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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years (10)

Sl. No.	Name of the teacher	Title of the book/chapters published	Department	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
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2	VISHAL RASHMI RISHU BHATIA		ELECTRONICS AND COMMUNICATION ENGINEERING	5G: AN ADVANCE TECHNOLOGY	INTERNATIONAL CONFERENCE ON SMART SYSTEMS AND INNOVATION RESEARCH	INTERNATIONAL CONFERENCE ON SMART SYSTEMS AND INNOVATION RESEARCH (ICSSIR-2019)	INTERNATIONAL	2019	ISBN: 978-93-81558-96-6	GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT	JCB PRESS, ANSARI ROAD, DARYA GANJ, NEW DELHI
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Lecture Notes in Electrical Engineering 526

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Part III VLSI and Embedded Systems

Optical Functions of Methanol and Ethanol in Wide Spectral Range 479
 Michal Lesňák, Kamil Postava, František Staněk and Jaromír Pištorá

A Novel Method to Detect Program Malfunctioning on Embedded Devices Using Run-Time Trace 491
 Garima Singhal and Sahadev Roy

Performance Analysis of Comparator for IoT Applications 501
 Mansi Jhamb, Tejaswini Dhall and Tamish Verma

Adiabatic Logic Based Full Adder Design with Leakage Reduction Mechanisms 511
 Dinesh Kumar and Manoj Kumar

IP Protection of Sequential Circuits Using Added States Watermark with Property Implantation 521
 Ankur Bhardwaj and Shamim Akhter

Design of Low Power and High-Speed CMOS Phase Frequency Detector for a PLL 529
 Nitin Kumar and Manoj Kumar

Comparative Analysis of Standard 9T SRAM with the Proposed Low-Power 9T SRAM 541
 Balraj Singh, Mukesh Kumar and Jagpal Singh Ubhi

Fabrication and Characterization of Photojunction Field-Effect Transistor 553
 Yogesh Kumar, Hemant Kumar, Gopal Rawat, Chandan Kumar, Varun Goel, Bhola N. Pal and Satyabrata Jit

Sarcasm Detection of Amazon Alexa Sample Set 559
 Avinash Chandra Pandey, Saksham Raj Seth and Mahima Varshney

Reducing Efficiency Droop for Si-Doped Barrier Model of GaN/InGaN Multi-quantum Well Light-Emitting Diode by Designing Electron Blocking Layer 565
 Pramila Mahala, Amit K. Goyal, Sumitra Singh and Suchandan Pal

Mole Fraction Dependency Electrical Performances of Extremely Thin SiGe on Insulator Junctionless Channel Transistor (SG-OI JLCT) 573
 B. Vandana, Prashant Parashar, B. S. Patro, K. P. Pradhan, S. K. Mohapatra and J. K. Das

Design of Low Power and High-Speed CMOS Phase Frequency Detector for a PLL



Nitin Kumar and Manoj Kumar

Abstract High-performance phase frequency detector (PFD) is an integral part of the high-speed phase-locked loop (PLL), and their characteristics have a great impact on the performance of PLL system. The demand for the decreasing of power dissipation in CMOS design is a major challenge to optimize the circuit power consumption. In this paper, the concept of low power techniques namely, stacking and body bias have been utilized for the implementation of the proposed CMOS PFD for high-frequency applications. All the results related to the proposed designs have been obtained using TSMC 0.18 μm CMOS process. The proposed PFD design shows a remarkable reduction in power dissipation up to 172.670 pW which is significantly lower than the conventional PFD. Simulation results also show that the proposed design has wider operating frequency of 1 GHz, making it a suitable circuit for high-performance PLL systems.

Keywords Body bias · CMOS · LCNT · Phase frequency detector
Phase-locked loop · Stack effect

1 Introduction

In recent years, increasing growth in CMOS technology has led to enhancing the demand for low power and high-speed circuits. Low power circuit design is the backbone to extend the battery life. There are three dominant sources of power dissipation in a MOS device, which are responsible for the draining of battery.

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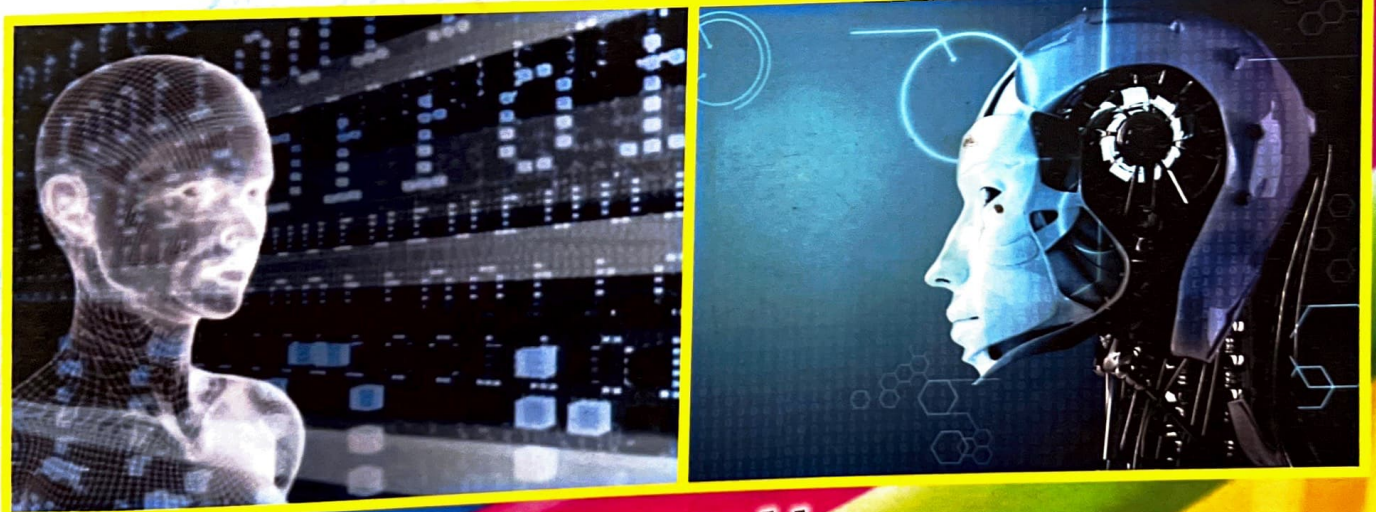
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TABLE OF CONTENTS

S.NO.	PAPER_ID	TITLE	AUTHOR	CO-AUTHOR	PAGE NO.
1	ICSSIR-01	5G: AN ADVANCE TECHNOLOGY	VISHAL	RASHMI, DR. RISHU BHATIA	1
2	ICSSIR-02	A REVIEW PAPER ON SOLAR TREE	SHIKHA KASANA	LALINA	6
3	ICSSIR-03	A REVIEW OF WIRELESS SENSOR NETWORK APPLICATIONS AND RELATED ISSUES	MAHAJABEE NA	SATISH KUMAR	9
4	ICSSIR-04	AUTOMATIC REGISTRATION OF IMAGES WITH INCONSISTENT CONTENT THROUGH LINE-SUPPORT REGION SEGMENTATION AND GEOMETRICAL OUTLIER REMOVAL	RAKHI CHAUDHRY	AMIT DALAL	12
5	ICSSIR-05	DIGITAL DIVIDE IN TECHNOLOGY - BRIDGING THE GAP	VIVEK KUMAR	NARENDER SINGH	15
6	ICSSIR-06	EFFECTS OF GROUND SLOTTING IN SIERPINSKI CARPET FRACTAL ANTENNA	MS. JYOTI	DR. RISHU BHATIA	18
7	ICSSIR-07	FUTURE GENERATION OF WIRELESS TECHNOLOGY	ISHFAQ AHMAD SOF	VIVEK ARORA	21
8	ICSSIR-08	POWER EFFICIENT TECHNIQUE FOR THE REMOVAL OF SOFT ERRORS IN MEMORIES	HIMANSHU UPADHYAY	DR. RAKESH JOON	26
9	ICSSIR-09	REVIEW PAPER ON WIRELESS TECHNOLOGIES (1G TO 5G)	PRATIBHA BHAYANA	DR. SUMIT SANGWAN	31
10	ICSSIR-10	RFID AND GST E-WAY BILL COLLABORATION	PINKY SHARMA		35
11	ICSSIR-11	AC POWER CONDITIONER	JAYANT	NEERAJ DESWAL	42
12	ICSSIR-12	ELECTRIC VEHICLES	JAYANT	DR. AMAN AGGARWAL	46
13	ICSSIR-13	FLUID STRUCTURE INTERACTION (F.S.I) ANALYSIS OF HYDRO DYNAMIC JOURNAL BEARING TITLE	ARUN KUMAR GAUR	DR. ANIL KUMAR, NITIN JAIN	49

5G: AN ADVANCE TECHNOLOGY

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ABSTRACT

From the last few years there has been a great advancement in mobile communication. Now a day's wired telephone systems has become a thing of past and there is tremendous advancement in wireless mobile networks. The concept of wireless communication started from 1G where G stands for Generation and gradually advancement with 2G, 3G, 4G and 5G. In mobile communication, fifth generation give maximum data rate, reduced latency with energy saving along with cost reduction and higher system capacity. The 5G technology will be commercialize possible in 2020.

Keywords: 1G,2G,3G,4G, 5G, WWW, WIMAX, WCDMA

1. INTRODUCTION

5G means fifth generation ,overcome the old technologies .5G technology have reduced latency, high rate of data, cost reduction, energy saving higher system capacity. By March 2019 first phase of 5g that is Release-15 will probably be completed. For the early commercial use second phase ,Release-16 will most probably be completed till March 2020, for submission to the ITU. As there was demand of very high data transmission with speed up 20 gigabit per second for ITU IMT-2020 specification, that is going to be achieved with millimeter waves of 15 GHz and higher frequency. According to standard proposal of 5G communication 3GPP (Generation Partnership project) is going provide New Radio frequency band to 5G.



Figure 1: 5G logo

Frequencies from 600 MHz to 6 GHz will be used in 5G NR which are slightly lower then earlies. It is estimated that the speed of the 5G technology at lower frequencies will be 15% to 20% higher than the 4g technology.

2. LITERATURE OF CELLULAR MOBILE COMMUNICATIONS

From the last few decades there is a remarkable advancement in the field of wireless mobile communication. The journey started from the 1st generation goes to the 4th generation recently and there is 5th generation ahead with more advancement and about to be launched in 2K20.

2.1 1st Generation

1G is to be considered as the father of wireless technology, was launched in 1980's. Despite of its limitations, it can be considered as revolution in true sense since it made 'communication on the move' possible for the first time.

It is a voice-only network. In this technology the transmitted radio waves are in analog form. At a time, some specific number of users can communicate wirelessly and even the voice data can interrupted other radio devices kept or used nearby, resulting in background disturbances. The capability to transmit voice data signal to relatively larger distance was an extraordinary thing which result in lower call drops.



Figure 2: Voice network based device

2.2 2nd Generation

A REVIEW PAPER ON SOLAR TREE

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ABSTRACT

Solar tree is a metal construction like as real tree. In this tree Solar panels are mounted on top of each branch. Energy generated by this tree using sunlight as a source will be available to everyone which will be used for charging batteries of mobile phones and portable computers etc. This paper describes the important factors of solar panel to generate the power. This paper also tell about the efficiency of today's solar panel i.e temperature of cell, energy conversion efficiency , Power point tracking etc. we can change the efficiency of solar cell by changing these factors. In last of this paper, tell about various applications and advantages of solar cell.

1. INTRODUCTION

A solar tree is a beautifying means to generate solar energy and also electricity. It uses multiple no. of solar panels that forms the shape of a tree. The panels are schedule in a tree fashion in a tall tower/pole.

TREE stands for

T= TREE GENERATING
R=RENEWABLE
E=ENERGY and
E=ELECTRICITY

This is like as a tree in structure and the panels are like as leaves of the tree which generates energy. Solar tree is a solar panel construction that resembles like a real tree. Solar panels are put on top of its limb using the sunlight energy, solar panels generate electric energy which is used for charging batteries of mobile phones, tablets, laptops etc. and, as an energy source of street lighting. It is attractive and modern design to conserve an energy from natural source i.e. Sunlight. It promotes of renewable sources of energy, Solar tree also promotes the use of efficient energy technologies, ie. LED street lighting, LED display etc. Solar tree represents an autonomous photovoltaic system. It is equipped with a system of solar panels which are illuminated by the sunlight, produce voltage at their respective endings. That voltage can be used for charging batteries. stored energy from those batteries is then used for various purposes. The necessary replacement of the batteries every few years are Neglected, electric energy produced by this system is completely cost-free. Additional automatic control of charging and discharging process of the batteries increase maximum lifetime of the batteries.

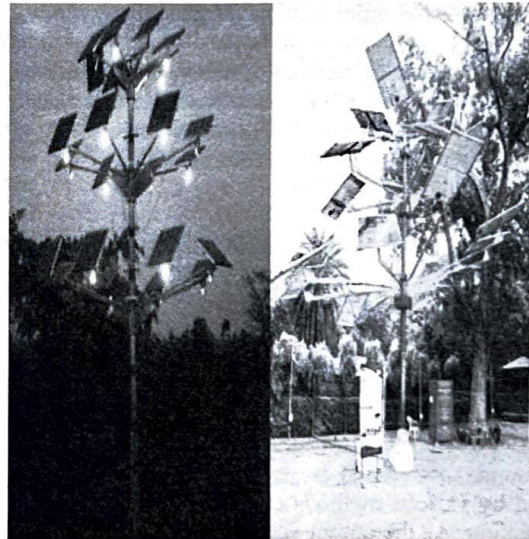


Figure 1

2. HISTORY

1. Solar energy plants developed in 1800.
2. Alexandre Edmond in 1839 discovered the photo voltaic effect.
3. In 1941 Russell ohl invented solar cell.
4. In 2008 by Rein Triefeldt developed Solar Tree Foundation .
5. Ross Lovegrove designed the solar tree in 2012.
6. In 1950,solar cells were capable to convert 6% of energy from sun into electricity
7. Solar cell were capable to convert 15% of energy from sun into electricity in 2012.

A REVIEW OF WIRELESS SENSOR NETWORK APPLICATIONS AND RELATED ISSUES

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ABSTRACT

WSN or Wireless sensor networks are used in many field like health care, military, biological, environmental monitoring, home applications and many other commercial application .WSN are capable to collect the information as wireless sensor networks are the collection of sensor nodes. Sensor nodes have the capability of actuating, sensing, and relaying on the collected data or information. This paper presents the WSNs application and some related issues to that applications.

Keywords: *Wireless sensor network, Green house monitoring, Event Detection, Sensor nodes.*

1. INTRODUCTION

Wireless sensor networks are such type of technology that resulted from the development of low power and low cost wireless technology. Wireless sensor networks are a group of sensing nodes which has low maintenance requirements and which can automatically monitor environmental parameters and detect the particular target using wireless networking. Wireless Sensor Networks (WSN) is be used to obtained smart environments data using large number of sensor nodes that are present at different locations and their mode of operation is also different . Smart environment is obtained by automation in transportation and innovations in home, industries etc.

Wireless Sensor network protocols have a unique self organizing capability. The sensor network can sense, process and communicate that help the command node or sensor node to observe all conditions and then react according to particular environment. The sensor nodes cooperate with each other. These Sensor nodes have an in-built processor, by which raw data are processed before transmission. The features of WSNs provides a wide range of applications that include biomedical, environmental, military, event detection and vehicular telemetric. Fig.1 shows the overview of WSN applications.

2. ENVIRONMENTAL APPLICATIONS

The environmental applications of WSN include the atmospheric parameters monitoring, habitat surveillance, animals and birds movements tracking, detection of forest fires etc.

It is necessary to measure the local climate parameters at different points of observation in different parts of the large greenhouse to make sure that the automatic system of green

house works properly and efficiently. If this work is done using a wired network then it will make the overall system costly and complex. However, for the same purpose a Wireless sensor network based application that using the many small size sensor nodes equipped with radio will be a cost effective solution for green house monitoring. Such an application has been developed in. Data analysis, setup of more complex network and control solutions based on DSP are the areas to be explored. WSNs also find wide range of applications in habitat surveillance as compared to other monitoring methods because of high deployment density of the sensor nodes and self organization capability of sensor nodes. The invisible placement of sensor nodes in the habitat does not leave any mark which might affect the behavior pattern of the inhabitants. This is the advantage of WSNs. An application based on WSNs in

Fields of application of wireless sensor networks



Figure 1: Overview of WSN Applications

AUTOMATIC REGISTRATION OF IMAGES WITH INCONSISTENT CONTENT THROUGH LINE-SUPPORT REGION SEGMENTATION AND GEOMETRICAL OUTLIER REMOVAL

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ABSTRACT

The implementation of automatic image registration is still difficult in various applications. In this paper, an automatic image registration approach through line-support region segmentation and geometrical outlier removal (ALRSGOR) is proposed. This new approach is designed to address the problems associated with the registration of images with affine deformations and inconsistent content, such as remote sensing images with different spectral content or noise interference, or map images with inconsistent annotations. To begin with, line-support regions, namely a straight region whose points share roughly the same image gradient angle, are extracted to address the issues of inconsistent content existing in images. To alleviate the incompleteness of line segments, an iterative strategy with multi-resolution is employed to preserve global structures that are masked at full resolution by image details or noise. Then, Geometrical Outlier Removal (GOR) is developed to provide reliable feature point matching, which is based on affine invariant geometrical classifications for corresponding matches initialized by SIFT. The candidate outliers are selected by comparing the disparity of accumulated classifications among all matches, instead of conventional methods which only rely on local geometrical relations. Various image sets have been considered in this paper for the evaluation of the proposed approach, including aerial images with simulated affine deformations, remote sensing optical and synthetic aperture radar images taken at different situations (multispectral, multisensor, and multitemporal), and map images with inconsistent annotations. Experimental results demonstrate the superior performance of the proposed method over the existing approaches for the whole data set.

Keywords: GOR (Geometrical Outlier Removal), SIFT (scale invariant feature transform), LSD (line segment detector)

1. INTRODUCTION

In image registration, two or more than two images are aligned which are having overlapping scenes captured at different times and by different sensors and from different viewpoints. Image registration can be applied to many fields like computer vision, remote sensing, medical analysis and pattern matching. But these image registrations are not automatic.

2. EXISTING SYSTEM

Images to be registered are usually acquired by different sensors or from different viewpoint, which causes geometrical deformations, such as translation, rotation, scaling, and sheared. The scenes existed in the reference images do not always stay in the corresponding sensed images.

Spectral content difference and illumination changes usually exist in multispectral/multisensor images/multitemporal images. The inconsistent spectral content increases the difficulty of corresponding feature matching in automatic registrations.

The particular interferences cause the scene content to be inconsistent between images to be registered. For example, the

speckle noises inevitably presented in SAR images make the feature extraction and identification difficult. For a better visualization, the interest icons and texts of street names existing in map images don't always keep the same transformations with the whole map images

3. PROPOSED SYSTEM

The line-support region, namely a straight region whose points share roughly the same image gradient angle, is first explored to segment images to be registered, which can alleviate the challenges of inconsistent contents in image registration.

Geometrical Outlier Removal (GOR) is developed to eliminate outliers and preserve inliers based on the geometrical classifications for candidate matches. The directed edges connected by any two feature points are utilized to classify all of initial feature points according to their locations. The candidate outliers are selected by comparing the disparity of accumulated classifications for each matched pair.

To deal with the incompleteness of detected line segments, an iterative strategy with multi-resolution is employed to preserve global structures that masked at full resolution by image details

DIGITAL DIVIDE IN TECHNOLOGY - BRIDGING THE GAP

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ABSTRACT

Digital divide has its affect on all the users of Information Technology (IT). It can be explained as a gap between users who have access to IT and those who have got a very limited access to IT opportunities. Our resource gives an overview of digital divide and outlines its causes and effects through a detailed introduction, implementation of Computes in Colleges and the problems which one may encounter in its implementation and remedial action for the same.

1. INTRODUCTION

The digital divide is defined as the gap between those students who have access to digital technology at home and those who do not. The factors causing the gap include socioeconomic status, ethnicity, and geographic location. The purpose of this study is to explore issues of the digital divide and its impact on academic performance. The factors causing the digital divide include socioeconomic status, ethnicity, and geographic location.

A new digital divide is emerging in colleges across the country. Rather than computer and Internet access defining the divide, the new digital divide in colleges is between students on one side and the faculty and administration who are charged with educating them on the other. Never before have had students had so much power at their hands to create and disseminate media. Never before have were students the campus experts of such a powerful tool. And never before have teachers, and especially administrators, been so vulnerable to the power of this media and technology and the potential consequences of its misuse. Given these vulnerabilities it is critical that action be taken to narrow this new digital divide.

One need not look far to see how technology is impacting colleges across the country. The proliferation of cell phones and digital music players alone demonstrates how much has changed in the past 10 years. Websites such as Face book and MySpace are changing the way students communicate, socialize, and network and other sites such as YouTube and iTunes bring media to students seamlessly, whether at home, on campus, or on the move.

The digital divide between students and adults (including teachers and parents) continues to widen. Students are powering down to go to college and powering up after college to re-enter the digital world.

Computer access and usage in educational settings have increased dramatically over the past twenty years. Instructors in secondary and postsecondary educational settings regularly use instructional technologies. Students are often required to be computer proficient and socialized in learning from technologies. Furthermore, students are now using technology to create social networks and enhance academic involvement.

In this paper, we address the following questions: How can technology both inside and outside the classroom be useful to promote college going? How can college preparation programs benefit from the increased usage of these internet networking sites?

2. IMPLEMENTATION OF COMPUTERS IN COLLEGE

Instructional technology is a broad concept that attempts to encompass the ever-changing availability of technologies. According to Seels and Richey (1994) instructional technology is the theory and practice of design, development, and evaluation of processes and resources of learning. Instructional technology comes in many forms and uses several different types of media. Applications include writing to read, integrated learning systems, and multimedia. As a widely examined form of instructional technology, multimedia is "the presentation of material using both words and pictures"

Instructional technologies are typically examined for instructional purposes. Researches focus on the extent of the usefulness, appropriateness, and benefits of using instructional technology to aid in student learning. However, instructional technology is not exclusive to the traditional classroom. College preparation programs possessing an instructional component and other academically based programs can consider how instructional technology most usefully facilitated student academic progress. In addition, the increased focus o technology in college classrooms provides an increased emphasis on adopting technology early while preparing students for college. After all, students will be learning from instructional technology in the college classroom and required to use technology to produce classroom assignments. Finally, many institutions of higher education are focusing on computer technology for basic processes, such as registering for courses. Exposing students to instructional technology early on will only benefit their transition to college.

The second important concept to define is computer-mediated communication (CMC), which is the process of using computers and networks to communicate with people. While instructional technology specifically refers to instruction. CMC refers to all

EFFECTS OF GROUND SLOTTING IN SIERPINSKI CARPET FRACTAL ANTENNA

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ABSTRACT

The demand of effective communication devices has been abruptly increased. Same requirement has been seen in antennas for multi-band applications. This work, presents the effect of the slots in ground plane. The proposed antenna is designed, and results are evaluated to study different output parameters. In the result, antennas may be useful for different wireless applications and mobile communication systems. The results showed sufficient isolation among the operating frequency bands with improvement in gain and bandwidth. The results obtained had showed better improvement in the return loss and radiation pattern in comparison to the other existing antenna. The resonant frequency for the return loss of the design antenna is 1-10 GHz.

Keywords: Micro strip patch antenna, bandwidth, VSWR, return loss

1. INTRODUCTION

Various Mobile communication systems (GSM900, GSM1800, UMTS), wireless computer links, remote controls, satellite mobile phones and wireless internet have shown a great growth in present days. The size of electronics required for mobile applications have decreased where as their functionality has increased. The antennas required for the many applications should be of light weight, small size, low profile, broad bandwidth, low cost and integrable with MIC/MMIC circuits. The miniaturization of antenna and improvement in bandwidth can be achieved by etching the slot in ground and patch of Sierpinski carpet antenna of proper length and width. This paper focus on the effect on antenna resonant frequency and other antenna parameters due to slots in patch and ground plane to design the compact antenna with improved bandwidth and efficiency.

2. ANTENNA GEOMETRY

A rectangular patch has been designed on $\epsilon_r = 4.3$ and $h = 1.6$ mm. In this design, the rectangular patch for 2.42 GHz is taken. For a dielectric substrate, there are some parameters as, thickness 'h', relative dielectric constant ϵ_r and antenna operating frequency f_r . For the effective antenna the width and length of the patch can be calculated by

$$W = c/2f \left[(\epsilon_r + 1) / 2 \right]^{-1/2}$$

$$\text{and } L = c / 2f \sqrt{\epsilon_e - 2 \Delta l}$$

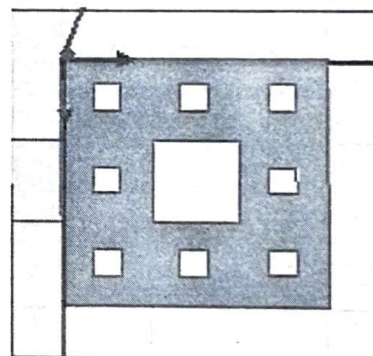


Figure 1: 2nd iteration of Sierpinski Carpet Fractal Antenna

Table 1. Parameters and dimensions of the ground slots in designed antenna:-

Ref.No	Name	Length	Width	Height
1	Ground	60	45	0
2	Slot 1	21	21	1.6
3	Slot 2	19	19	1.6
4	Slot 3	17	17	1.6
5	Feed	15	10	1.6

The length, width and height of the design antenna is shown in table 1

In the simple rectangular micro strip patch, three slots in the ground plane have been made as shown in Figure 2.2.

FUTURE GENERATION OF WIRELESS TECHNOLOGY

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ABSTRACT

This paper is based upon my experiences as a researcher on the 5G technology emphasizing on its salient features, technological design (architecture), advantages, and disadvantages. We have seen that after every ten years, a new generation of mobile network technology comes along like the first generation (1G) appeared in the 1980s then GSM in the year 1990s, 3rd generation arrived in 2001, and LTE began rolling out in 2010. Each generation has its pros and cons and tries to fix the flaws of its predecessor like GSM fixed the security weaknesses of analogue telephony, 3G sorted out lack of mobile data, as in case of GSM but it did not succeed much, then 4G was launched to cover these all issues related to data, speed and connectivity. These next-generation networks are all about fast data rates and greater capacity. It is about the seamless, real-time interaction between humans and billions of intelligent devices. 5G wireless technology promises a rich, reliable and hyper connected world. 5G is emerging ahead of the turn of a new decade and the next big change to hit mobile market.

Keywords: Global System for Mobile (GSM), LTE- Long Term Evolution, Analogue Telephony, Morphological, Data, and Hyper connected.

1. INTRODUCTION

5G is the fifth generation of cellular mobile communications networks. It will succeed the 4G such as



Figure 1: Evolution of Mobile Technology.

(LTE/WiMax), 3G and 2G systems. The performances of 5G includes: high data rate, lower latency, energy saving, less cost, higher capacity, and higher device connectivity. With these

features, its usability and its ultra-high speed, it has potential enough to change the mobile market.

Looking back, we see that a mobile generation succeeds every 10 years in the field of mobile communication technologies. The first generation (1G) of mobile technology was an analog cellular standard introduced in the 1980s; it was very slow, the cost was high and the capacity was not really satisfactory. The Second Generation (2G) which includes various systems such as CDMA, GSM, and TDMA, were the first generation of digital cellular technologies which were introduced in 1990s, these were faster than the analog systems but they were also not sufficient to meet the high data rates and high connectivity, then the Third Generation (3G) like EVDO (Evolution Data Optimized), HSPA(High Speed Packet Access), and UMTS (Universal Mobile Telecommunications Service) were introduced in 2000s, which were very successful in the field of mobile technology. Fourth Generation (4G) such as the WiMAX and LTE, launched in 2010s, are still fasting in terms of speed and data rates as well as connectivity and now with the Fifth Generation (5G) mobile technology, and are advancing towards more and faster, more, sophisticated and smarter technologies. 5th Generation of mobile brings three new aspects which include: greater speed- for sharing more data, lower latency - means more responsive, and more sophisticated connectivity. Initially, the 5G devices will need 4G for initial connections before initializing up to 5G, to find the areas where it's available. 4G continues to improve with time and time again, as well.

The relationship of 5G with 4G has made AT & T (American Telephone and Telegraph Company) to get a little serious about its 4G. Now they are describing their 4G network as "5G Evolution," because 4G is very much necessary for 5G to get permission for its connectivity.

POWER EFFICIENT TECHNIQUE FOR THE REMOVAL OF SOFT ERRORS IN MEMORIES

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ABSTRACT

Soft errors play a serious role in memory blocks. As a result of the high proportion of transient error rate in logic circuits, the encoder and decoder electronic equipment round the memory blocks area unit additional vulnerable to soft errors and therefore should be protected. thus to safeguard encoder and decoder electronic equipment against transient errors, error-detection methodology for difference-set cyclic codes with majority logic decryption was introduced. it's an acceptable technique to sight error however has giant decryption time and enormous access time. the same category of geometry tenuity check (EG-LDPC) codes that area unit one step Majority Logic decryption methodology is employed to scale back the decryption time. during this paper, Majority Logic Detector/Decoder is employed to any scale back the decryption time. Simulations area unit dole out and therefore the results area unit compared with the one step Majority Logic Decoder. Majority Logic Detector/Decoder is found to own less decryption time compared to Majority Logic Decoder.

Keywords: Error correction codes (ECC), Euclidean Geometry Low Density Parity Check (EG-LDPC) codes, Majority Logic Decoding (MLD) and Difference-Set Low Density Parity Check (DS-LDPC) codes.

1. INTRODUCTION

In semiconductor devices, as a result of the impact of technology scaling, we've got smaller dimension, higher integration densities and low in operation voltage etc. ^{[1], [2]} to satisfy client wants, however their sensitivity to radiation will increase dramatically. Soft errors amendment the logical values of memory cells while not damaging the circuits. Soft errors also are referred to as as SINGLE EVENT UPSET (SEU) ^[3]. Memory could be a basic resource in each digital system. these days some sorts of soft error happens once bit that's flipped is in crucial system management register like found in FPGA or DRAM in order that errors cause product to malfunction. whereas retrieving info from memory, it ought to be uncorrupted as if that is encoded. thus it's vital to safeguard memory against error ^{[4], [5]}. Some normally used error identification techniques area unit 1. Triple standard Redundancy (TMR) and 2. Error Correction Codes (ECC). Triple standard Redundancy, generally referred to as Triple-Mode Redundancy (TMR) could be a fault tolerant type of N-Modular Redundancy, therefore the complexness overhead would be 3 times and complexness of the bulk citizen and so increasing the facility consumption. For recollections, it clad that error correction code codes area unit best thanks to mitigate memory soft errors ^[1]. Error

Correction Codes (ECCs) protects encoder and decoder against unobserved knowledge corruption, and is employed in recollections. error correction code memory maintains a memory system proof against single-bit errors:

{the knowledge|the info|the information} that's scan from every word is usually constant because the data that had been written thereto ^[1]. Single Error Correction (SEC) codes which

will correct one error in memory word area unit normally used. Cyclic codes area unit linear block error-correcting codes that have convenient pure mathematics structures for economical error detection and correction. thus cyclic codes area unit additional appropriate among error correction code codes that meet the wants of high error correction capability and low decryption complexness owing to the bulk decodable logic. The decryption strategies include: one step majority-logic (MLG) decryption [8], Gallager's bit flipping (BF) decryption ^[7], weighted MLG decryption, weighted BF decryption, aposteriori chance (APP) ^[19] decryption and repetitious decryption supported belief propagation or sum-product formula (SPA) ^{[10], [11]}. geometry (EG) LDPC is constructed victimisation special structures of finite geometry. numerous sorts of EG-LDPC codes have the various properties e.g., type-I codes area unit systematic, type-II codes have coding and check matrices with regular standard structure, Galleger codes have properties that alter their error correction rate to be modified dynamically ^[8]. geometry tenuity check (EG-LDPC) codes, a sub-group of the tenuity check (LDPC) codes, that belongs to the family of cubic centimeter decryption is taken into account owing to its low complexness and easy implementation. A code is claimed to be cyclic provided that the rows of its parity-check matrix and generator matrix area unit the cyclic shifts of their initial rows. conjointly a code is cyclic code if for any codeword c , all the cyclic shifts of the codeword area unit still valid codewords. The minimum variety of code bits that area unit completely different in associatey 2 codewords is claimed to be minimum distance of an error correction code, d . the utmost variety of errors that associate error correction code will sight is $d - one$. the utmost variety of error that associate error correction code