired by nature, chemical signalling (also known as molecular communication). This article explores some of the recent advancements and challenges in engineering molecular communication systems. The idea of small devices swimming in the body to find and describe various pathogens to cure diseases has been around for a few decades and was perhaps well popularised by 1966 film fantastic Voyage. Over the past decade, with the advancement in the field of Biology bioengineering and nanotechnology mm devices are beginning to emerge, but also other applications, such as environmental cleaning and manufacturing, as well as Latest storage on molecular structures (example :DNA storage). The Nobel Prize in chemistry was awarded “for the design and synthesis of molecular machines”.

For many applications especially in medicine and synthetic Biology is used to create a perfectly self-sufficient micro/nano-sized device based on a genetically modified cell. This is in part because of the biocompatibility of synthetic biological devices.

In humans, for example, there are at least as many bacterial cells living inside the body as there are human cells. This helpful bacterium regulates many functions of the body and many different diseases have been linked to imbalances in the human microbiome. Another important benefit in using synthetic biological devices is that it would be much easier to reprogram cells rather than to design and build completely new machinery for micro/nanosized robots that can perform sensing and actuation in the body. Some recent examples of synthetic devices include genetically modified bacteria that can be used to detect cancer cells in Vivo, and bacteria that can be used for targeted drug delivery.

OBJECTIVES

Another benefit of these systems is that molecules can often be the most energy efficient means of communication when delay can be tolerated. They can also store tremendous amounts of information in a small volume. Despite the prevalence of chemicals signalling in nature, it was only over the past two decades that biologists and bio engineers have uncovered some of the underlying pathways, and developed techniques for modifying them. Beside this biological approach, molecular communication systems can be viewed from a communication engineering lens, where other aspects such as reliability, data rate, and network protocols are designed and built into these systems to ensure tiny devices could communicate and collaborate reliability in large swarms. Such an approach is required for transitioning from a few sub-millimetre devices in laboratories to swarms operating in real-world applications [23]. Molecular communication is also important in the design of biochips, where components within a chip, such as a DNA storage unit and a molecular processing unit, are connected by chemical signalling, driven by these applications.

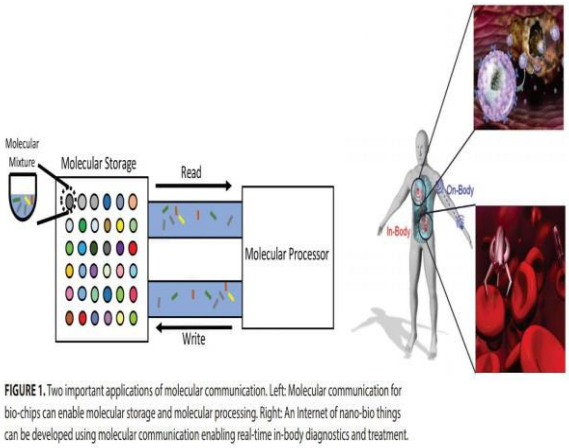


FIGURE 1. Two important applications of molecular communication. Left: Molecular communication for bio-chips can enable molecular storage and molecular processing. Right: An Internet of nano-bio things can be developed using molecular communication enabling real-time in-body diagnostics and treatment.

Fig: Molecular Communication

THEORETICAL LIMITS AND EXPERIMENTAL IMPLEMENTATIONS

One of the most fundamental aspects of any communication system is the Shannon capacity of the communication channel, which characterizes the maximum theoretical achievable data rates for that channel. Understanding this theoretical limit provides an upper bound on performance as well as intuition that is useful for system design. However, even the "simplest" molecular channel has serious analytic complication for characterizing the channel capacity which cannot be ignored: particle indistinguishability which results in ISI. Which particle emission corresponds to which arrival can be ambiguous? That is, particles transmitted in the previous symbol duration may arrive during the current symbol interval, and the receiver cannot differentiate between the interfering particles and current transmissions particles. Previous works have considered two different approaches to mitigate ISI. First, multiple types of particles that are distinguishable at the receiver can be employed where the transmitter alternates between the particles during each channel use. However, from an information theoretic perspective, this approach is equivalent to having parallel channels, where the symbol duration for each channel is longer. Another approach has been to use enzymes or multiple reactive chemicals to degrade the information particles that remain in the channel. However, formulating analytical channel models for these systems, such that capacity can be calculated, is challenging. It may also be possible to design information particles that are unstable and degrade over time naturally. Although these techniques can reduce the ISI, it cannot completely eliminate it. Therefore, despite these efforts, any realistic formulation of a molecular channel is an ISI channel, where formulating the channel capacity can be challenging. To find some analytical formulations for channel capacity, previous works have either assumed that the channel has no ISI, or that it has limited ISI, where bounds on capacity can be derived. With these simplifications, it is shown that the data rate for molecular communication can be from a few bits per seconds to a few thousand bits per second if a single type of particle is used for transmission. For example, one formulation of a molecular channel is the particle intensity channel where information is encoded in the intensity/ concentration of the particles released. In this case, it can be shown that the channel can be formulated as the Poisson channel, where for the ISI free point-to-point link.

REFERENCES

1. H. Arjmandi, A. Gohari, M.N. Kenari, and F. Bateni, "A new modulation technique and performance analysis," IEEE Communications Letters, vol. 17, no. 4, pp. 645–648, 2013.
2. W.C. Agosta, Chemical communication: The language of Pheromones, first edition ed. W.H. Freeman & Co. Aug 1992.

IMPLEMENTATION OF QoS BASED ROUTING ALGORITHM FOR WIRELESS BASED NETWORKS

V.G.V. Nihani, G.A.J. Daniel

In WSN, the main reasons for the effective design of protocol are to have minimal energy consumption and security. So to address these issues, we propose a new routing protocol called Secured QoS aware Energy Efficient Routing protocol, which will be designed based on trust and energy modelling. In this, the trust modelling uses an authentication technique with a key based security mechanism to provide trust scores. The trust scores will be calculated in this work for enhancing the security. In addition, a cluster based secure routing algorithm has been suggested in which cluster head has to be selected based on QoS metrics and trust scores.

Introduction

Wireless sensor networks consist of small devices known as sensor nodes. They have less battery power, limited storage capacity and less computational capacity. The sensor nodes collect the information through in-between nodes and send this collected information to sink node i.e. destination node. So an appropriate routing technique is needed to transmit the collected information by nodes through multi hop routing path. In this multi hop routing, every sensor node should transfer the data and other nodes data also.

Trust-based LEACH Protocol for Wireless Sensor Networks:

Trust-based LEACH (Low Energy Adaptive Clustering Hierarchy) protocol to provide secure routing, while preserving the essential functionalities of the original protocol. The Decision making of our scheme is based on the decision trust, evaluated individually and dynamically for different decisions by basic situational trust. The situational trust is control.

Multipath secure routing:

Wireless Sensor Networks (WSNs) have been a subject of extensive research and have undergone more growth in the last few years. Wireless sensor networks utilize collaborative measures such as data gathering, processing, and management of sensing activities for enhanced performance. In order to communicate with the sink node, node having low energy power may have to traverse multi-hops. This requires neighbour nodes to be used as relays. The advantages are resist sinkhole attack and wormhole attack.

BASED ON TRPM:

B.Sun and D.Li proposed a comprehensive trust- aware routing protocol with multi-attributes for wireless sensor networks. Due to severe restrictions in power with poor hardware equipment, and lack of centralized administration in management wireless sensor networks are extremely vulnerable to malicious attacks aimed at routing and other aspects. To overcome this problem TRPM is introduced. This trust model relies on an improved sliding time window considering attack frequency to facilitate the discovery of malicious behaviour of attackers.

BASED ON FUZZY:

X.Anita, M.A.Bhagyaveni and J.Martin Leo Manickam proposed fuzzy based trust prediction model for routing in wireless sensor networks. The collaborative nature of multi hop wireless sensor networks makes it unsafe with number of attacks. This vulnerable behaviour of wireless sensor networks mandates the requirements of light weight security scheme. The proposed work is fuzzy based trust prediction model for routing (FTPR). Fuzzy based trust prediction has a trust prediction model which predicts the future behaviour of neighbour node based on its behaviour and fluctuations in trust value over a period of time.

BASED ON TRUST VOTING ALGORITHM:

Xiao X-Y, wen-chihpeng and C-C Hung proposed trust voting to determine faulty sensor readings. It helps in determining faulty readings in wireless sensor networks. By exploring correlations between readings of sensors, the correlation network is based on similarity between readings of sensors. Sensor rank is a mechanism for rating sensors in terms of the correlation. Trust voting is introduced to determine faulty sensor readings.

REFERENCES

1.Song, F. , & Zhao, B. . (2008). Trust-Based LEACH Protocol for Wireless Sensor Networks. The Second International Conference on Future Generation Communication and Networking, vol 1, pp. 202-207.

2.Wang, J. , Li, L. , & Chen, Z. . (2011). A Routing Algorithm Based on Trustworthy Core Tree for WSN. In: IEEE/IFIP International Conference on Embedded & Ubiquitous Computing. Hong Kong, China. pp.763-770.

3.Duran , N. M. , Kofi , N. , Shamsi, J. , Haider, W. , &Abbsi, A. M. . (2013). Secure multi-hop routing protocols in Wireless Sensor Networks: Requirements, challenges and solutions. In: Eighth International Conference on Digital Information Management. Islamabad, Pakistan. pp. 41-48.

4.B. Sun and D. Li. (2018) A Comprehensive Trust-Aware Routing Protocol with Multi-Attributes for WSNs. IEEE Access, Vol. 6, pp. 4725-4741.

5.N. Lewis, N. FoukiaAn efficient reputation-based routing mechanism for wireless sensor networks: Testing the impact of mobility and hostile nodes,Sixth Annual Conference on Privacy, Security and Trust (2008), pp. 151-15ACM International Workshop on Data Engineering for Wireless and Mobile

6.X. Xiao, W.C. Peng, C.C. Hung, W.C. LeeUsingsensorranks for in-network detection of faulty readings in wireless sensor networksProceedings of the 6th Access (2007), pp. 1-8

7. Munuswamy, S., Saravanakuma, J. M., Sannasi, G., Harichandran, K. N., &Arputharaj, K. (2018). Virtual force-based intelligent clustering for energy-efficient routing in mobile wireless sensor networks. Turkish Journal of Electrical Engineering & Computer Sciences, 26(3), 1444–1452.

8.Villas, L. A., Boukerche, A., Ramos, H. S., de Oliveira, H. A. B. F., de Araujo, R. B., &Loureiro, A. A. F. (2013). DRINA: A lightweight and reliable routing approach for in-network aggregation in wireless sensor networks. IEEE Transactions on Computers, 62(4), 676–689.

DESIGN AND IMPLEMENTATION OF MINIATURIZED TRIANGULAR SHAPE DIELECTRIC RESONATOR ANTENNA USING ARTIFICIAL MAGNETIC CONDUCTOR SURFACE FOR 5G APPLICATIONS

Voleti Naga Pranav, K. Nikitha

A dielectric resonator antenna (DRA) is a radio antenna mostly used at microwave frequencies and higher, that consists of a block of ceramic material of various shapes, it is mounted on metallic surface. A Triangular shaped DRA is miniaturized using artificial magnetic conductor (AMC) surface on substrate of type FR4 without disturbing other important parameters like gain, resonance frequency and efficiency. The miniaturization is performed for dielectric resonator antenna at 3.5GHz. The size of antenna is reduced by nearly 85% using AMC. The AMC and DRA are positioned on FR4 substrate. The AMC surface consists of small 9 copper patches are introduced with small gap between them. DRA is mounted on AMC surface, which significantly reduces the overall DRA volume. AMC are shorted with ground metal with help of small metallic vias. The design has three main features: (i) simple micro-strip line feeding (ii) use of parasitic metallic strip to achieve impedance matching (iii) use of AMC surface for design miniaturization. This antenna is mainly used for 5G wireless applications. The volume of DRA is reduced by nearly 85% and ground surface also reduces by nearly 15.5% of original DRA without AMC surface.

INTRODUCTION:

The antenna is a metallic device which is used for the purpose of radiating and receiving the radio or electromagnetic waves. The antenna acts as transitional structure between free space and a guiding device. The guiding device is the transmission line which is used to transport electromagnetic energy from the transmitting source to the antenna or from the antenna to the receiving device. Over the last sixty years, antenna technology has been essential partner of the communication revolution. During the transmission, a radio transmitter supplies an electrical current to the antenna terminals, and the antenna radiates the energy from the current as the electromagnetic waves.

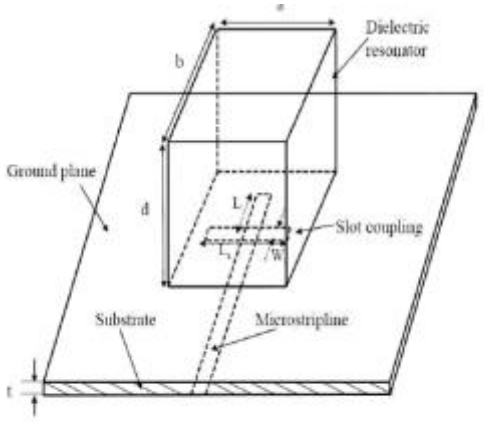


Fig: DRA Design

APPLICATIONS OF DRA:

- Satellite Communication
- IOT applications for wideband Device to Device
- Communication Mobile and handsets
- 5G Communications

The DRA is an open resonating structure, fabricated from the low loss microwave dielectric material. Dielectric resonators (DR) have proved themselves to be an ideal candidate for antenna applications by virtue of their high radiation efficiency, the flexible feed arrangement, simple geometry, small size and the ability to be produced different radiation pattern using different modes. Feeding techniques like probe feed, aperture slot, micro strip line and the coplanar line can be used with the DRAs, which enables them for integration with the microwave printed technology. Additionally, DRA avoid some limitations of the patch antenna including the high conductor losses at the millimetre-wave frequencies, sensitivity to tolerances, and narrow bandwidth. DRA of the cylindrical, hemispherical and rectangular shapes are most widely used and investigated. The rectangular shape is the much easier to fabricate and one or more-dimensional parameters are available as an additional degrees of freedom for the design. Impedance bandwidth varies over a wide range with the resonator parameters. For a given DRA geometry, the radiation pattern can be made to change by the exciting different modes. Single shaped DRA operates in a fundamental mode; it's a bandwidth is typically below 10%. The research of the wide-band DRA was the first experimentally carried out, who stacked two different DRAs on top of one another to obtain a dual-resonance operation. Since then other wide-band DRAs using the stacking methods have been reported. Moreover, some methods that need only a single DRA to achieve the wideband operation were reported. Recently, there various bandwidth enhancement techniques have been developed for DRAs, such as co-planar parasitic DRAs, stacked DRAs, and deformed DRAs. More recently, a disc-ring DRA was proposed by combining one smaller cylindrical DR and one larger annular ring DR concentrically together to achieve a 45% impedance bandwidth.

Fig: Different DRA Geometries

In broadband DRAs using narrow slot aperture coupled to the micro-strip line feed are presented. Two different shapes of dielectric resonators tapered in the stair-like structure have been designed for wideband applications. The design of a broadband Dielectric Resonator Antenna (DRA) tailored and modified appropriately for the implementation as a textile wearable antenna in Body Area Networks (BAN).

REFERENCES

1. H. A. Wheeler, ‘‘Fundamental limitations of small antennas’’, IRE, vol.35, no. 12, pp. 1479–1484, Dec. 1947.
2. W. Geyi, ‘‘Physical limitations of antenna,’’ IEEE Trans. Antennas Propag., vol. 51, no. 8, pp. 2116–2123, Aug. 2003.

A. K. Skrivervik, J.-F. Zurcher, O. Staub, and J. R. Mosig, ‘‘PCS antenna design: The challenge of miniaturization,’’ IEEE Antennas Propag. Mag., vol. 43, no. 4, pp. 12–27, Aug. 2001.

4. D. Kim, ‘‘Planar magneto-dielectric metasubstrate for miniaturization of a microstrip patch antenna,’’ Microw. Opt. Technol. Lett., vol. 54, no. 12, pp. 2871–2874, Dec. 2012.

5. N. H. Shahadan, M. H. Jamaluddin, M. R. Kamarudin, Y. Yamada, M. Khalily, M. Jusoh, and S. H. Dahlan, ‘‘Steerable higher order mode dielectric resonator antenna with parasitic elements for 5G applications,’’ IEEE Access, vol. 5, pp. 22234–22243, 2017.

6. S. Danesh, S. K. A. Rahim, and M. Khalily, ‘‘A wideband trapezoidal dielectric resonator antenna with circular polarization,’’ Prog. Electromagn. Res. Lett., vol. 34, pp. 91–100, Oct. 2012.

7. M. Khalily, M. K. A. Rahim, N. A. Murad, N. A. Samsuri, and A. A. Kishk, ‘‘Rectangular ring-shaped dielectric resonator antenna for dual and wideband frequency,’’ Microw. Opt. Technol. Lett., vol. 55, no. 5, pp. 1077–1081, May 2013.

8. S. Khan, H. Ali, R. Khan, R. Harry, and C. Tanougast, ‘‘An L-shaped frequency reconfigurable MIMO dielectric resonator antenna for PCS band applications,’’in Proc.29 thIrish Signals Syst.Conf.(ISSC),Belfast,U.K., Jun. 2018, pp. 21–22.

9. S. Zhu and R. Langley, ‘‘Dual-band wearable textile antenna on an EBG substrate,’’ IEEE Trans. Antennas Propag., vol. 57, no. 4, pp. 926–935, Apr. 2009.

10.Z. H. Jiang, D. E. Brocker, P. E. Sieber, and D. H. Werner, ‘‘A compact,low-profile metasurface-enabled antenna for wearable medical body area network devices,’’ IEEE Trans. Antennas Propag., vol. 62, no. 8, pp. 4021–4030, Aug. 2014.

MILLIMETER WAVE DOUGHNUT SLOT MIMO ANTENNA FOR 5G APPLICATIONS

Sk. Samdani, Y. Sudheer Kumar

A change from a long and distant period of history of cellular communication aims in the deployment of 5G base stations and antennas. Upgrading from 4G to 5G results in three main benefits: faster speed, shorter delays and increased connectivity. Due to enhancement in technologies, mm wave can be used in most of the new electronic components mainly, antennas. This paper intent to design an antenna in millimetre wave frequency range (24GHz-300GHz) for 5G applications. A doughnut slot antenna with improved gain using MIMO configuration is presented. There exists valuable isolation at 28GHz. The dual band antenna resonates at 28GHz and 45.54GHz suiting 5G applications. The antenna is compact sized and extending to MIMO gives low values of ECC at all frequencies. Doughnut slot patch antenna is commendable for future 5G communications. The millimeter-wave region of the electromagnetic spectrum is commonly defined as the 30- to 300-GHz frequency band or the 1-cm to 1-mm wavelength range. Utilization of this frequency band for the design of data transmission and sensing systems has a number of advantages: 1. The very large bandwidth resolves the spectrum crowding problem and permits communication at very high data rates. 2.The short wavelength allows the design of antennas of high directivity but reasonable size, so that high-resolution radar and radiometric systems and very compact guidance systems become feasible. 3.Millimeter waves can travel through fog, snow, and dust much more readily than infrared or optical waves.

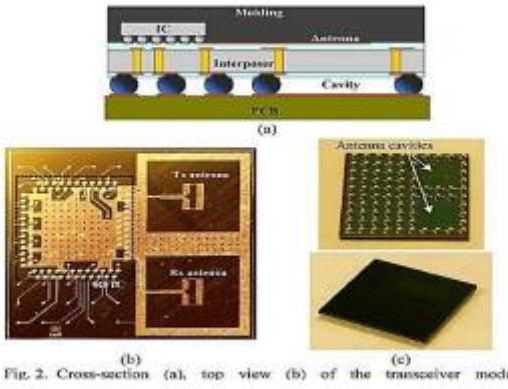


Fig. 2. Cross-section (a), top view (b) of the transceiver modul

DOUGHNUTS SLOT 5G MIMO ANTENNA:

The doughnut slot 5G antenna is extended to a 2 x 2 MIMO for the enhancement of parameters such as gain radiation efficiency etc. The structure of 2 x 2 MIMO is shown in Fig below :(a) top view (b)back view The two antenna elements are placed at a distance of $\lambda/2$ spacing and excited both the antenna elements with separate ports. The substrate width has been increased 3 times in order to achieve proper matching. The MIMO antenna has dimensions of 6mm x 18mm resonating at two resonant frequencies 28.26GHz and 45.61GHz for 5G millimeter wave communication. The doughnut slot 5G antenna is extended to a 2 x 2 MIMO for the enhancement of parameters such as gain radiation efficiency etc. The structure of 2 x 2 MIMO is shown in Fig above. The two antenna elements are placed at a distance of 3/2 spacing and excited both the antenna elements with separate ports. The substrate width has been increased 3 times in order to achieve proper matching. The MIMO antenna has dimensions of 6mm x 18mm resonating at two resonant frequencies 28.26GHz and 45.61GHz for 5G millimeter wave communication.

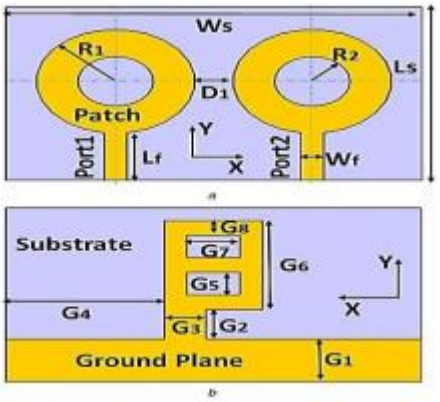


Fig: Doughnut Shape Antenna

REFERENCES

1. Menna El Shorbagy, Raed M Shubair, Mohamed I AlHajri, Nazih Khaddaj Mallat, "On the Design of Millimetre-Wave Antennas for 5G," in IEEE Microwave Symposium(MMS), 2016 16th Mediterranean, pp.1-4, Jan 2017.

2. Y.Niu, Y.Li, D.Jin, L.Su and A.V.vasilakos, "A survey of millimetre wave(mm Wave) Communications for 5G: Opportunities and Challenges," arXiv:1502.07228,2015.

3. Yassine JANDI, Fatima GHARNATI, Oulad said ahmed, "Design of a compact Dual bands patch antenna for 5G Applications," International Conference on Wireless Technologies, Embedded and Intelligent Systems(WITS), IEEE 2017.

4. Brajlata Chauhan, Sandip Vijay, S.C. Gupta, "Millimetre-Wave Mobile Communications Microstrip Antenna for 5G – A Future Antenna," International Journal of Computer Applications, vol.99-No.19, August 2014.

BRAIN CONTROLLED HOME AUTOMATION

P. Sai Sumana, B. Saranya

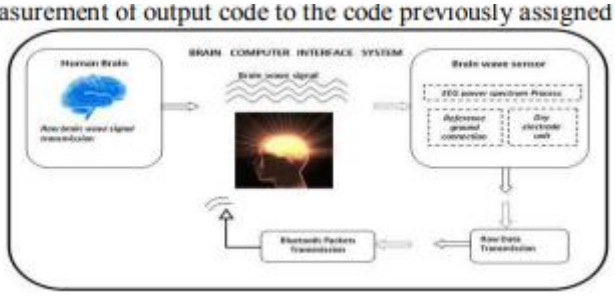
This system has designed a smart house control system that uses brainwave technology to achieve brain-computer interaction. As the Brain signals are captured by sensor placed over the head. Different brain states are the result of different patterns of neural interaction. These patterns lead to waves characterized by different amplitudes and frequencies. The signal generated by brain was received by the brain sensor (Neurosky mind wave sensor) and it will divide into packets and the packet data transmitted to wireless medium (blue tooth). the wave measuring unit will receive the brain wave raw data and it will convert into signal. Then the instructions will be sending to the home section to operate modules. Introduction: Amazingly, nothing in the world can be compared with the human brain. Our Human Brain is highly complex and is made up of about 100 billion neurons. electrical signals are not fully transferred from one neuron to another, but some part of it escapes and reaches the scalp. These signals are captured by the electrodes and used to control the device. The proposed system aims to control home appliances (like bulb, fan etc.) with the help of Human Attention Level which comes under non-invasive method of brains signal measurement. This attention is being measured by Neurosky Headset. Attention level values are ranges from 1 to 100. Attention means user's level of mental focus which occurs during intense concentration.

Neurosky Headset:

TECHNICAL APPROACHES:

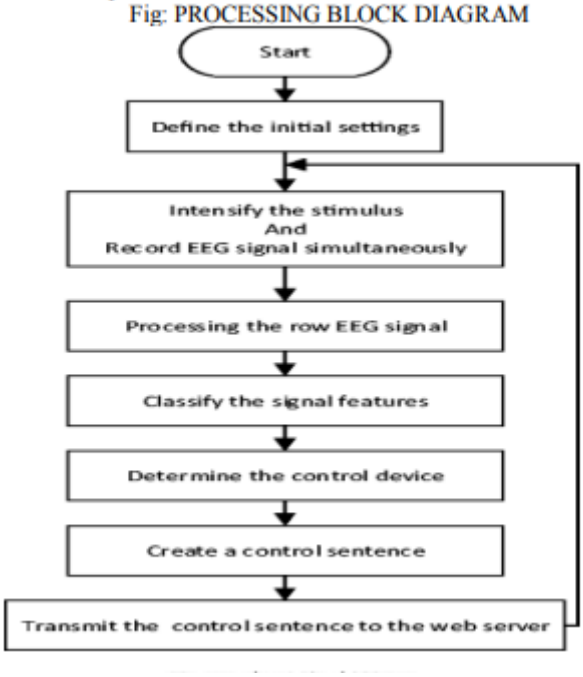
To study the different types of brain signals and their wavelengths. Optimize the brain waves received by the Neurosky headset by using compression techniques Implementation of the code in Matlab and executing Measurement of output code to the code previously assigned to the device and switching on/ switching off the device based on the response.

Measurement of output code to the code previously assigned



on the response.

Fig: PROCESSING BLOCK DIAGRAM



Neurosky Mind Wave

Brainwave Type	Frequency Range	Mental states and conditions
Delta	0.1Hz to 3Hz	Deep, dreamless sleep, non-REM sleep, unconscious
Theta	4Hz to 7Hz	Intuitive, creative, recall, fantasy, imaginary, dream
Alpha	8Hz to 12Hz	Relaxed (but not drowsy) tranquil, conscious
Low Beta	12Hz to 15Hz	Formerly SMR, relaxed yet focused, integrated
Midrange Beta	16Hz to 20Hz	Thinking, aware of self & surroundings
High Beta	21Hz to 30Hz	Alertness, agitation

Flowchart to perform automation

It is quite probable that in the future most of our appliances will be controlled directly through our wishes or the brain and this project stands as an affirmation to that vision. Signals from the brain can be further studied and the technology can be refined to bring about more specific results. The scope of the project was primarily to establish control through no physical motion on part of the user and it has been successful in doing so but it has also laid a foundation. By using BCUI TECNOLOGY brain actuated application can be done mainly for paralyzed people with the help of brain sense.

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)
(Sponsored by Siddhartha Academy of General & Technical Education)

Estd.1977