Multimodal Medical Image Fusion Based on Interval-Valued Intuitionistic Fuzzy Sets

T. Tirupal, B. Chandra Mohan, and S. Srinivas Kumar

Abstract Multimodal medical image fusion is the process of combining two multimodal medical images to increase the quality and to extract maximum information from the output image for better treatment and precise diagnosis. The fused image obtained from non-fuzzy sets lags with complementary information. Compared with fuzzy set theory, intuitionistic fuzzy sets (IFS) are determined to be more suitable for civilian and medical image processing as more uncertainties are measured. In this paper, an algorithm based on an interval-valued intuitionistic fuzzy set (IVIFS) is presented for efficiently fusing multimodal medical images and the final fused image is passed through a median filter to remove noise. Simulations on few sets of multimodal medical images are performed and compared with the existing fusion methods, such as an intuitionistic fuzzy set and fuzzy transform. The superiority of the proposed method is presented and is justified. Fused image quality is additionally checked with different quality measurements, for example, entropy, spatial frequency (SF), average gradient (AG), etc.

Keywords Image fusion · Fuzzy set · IFS

1 Introduction

With the latest developments in the field of technology, digital image processing systems have turned into a reality in developing the number of fields, for example, machine vision, medical imaging, and military applications. The consequence of the utilization of these strategies is an awesome increase of the amount of data available. To extract all the valuable information from the source images and to reduce the increasing volume of data, a powerful method is used in image processing called

T. Tirupal (✉)
Department of ECE, GPCET, Kurnool, Andhra Pradesh 518452, India

B. Chandra Mohan
Department of ECE, BEC, Bapatla, Andhra Pradesh 522101, India

S. Srinivas Kumar
Department of ECE, JNTUA, Ananthapuramu, Andhra Pradesh 515002, India

Smart Blind Stick Using Ultrasonic Sensor

T. Tirupal[1*], B. Venkata Murali[2], M. Sandeep[2], K. Sunil Kumar[2], C. Uday Kumar[2]
[1] Associate Professor and Head, [2]UG Scholar, Department of Electronics and Communication
Engineering, G. Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India

*Corresponding Author: ecetirupal@gpcet.ac.in

ABSTRACT

The main aim of this paper is to assist blind persons without human need. Notably, the visually impaired individuals convey a hand that stays with them at whatever point they need help. Once in a while in any event, when they utilize this stick, there is no assurance that the visually impaired people are protected and get in arriving at their destinations. There might be a deterrent in their way yet isn't experienced by the individual with the assistance of the stick. Notably, the visually impaired individuals convey a hand that stays with them at whatever point they need help. Once in a while in any event, when they utilize this stick, there is no assurance that the visually impaired people are protected. There might be an obstruction in their way however isn't experienced by the individual with the assistance of the stick. Thus, the people may be injured if the obstacle is big enough or dangerous. Thus, in this paper, a blind stick is designed and developed to assist the blind person and provide them a clear path. The system consists of an ultrasonic sensor fixed to the user's stick. While the user moves the stick in the forward direction, the ultrasonic sensor with Arduino mega fixed to the stick tries to detect the obstacle if any present in the path. If the sensor recognizes the obstacle, the output of the recipient triggers, and this change will be identified by the microcontroller since the output of the receiver is given as inputs to the microcontroller. This stick recognizes the article before the individual and offers a reaction to the client either by vibrating or through the order. In this way, the individual can walk with no fear. This gadget will be the best answer for defeat the troubles of the visually impaired individual.

Keywords-- Arduino Mega, Electronic Travel Aids, Smart Blind Stick, Microcontroller, Ultrasonic Sensor

INTRODUCTION

According to WHO, 30 million social classes are forever outwardly disabled and 285 billion social classes with vision weakness. If you notice them, you can consider it they can't need without the help of others. One needs to request that direction arrives at their objective. They need to confront more battles in their day-by-day life. Utilizing this visually impaired stick, an individual can walk all the more unhesitatingly. This strolling stick is an option in contrast to the customary strolling stick. Here, Arduino UNO, ultrasonic sensor, IR sensor, voice playback module, LCD show, and voltage controller is utilized. Arduino is a microcontroller that can do every one of the estimations fastly and rapidly with incredible exactness. The ultrasonic sensor is utilized to distinguish the item toward the front of the individual by estimating the distance between the article and the stick. For left and right article recognition, IR Sensor is utilized which is exceptionally little in range. So, it detects a very close object. Using more ultrasonic sensors may create calculation problems. So, IR Sensor is Preferred. The voice playback module will help the visually impaired individual to arrive at the objective through the order or receiver.

Outwardly disabled individuals are individuals who think that it's hard to perceive the littlest detail with sound eyes. Those who have the visual acuteness of 6/60 or the horizontal range of the visual field with both eyes open have less than or equal to 20 degrees. These people are regarded as blind. A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (about

Balloon Satellite for Monitoring of Temperature, Humidity, and Air Pressure

KCT. Swamy[1*], Y. Ramu[2], M. Nanda Kishore[2], P. Lakshmi Sainatha Reddy[2], R. Ravindra[2]
[1]Associate Professor, [2]Student, Department of Electronics and Communication Engineering,
G. Pullaiah College of Engineering andTechnology, Kurnool, Andhra Pradesh, India

*Corresponding Author: kswamy@gmail.com

ABSTRACT

Geostationary and geosynchronous satellites have a wide space of utilization in present-day innovation. The principle downside for the more extensive utilization of such satellites is their significant expense of dispatching into their circle. As alternatives to conventional rocket launching, launching by high muzzle speed guns or by electric rail guns have been proposed. In any case, it is thus pushed that aerostats, stratospheric or mesospheric inflatables fastened to a fixed point on the earth can likewise be utilized to satisfy similar undertakings inside a restricted space of inclusion. Nonetheless, it is feasible to enlarge the space of inclusion by utilizing a group of stars of such inflatables, probably for a portion of the expense of satellite dispatching. Presently, aerostats at about a few kilometers' heights are being used for several purposes, including border monitoring. In the light of improvement of new elite materials, just as the advancement of super pressing factor inflatables, it is currently proposed to re-consider similar idea as a stage for high elevation gadgets utilized for interchanges, media broadcasting, natural observing through optical or SAR symbolism, checking for line security and illicit dealing. Likewise, the chance of two-phase dispatching, i.e., dispatching an aerostat from a high-height aircraft will be tended to.

Keywords – Aerostats, Balloon, Geostationary, Orbit, Satellite

INTRODUCTION

Fastened inflatables arriving at the lower portions of the stratosphere have been read in the 1960s for environmental examination and victories from model inflatables have been acquired. The fundamental issue identified with high height aerostats has been tracked down that outrageous floating burdens are being actuated by high elevation twists during the rising (dispatching) and drop (recuperation) stages. The progressions in climate in nature around us are an obvious reality. It is bit by bit at this point certainly having troublesome results on our lives and the things around us. With the ongoing increment in industrialization, the release of harmful substances has expanded complex. The levels of lethal gases noticeable all around are disturbing and these are causing an irreversible change. The air pollution rates nowadays drastically countries which require more portable and cost solution. The proposed system includes the design for monitoring air pollution and creating awareness among the public [1]. This paper aims at using IoT along with the cloud to make the services real-time and faster [2]. The proposed framework is introduced in a specific area where there is intense air contamination. The level of each perilous contamination is observed at intermittent spans. The air quality (AQI) for the noticed and mindfulness is made among the public an application which shows the level of each noticed contamination and the air quality record in that specific area. Consequently, the nature of air in that space can be perceived by people in general by reviewing the grouping of the gases in both mathematical and graphical configurations. Further, this framework is to be stretched out in the future by permitting the general population to enlist themselves in an application that pushes week by week or month to month air quality report through a message which reaches the user as a notification that is more comfortable in accessory pollution is the worst environmental problem and it causes a multitude of adverse effects on human health, water bodies and climate [3]. The main source of air pollution in all major cities is due to vehicles and the second

Face Mask Detection Using Convolutional Neural Network

D. Rajasekhar[1*], N. Chakradhar Reddy[2], M. Jayasurya Raj[2], Shaik Jeelan[2]
[1]Associate Professor, Department of Electronics and Communication Engineering,
G.Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India
[2]Student, Department of Electronics and Communication Engineering, G. Pullaiah College of
Engineering and Technology, Kurnool, Andhra Pradesh-518002, India

*Corresponding author: ecerajasekhar@gmail.com

ABSTRACT
With the horizon still brim-full, effective efforts to contain the COVID-19 pandemic require a high level of attention to offset severely impacted community fitness and the global financial system. Without the potent antiviral and expensive scientific resources, WHO recommends a number of ways to limit infection rate contamination and avoid depleting the medical system's limited resources. Several of the non-pharmaceutical treatments are to wear a mask. A mask is one of the non-medical techniques that can be used to reduce the quantity of infected droplets ejected by affected individuals. Nonetheless of debates concerning clinical sources and mask variations, all countries require public use of masks that cover the nose and mouth. This project hopes to achieve a more accurate and useful method that could efficiently contribute to community fitness.

Keywords-- ANN, COVID-19, CNN, Infected Droplets, Pharmaceutical Treatment, WHO

INTRODUCTION

A face-mask sensing method is a sequence of rules that, like an object detection method, recognizes and detects face-masks in an images and videos using connected components. Image categorization and image localization are combined in object detection. The class of an object is determined by image classification. Face-masks, for example, will categorize a photograph as either "masked face" magnificence or a "non-masked face class". The picture localization determines the location of the face-mask and draws boundary packing containers all around it [1]. At the moment, a few face-mask recognition methods focus just on image class, while others focus on image localization. Additionally, current item detection techniques, such as Single-Shot, and others, were used to track and practice face-mask detection strategies The majority of post-Covid-19 face-mask detection techniques proposed are deep learning (DL)-based methods, which are a subset of machine learning (ML) algorithms. DL-based networks include deep neural networks (DNN), recurrent neural networks (RNN), and long short-term memory (LSTM) (LSTM). DNN is a neural network with many layers, and the method is also known as a DL-primarily based set of rules. In terms of feature extraction, traditional ML-based algorithms are outperformed by DL-based total algorithms. Selectivity in the decomposition procedure causes blockading and undesirable edges in the fused image. During the mastering process, the features that interact with the rims, corners, and textures of a picture should be precisely retrieved using an algorithm. DNN learns these high-level skills automatically from images, so although ML-based methods require human monitoring and are regularly handmade. As a result, the majority of face-mask detection methods, particularly the characteristic extraction phase, have used DL-based entirely algorithms [2]. CNN, a sort of Deep learning model, is commonly used in face-mask identification and recognition algorithms. As the name implies, it has a convolution layers and a pooling layer. CNN's convolution assets use filters to extract useful functions from a photo, while the pooling layer reduces dimensionality.

Deep Learning Based Face Detection

Face detection has always relied on shallow learning-based approaches. It had been having difficulties with a variety of concerns, including stance variation, facial disguises, scene lighting, the complexity of the photo background,

GUI Based Optical Character Recognition using Neural Networks

B. Geetharani[1*], T.M. Sandhya[2], T. Sai Rishitha[2], V. B. Susmitha[2], C. Vimala[2]

[1]Assistant Professor, Department of Electronics and Communication Engineering,
G.Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India

[2]Student, Department of Electronics and Communication Engineering, G. Pullaiah College of
Engineering and Technology, Kurnool, Andhra Pradesh, India

Corresponding author: tirutalari@gmail.com

ABSTRACT

The Optical Character Recognition (OCR) process means the transition from examined primer or written images to a machine-adjudged document. The American Standard Code for Information Interchange (ASCII) in cognitive processing uses OCR. The challenge is two primary clans word segmentation by letters and character recognition. apply a new approach to include the two functions by Scale-Invariant Transforming Feature (SIFT) descriptors. To compare SIFT descriptors (RootSIFT), construct a new procedure, that offers outstanding results without accelerating calculation or repository conditions. In order to identify English characters, proposed system suggests that the reverse propagation neural network for bracket of character be employed. Conducted trials with further than 10 expedients aimed for every character and tried the delicacy for numerical figures, map letters, small letters, and alphanumeric symbols. The interpretation analysis of optimized neural network algorithm has attained an outside.

Keywords-- ASCII, Machine Adjudged, Neural Network, OCR, RootSIFT, SIFT

INTRODUCTION

Character recognition has existed one of the most important exploration areas in designs [1, 2]. It converts the scrutinized manual column into a user- readable format. Records can be manually written or scrutinized by a printer. The capability to write with one's hands may be limited or banned. The efficacy of an Optical Character Recognition (OCR) network varies greatly depending on the form angle, scanning, segmentation, and honored technologies [3-5]. This is dependent on the type of paper used, the printer's configuration, and the printer's age. Fonts have a considerable impact on font size and variety in the final result. The analyses' single most important field of pattern recognition is character identification. This is the process of converting a scanned text file into a machine that can be read. On a tablet, reports can be typed or handwritten messages. The handwriting might be restricted or unrestricted. Depending on the type of document, an OCR system's output can fluctuate significantly. It is determined by the type of paper, the category, and the printing date. At the final stage of output, the root size and interpretations have a tract of slack [6, 7].

The following is the flow of the article: In the second section, numerous works on optical character recognition based on local invariant features are presented. The proposed methodology for preprocessing, data extraction, and classification is explained in the third part. The ABC-BPNN algorithm for optical character recognition based on local invariant characteristics is discussed in the fourth section. The fifth section discusses performance evaluation and how it compares to other methods. The article's conclusion is delivered in the sixth part [8, 9].

PROPOSED METHODOLOGY

The OCR system involves converting a kind of document or penned manual paper into a machine- readable format that can be used for scripting, archiving, and prophetic handbook. By converting commentary on paper into electrical environment, OCR outfit produces much of the data in the world on hard imitating forms. The most important step in integrating OCR with the ABC system is to assign data from the ABC fashion for the repast ahead backward propagation operation. The suggested OCR network is parted into two parts. The foremost is

Microcontroller based Automatic Sun Tracking Solar Panel

B. Geetharani[1*], K. Joshna[2], M. Laharika[2], A. Gouthami[2], M. Dhana Lakshmi[2]
[1]Assistant Professor, Electronics and Communication Engineering Department,
G.Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India
[2]UG Scholar, Electronics and Communication Engineering Department, G. Pullaiah College of
Engineering and Technology, Kurnool, Andhra Pradesh, India

[*]Corresponding author: tirutalari@gmail.com

ABSTRACT

The solar industry is a worth billions of dollars industry. This produces 20 GW of power, which is insufficient for processing. Every day, the Sun brightens the globe by irradiating a massive amount of energy, the bulk which one is lost or not utilized as a result of improper solar panel installation the conversion of solar energy to electrical energy is significantly higher when the solar panel is constantly placed 90 degrees to the sun. To build an automatic solar panel using ATMega328 controller, we'll use two Light sensors (Light dependent resistors) to detect light and a servo motor to spin the solar panel in the position of the sun rays. The benefit of this concept is that the solar panel will constantly track light from the sun and will regularly charge when facing the sun, and offer the maximum amount of power.

Keywords- Automatic, Electrical, Light Sensors, Power, Solar Energy, Sun

INTRODUCTION

From the past decade most of the population in the world have started using solar power as an additional power source. As the solar energy is an abundant source it can provide all the necessary needs for longer period by supplying power and heat to users. Solar energy has the capability to become the primary source of energy in the coming times. A solar tracker is an automated solar panel that tracks the Sun to maximize power output. The position of the sun in the sky changes with operators as well as any permanent point. The heliostat is a moving mirror that reflects the sun's movement to a fixed location, is one well-known type of solar tracker, though there are many others. The tracker is driven by motors and gear trains in reaction to the sun direction, which is controlled by a controller. The solar tracker can be used for solar cells, solar day-lighting systems, and solar thermal arrays, among other things the solar cells that require more sunlight for increased efficiency takes solar tracker as ideal. Many of the solar panels are placed on a fixed structure, such as a roof. This idea is not the good as the sun is a non-stationary object. Other option is to actively track the sun by changing the solar panel to follow the Sun using a sun tracking system [1]. When the Sun is always shining on the panel, the large amount of energy can be received because the panel is at its most efficient. The aim of this project is to maximize the efficiency of the solar cells.

A human-machine interface-based version of this proposed technology is currently available on the market. The hinged solar panel must be manually adjusted in the direction that allows for perpendicularity. This process lacks accuracy and precision while placing the panel and it is difficult to position the panel consistently (Fig. 1). With the use of various sensors and circuit technologies, this article intends to create a completely automated solar panel that modulates itself to fit the erectness. Because the authors are aiming for simplicity and economy, a basic light dependent resistor or photo-resistor is suitable for the project. For the intended task, LDR is connected to an Arduino Microcontroller system [2].

The proposed system will be simple and effective, while also being inexpensive to all who can pay solar power. Renewable energy is the energy of the upcoming years, and effectual conversion of this energy into usable type is critical.

ORIGINAL PAPER

Double difference method with zero and short base length carrier phase measurements for Navigation with Indian Constellation satellites L5 (1176.45 MHz) signal quality analysis

Swamy KCT ✉, Venkata Ratnam Devanaboyina, Towseef Ahmed Shaik

---

ⓘ **Get access to the full version of this article.** View access options below.

Institutional Login

🏛 | **Access through your institution**

Log in to Wiley Online Library

If you have previously obtained access with your personal account, please log in.

Log in

Purchase Instant Access

○ **48-Hour online access**		**$12.00**
Details		⌄

○ **Online-only access**		**$20.00**
Details		⌄

◉ **PDF download and online access**		**$49.00**

Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds

T. Tirupal and D. Rajasekhar

Abstract Agriculture has reliably been the establishment of India's bolstered improvement. As the quantity of occupants in India continues building up, the interest for things grows too. Subsequently, there is a more noteworthy requirement for multiple cropping in the farms and this requires adequate and efficient machines. The wheel period of the rainstorm is antagonistically influencing the nation's precipitation quantity between long stretches of June to July. The late arrival of the monsoon affects the yielding capability of the crop. In this regard, farmers should be trained to cultivate in the right season using modern technologies with the minimum usage of water. This paper discusses an automatic seed cum fertilizer sowing machine with water dripping on the seeds at the time of sowing. This proposed mechanism will help the farmers to cultivate the land even if the arrival of the monsoon is late.

1 Introduction

The wheel period of the storm is antagonistically influencing the nation's precipitation portion between June to July. Poor or no precipitation has furthermore influenced the nation's precipitation share during the long stretch of June. In India, late monsoon is observed in certain parts of the country like; the west parts of Punjab, Haryana, Delhi, Rajasthan, Gujarat, Uttar Pradesh, south parts of Karnataka, Tamil Nadu, Andhra Pradesh, parts of Telangana, Madhya Pradesh, Chhattisgarh and the leeward side of Maharashtra. The late arrival of monsoon affects the yielding capability of the crop. In this regard, farmers should be trained to cultivate in the right season time using modern technologies and with the minimum usage of water. Groundnut, cotton, maize, jowar, bajra, sesamum, and dal are the major rainfed crops in the Rayalaseema region including Anantapur, Chittoor and parts of Kadapa and Kurnool districts, while the dry land legume is cultivated in large areas and in other areas also

T. Tirupal (✉) · D. Rajasekhar
Department of ECE, GPCET, Kurnool, Andhra Pradesh 518452, India

A Critical Review of Image Fusion Methods

Mr. Gude Ramarao[1], Dr. Chinni.Hima Bindu[2], Dr. T. S. N. Murthi[3], D. R. Saran Kumar[2], Dr. S. Suresh Kumar[2]

[1]Research Scholar, JNTUK, Kakinada, and Assistant Professor, Department of ECE, G.Pullaiah College of Engineering and Technology,
Kurnool-518002, Andhra Pradesh, India.
[2]Department of ECE, QIS College of Engineering, Ongole, Andhra Pradesh, India.
[3]Department of ECE, JNTUK, Vizianagaram, Andhra Pradesh, India.

Abstract

The need for image fusion is rising recently in image processing requirements due to the tremendous amount of acquisition systems. Fusion of images is defined as an alignment of important Information from diverse sensors using numerous mathematical models to generate a single composite image. In this paper, various state-of-art image fusion approaches of diverse levels with their pros and cons, various transform-based and spatial methods with quality metrics, and their applications in different areas have been discussed. Finally, this review has concluded many upcoming directions for different applications of image fusion.

keywords – Image Fusion, Acquisition system, Diverse levels, Spatial methods.

1. Introduction

Image fusion is an emerging field for generating an Enlightening image with the integration of images found by different sensors for decision making [1]. The investigative and visual image quality can be improved by mixing different images. Effective image fusion is capable of protective vital Information by extracting all important Evidence from the images without producing any discrepancies in the output image. After fusion, the fused image is more appropriate for the machine and human perception. The first step of fusion is source image is mapped with respect to the reference image, and this process is called Image Registration. This type of mapping is achieved to match the equivalent image on the basis of confident features for further analysis. Image fusion and Image registration are apparent to generate valuable Information in several areas [2]. According to the literature, the number of scientific papers has been increased dramatically since 2011 and reached the peak of more than 26,000 in 2020 which can be demonstrated in Fig. 1.

This fast-growing trend can be recognized due to the enlarged demand for high-performance image fusion methods with low cost. Recently, various methods like multi-scale decomposition and sparse representation have been familiarized that bring several ways for educating the image fusion performance. There is an essential for a well-organized fusion method due to differences between corresponding images in numerous applications. For instance, numerous satellites are increasing nowadays to acquire aerial images with diverse spatial, spectral, and temporal determinations in the

SMART CAR PARKING SYSTEM USING ARDUINOUNO

[1]B Obulesu, [2] Kotipalli Nivas,[3]S Mohammed Aijaz, [4]T Pavan Kumar Yadav, [5]Katta Sai Bharath,
[6]Golla Premnath,

[1] Assistant Professor [2,3,4,5,6] B.Tech Scholar,

[1,2,3,4,5] Department of Electronics and Communications Engineering

[1,2,3,4,5,6] G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract—Nowadays, smart cities are full of more population due to availability of technology and basic needs.so we proposedSmartParking system which consists of an on-site deployment of an IOT module which is used to check, monitor and signalize the availability of parking spaces or slots in busy areas.This project with combination of IOT and coordinated framework for efficient and easy way of parking the vehicles without searching for empty places. The mainintention of this Smart Parking system is to comprise the IOT module whichis utilized for signaling the driver of vehicle and mainly its condition of accessibility of single parking spot or place.Theprojectadditionally contains an abnormal state perspective of theframework engineering.At the end, the project clearly examines the working of the framework in type of an utilizationcase that demonstrates the rightness of the proposed show. The Ultrasonic Range DetectionSensor which is utilized with Arduino Uno to indicate the empty slots with indication.By measuring the distance using ultrasonic sensors, vehicle drivers are able to find the empty space in the parking lot. which helps thedriver to find the slot very easily and can minimize the searching time. As the parking slot in parking area is if found empty immediately it is detected using ultrasonic sensors which is reported further. We achieved this with help ofprogramming the aurdino uno, sensors and components. The main foremost inspiration of this idea is to minimize the clog of vehicles in urban areas effectively. In the daily news papers, we have seen many articles with respect to the vehicles stopping issues and parking place issues all over India and mainly in the cities like Delhi, Mumbai, Chennai, Bangalore and numerous metropolitan urbanareas. In a recent study, many researches have found that for one year, the vehicles like cars and bikesare consuming approximately 186823.5 liters of fuel and releasing almost 825 tons of carbon dioxide.Every one are responsible for this so,the aimless driving should come to an end in the parking areas.where this project is highly suitable to save the nature and parking problems all over the world.

Key words—Object Detection System, Arduino, Ultrasonic Sensor.

I.INTRODUCTION

whenaurdino and IoTis usedwithsensors,servo motors,lcdsandactuators,then theinnovation will definitelyturnsintoa bigprojectof themorebroadclassof digital physicalframeworks,whichlikely willincorporates the advances for the future. For Example: if we consider the keen networks, virtual power plants, brilliant homes,and the urban communities areas. Among this the difficulties that arises ineverydaylifeis oneofmostunavoidabletask isparkingthecarwhereverpeoplego. As our needs expand our setting out also increments rapidly however because of this extreme increment in utilization of vehicles likecars, bikesand increment in popular this project confront the intense assignment of parkingcar especially amid in the busy hours of day. Amid pinnacle hours of weekends the majority of the savedparking zone gets completely full and this leaves the client to scan for empty parking among other parking areas majorly.whichmakesmore abandonsand wastes time of themwith nosignonaccessibilityofparking spots. To overcome this major issues there is certainly a requirement for composed parking in businesscondition at the malls,shopping areas and parks. To outline such parking there is need of parking space with idealparking spot which relies upon public cost and time. However this project mainly composes the time drivengrouping strategy which takes proper care of the issue of parking in busy hours and utilizing opening assignmenttechnique.

The fundamental approach of this project is to decrease the clogging movement that occurs daily in and around theparking areas of urban zones which is found that the vehicles are looking for parking slots to park their vehicles.The best way of providingthe destination to a specific driver within the located parking place.A vehicle parking scenario gives a visual output indicating an unfilled parking

Retina Blood Vessels Extraction Using Kirsch's Template Method

Guide Name: Obulesu Battari
Department: Electronics and Communication Engineering
Name of Organisation: G Pullaiah College of Engineering and Technology
Location: Kurnool, India
Email: obulesub@gmail.com

Member 3: Akhilesh Kumar Tripurana
Department: Electronics and Communication Engineering
Name of Organisation: G Pullaiah College of Engineering and Technology
Location: Kurnool, India
Email: akhileshakki8088@gmail.com

Member 1: Pinjari Adam Ali
Department: Electronics and Communication Engineering
Name of Organisation: G Pullaiah College of Engineering and Technology
Location: Kurnool, India
Email: adamalikhan143@gmail.com

Member 4: Kotesh Bunaboina
Department: Electronics and Communication Engineering
Name of Organisation: G Pullaiah College of Engineering and Technology
Location: Kurnool, India
Email: kotesh704@gmail.com

Member 2: Krishna teja Karanam
Department: Electronics and Communication Engineering
Name of Organisation: G Pullaiah College of Engineering and Technology
Location: Kurnool, India
Email: tejak774@gmail.com

Abstract—Analysis on the retina blood vessels from fundus images have been extensively used in the medical community to descry the complaint condition in the blood vessels. An automated dogging of retina blood vessel can help to give precious computer- supported opinion for the ophthalmic conditions. Therefore, it helps to reduce the time for the ophthalmologist to analyses and diagnose the result of the fundus image of case. The purpose of this exploration is to make an algorithm to trace the retina blood vessels. The system to be used in this exploration correspond of two corridor which are the pre-processing part and the point birth by using the Kirsch's template. Combining the pre-processing at the early stage and point birth at the coming stage is applied to prize the edges of the blood vessels. The proposed algorithm was vindicated by using two online databases, DRIVE and HRF to validate the performance measures. Hence, proposed system is able to prize the retina blood vessel.

Keywords—Fundus Image, CLAHE, Kirsch's Template Method, Extraction, Retina Blood Vessels.

I. INTRODUCTION

The retina is a thin layer of tissue that lines the inside of the eye and sends signals to the brain for visual recognition. The retinal blood vessels are made up of arteries and veins that help to transport blood throughout the eyes. It is one of the most important factors in the eyes. However, there may be instances where blood vessel dysfunction leads to disease. Retinal vein occlusion, hypertensive retinopathy, central retinal artery occlusion, wet macular degeneration, diabetic retinopathy, ocular ischemic syndrome, and other conditions can result from retina blood vessel disorders. According to [1] approximately 103 patients were diagnosed with central retinal artery occlusion between January 2009 and December 2017, all of this disease can result in vision loss, blindness, and even stroke. As stated by [2,] early detection of subclinical diabetic retinopathy could aid in patient

Power and Area Constrained Crosstalk Elimination Circuit for High-Speed VLSI Interconnects

G.Ramarao [1], Dr.P.Sudhakara Rao [2]

[1] ECE, Dept, G.Pullaiah College of Engineering and Technology, Kurnool, A.P, India

[2] ECE, Dept, G.Narayanamma Institute of Technology and science, Telangana, India

[1] gramarao@gmail.com , [2] sparvata@gmail.com

705

Abstract:

Crosstalk is one of the major issues in the VLSI interconnects. Crosstalk reduces the performance of the operation while doing the switching operation. The degree of distortion is more when the frequency of the switching is more. Crosstalk can be eliminated by doing the encoding process before connecting the data into the bus line. In this work, an optimized logic is designed to perform the crosstalk elimination problem. Area and power-constrained designsare performed to reduce the hardware resource utilization and complexity. By using the proposed design, the power and area reduced when compared to the conventional design. The design is developed using 180nm and 45nm technology to evaluate the performance. By using the proposed design, 1679248nW power and 68 cell which is less when compared to the conventional design.

INTRODUCTION

Cross talk is the foremostconcerns which is happening in an integrated circuit due to the mutual inductance that happened between two connections.This effect is more when the transistor size is too small. This is a major problem in integrated circuits while doing the fabrication. Crosstalk is a notable factor at all degrees of microelectronic devices from framework level links through wires on PCB and multi-chip–components to chip level routing. It is an electromagnetic impact because of coupling capacitances and inductances among the electrical channels. Crosstalk makes undesired signals disturbances be coupled from a functioning line into a calm line [1].Depending upon its level, the induced noise onto the victim may impact the timing behavior of the victim signal by expanding its setup time. It might even reason for failure by initiating false pulse or affecting false sign levels which might be proliferated through the circuit. With expanding coordination thickness and reduced process durations, these impacts become progressively obvious and high destructive, so they should be taken care of all the more cautiously. Crosstalk should be considered specifically on VLSI chips with sub-micron constructions and the present big die dimensions.

The Influence of Ultrasound for the Protection of Animals on Highways Through Electronic Circuits

T. Tirupal and S. Fowzia Sultana

Abstract While driving in regions where creatures are regularly present, it is not unexpected to wind up in a mishap. Both wild and residential creatures might be outside and can keep running into the street. Normally, a driver's first nature is to swerve to abstain from hitting the creature; however, that can have wrecking results, such as losing control of the vehicle and enduring genuine wounds. Swerving can deliver a domino impact, making the driver strike another vehicle or object, which can prompt far more atrocious outcomes, similar to the vehicle moving over or genuine damage to different drivers out on the road. It is essential to avoid such accidents and protect animals as well. To overcome this, new method is proposed in this paper which includes a circuit generating ultrasonic waves. It can be used as pest repellents. For generating ultrasonic waves of high frequency, a generator using 555 timer can be employed. These waves are designed to produce an extremely high-frequency sound that is beyond what humans can hear. Ultrasound is used to bring about enough irritation in animals and make them stay away from highways.

Keywords Ultrasonic · Humans · Animals

1   Introduction

There are different reasons why individuals must repulse creatures from territories where they can damage individuals or devastate important goods and furthermore stay away from mishaps. This objective can be accomplished in various ways utilizing various techniques. We can recognize electrical, chemical, mechanical, optical, reflective bags, acoustical strategies, and so on. The benefit of the acoustical technique contrasting with others is: economical to utilize, not unsafe to creatures and safe for individuals utilizing it. This is valid under the presumption that ultrasound is utilized, which is indiscernible for individuals and does not cause any consultation harm, notwithstanding when presented to sound weight levels up to 120 dB. At the point when creatures hear these sounds they will just sit and gaze at the region where

---

T. Tirupal · S. Fowzia Sultana (✉)
Department of ECE, GPCET, Kurnool, Andhra Pradesh 518452, India

PASSPORT VERIFICATION SYSTEM USING RFID AND WIFI TECHNOLOGY

[1]K Uma Maheswari, [2]K Sarath Kumar Reddy, [3]R Vamshidhar Reddy, [4]D Victor Praneeth, [5]C Sai Vardhan Reddy.

[1] Assistant Professor [2,3,4,5,6] B.Tech Scholar,

[1,2,3,4,5] Department Of Electronics And Communications Engineering

[1,2,3,4,5,6]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract:

TheprojectdesignedisanauthenticationsystemwherethepassportholderisauthorizedthroughRFIDtechnology.RFIDisanacronymforRadioFrequencyIdentification. RFID is one member in the family of Automatic Identification and DataCapture (AIDC) technologies and is a fast and reliable means of identifying just about anymaterial object. This project can be used for security purpose where it gives informationabout the authorized persons and unauthorized persons. This can be applied in real timesystems as such in recording the attendance, in the companies, airports for accessing thepassports and in industries to know who are authorized. The passport holder would have anRFID tag whichcontains all the passport details like name, number, nationality etc. Thistag has to be swiped over the reader and the information thus read is provided to anArduino. This information is matched with the one stored in the Arduino, if the datamatchesmicrocontrollerdisplaysanconfirmationmessageotherwise displaysadenialmessage on a LCD screen. The status of a particular person can also be obtained through astatus button in the system. If the passport authentication fails the servo motor closes andblocktheperson at theentry. Thedata is sent wirelessly from node 1 to node2.

Key words:RFID card,Arduino, authorized, unauthorized, Buzzer,Blynk app, RFID Scanner, etc.,

1. Introduction:

Until recently, the travel documents such as a passport where just on paper possessing only thebiographic information of the holder. However there has been a shift in technology suchthat biometrictechnologies may now be implemented in traveldocuments.When implemented in travel documentssuch as passports theseare knownas electronic passports (e-passports) aiming at strengthening securityand reducing forgery. Secure and trusted travel documents are an essential part of international security, astheyallowstates andinternationalinstitutions toidentify themovementofundesiredordangerous persons.

An electronic passport (E-Passport) is an ID document which possesses related Biographic orbiometric information of its bearer. It is embedded in Radio Frequency Identification chip (RFID Tag)whichisaccomplishedofcryptographicfunctionality.Thesuccessfulimplementationofbiometrictech

niques in documents such as E-Passports aims to the strength of border security by decreasing thepossibilityofcopyorfakepassportandcreatingwithouthesitation ofidentityofthe documents'holder.

Thee-Passportalsooofferssubstantialbenefitstotherightfulholderbyprovidingamoresophisticated means of confirming that the passport belongs to that person and that it is authentic, withoutjeopardizing privacy. The states are currently issuing E-Passports, which corresponds to more than 50% ofall passports being issued worldwide. This represents a great enhancement in national and internationalsecurity as it improves the integrity of passports by the need to match the information contained in the chipto the one printed in the document and to the physical characteristics of the holders; and enables machine-assistedverification ofbiometricand biographicinformationto confirm theidentity of travelers.

INFRARED IMAGE FUSION USING AN ADAPTIVE TRANSITION REGION EXTRACTION TECHNIQUE

[1]B Eramma,[2]M Sai Prakash Reddy, [3]Dasari Raju, [4]Boya Naga Mohan, [5]Katepogu chinna Raju,[6]K Sai Prudhvi Raj

[1] Assistant Professor [2,3,4,5,6] B.Tech Scholar,

[1,2,3,4,5] Department Of Electronics And Communications Engineering

[1,2,3,4,5,6]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract:

The Main Theme of our Project is, to follow a designated climate, disguised weapon identification, route and military require different imaging modalities, for example, Visible Image (VI) and Infrared (IR) Image. These modalities give extra subtleties. Corresponding data from these Images should be melded into a solitary Image for advanced situational mindfulness. Subsequently, an ideal Fused Image ought to absorb the fundamental splendid data from the IR Image and hold a significant part of the first visual data from the VI.

To accomplish this, a locale-based Image Fusion method utilizing a productive Adaptive Transition Region Extraction (ATRE) technique is proposed in our undertaking. Interestingly, the change district extraction-based approach is brought into the setting of apparent and infrared Image Fusion. This technique is advantageous in light of the fact that it defeats the issues of clamor awareness, unfortunate difference and obscuring impacts related with the customary pixel-based strategies. The proposed ATRE method is utilized to productively separate the brilliant article districts from the IR Image and hold a significant part of the visual foundation locales from the VI.

An Adaptive boundary is presented for exact division. A locale planning process is followed to get the Fused Image. Our method is tried on standard Fusion datasets. Picture examination and objective Fusion records are used to approve the outcomes. They are contrasted and Conventional and Current pixel based and district-based Fusion procedures. The results uncover that the recommended procedure is equivalent or better than cutting edge Fusion strategies.

Key words:

Infrared Image, Visible Image,ATRE Technique, Region based, Pixel Based, MATLAB software, Binarization, Threshold selection, Mean, Entropy, Mutual Information, Standard Deviation.

1. Introduction

Picture Fusion is a promising exploration subject in the field of Image handling. It is a procedure for joining equal and repetitive subtleties from various Images, both of a similar view or of an alternate methodology, into a Single Image. The Fused Image got may yield an unequivocal visual discernment and applied in cutting edge Image handling applications. With the innovation of cutting-edge imaging gadgets for catching Images, numerous analysts are drawn in and applied the Image Fusion methods to numerous applications i.e., observation, illness finding, remote detecting and so on. All the more explicitly, the IR Image and VI Fusion methods are broadly used in numerous applications, for example, Image military reconnaissance, object acknowledgment, location, Image upgrade, remote detecting and so

on. It is particularly significant in military innovation for programmed target recognition and limitation.

The sensors utilized in the VI catch reflected lights from the article with rich appearance data. Be that as it may, the Images caught by the noticeable sensors are affected by much hindrance, for example, terrible weather pattern, unfortunate brightening, haze and evening time. Then again, the IR sensors catch Images utilizing the standard of warm radiation. IR Images are unaffected by the previously mentioned aggravations. All things being equal, they have low goal and unfortunate subtleties. Hence, a decent Image is gotten by consolidating the correlative data of both the IR

A NEW CLASS OF SINGLE BURST ERROR CORRECTING CODES BY USING PARALLEL DECODING

[1] B Eramma, [2] D Venu Gopal, [3] H Yirendra Nath, [4] G Sanjay Kumar, [5] K Vishnu Vardhan
[1] Assistant Professor [2,3,4,5] B.Tech Scholar,
[1,2,3,4,5] Department of Electronics and Communication Engineering
G Pullaiah College of Engineering and Technology, Nandikotkur Rd,near Venkayapalle,Pasupala Village,Kurnool,Andhra Pradesh 518002, India

ABSTRACT: With technology scaling, burst errors or clustered errors are becoming increasingly common in different types of memories. Multiple bit upsets due to particle strikes, write disturbance errors, and magnetic field coupling are a few of the mechanisms which cause clustered errors. In this project, A new class of single burst error correcting codes are presented which correct a single burst of any size b within a codeword. A code construction methodology is presented which enables us to construct the proposed scheme from existing codes, e.g.,Hamming codes. A new single step decoding methodology for the proposed class of codes is also presented which enables faster decoding. Different code constructions using Hamming codes, and BCH codes have been presented in this project and a comparison is made with existing schemes in terms of decoding complexity and data redundancy. The proposed scheme in all cases reduce the decoder complexity for little to no increase in data redundancy, specifically for higher burst error sizes. In this project, A new class of single burst error correcting codes are presented with a parallel decoding scheme. The proposed parallel decoding scheme enables high speed decoding. This is particularly useful for memories whose performance is sensitive to read or access latencies. A new construction methodology is presented which enables the proposed codes to be derived from already existing codes so that a single burst error can be corrected.

1.INTRODUCTION

Technology scaling has been leading to smaller and smaller device geometries over the years. This has given rise to a host of different problems with both the established memory technologies as well as the newer forms of emerging memory technologies. One such form of error is a burst error which is becoming more and more prevalent in several types of memories due to shrinking feature size. Consider the case of static random-access memory (SRAM). Soft errors caused by radiation poses a significant reliability concern for SRAMs [1]. With technology scaling, the susceptibility of SRAMs to soft-errors has significantly increased as well [2]. In current nano scale technology nodes, device geometries are small, and with technology scaling, devices are

getting smaller. Thus, a particle strike might affect more than one cell causing a multiple bit upset (MBU) [3]. The smaller the device geometries, the larger the number of cells that are affected by a single particle strike. A b-bit burst error caused by such a particle strike can cause multiple bits to be flipped within the b-bit burst window.

Dynamic random-access memory (DRAM) also suffers from a similar problem [4]. The problem arises due to the small physical dimensions brought about by technology scaling. Although it enables to increase the memory capacity of a chip, it also enables the ease with which near-by or adjacent DRAM cells interact with each other. Thus, accessing a memory cell causes a disturbance in the neighboring memory cells causing their charge to leak

EFFECTIVE DATA MONITORING OF CROP ESSENTIALS USING IOT AND WIRELESS SENSOR NETWORK

[1]S Fowzia Sulthana, [2]Boya Bhavani, [3]Bahatam Amulya, [4]Dandu Lakshmi, [5]Kasiraju Krishna Tulasi,

[1] Assistant Professor [2,3,4,5] B.Tech Scholar,

[1,2,3,4,5] Department of Electronics and Communications Engineering

[1,2,3,4,5]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract:

Agriculture is an integral part of Indian economy. Over 60% of Indian population based upon agriculture and one third of the income of nation arises from agricultural practices. Hence it plays a vital role in the development of the country. Various issues related to farming is continuously hampering the development of the country. Possible solution for these problems is to opt for modernized agriculture that comprises of modern trends. Hence, agriculture can be made smart using IoT and other technologies. Smart agriculture increases crop yield, decreases water wastage and imbalanced use of fertilizers. WSN based Smart agriculture is proposed which combines WSN and IoT technologies to implement a low-cost data system applicable for vast land. This project describes about increases the quantity and quality of agricultural products with low cost compare to existing IoT based smart farming. The system proposed uses a microcontroller NodeMCU, which has a Wi-Fi module (ESP8266) over it. Soil moisture sensor, humidity and temperature sensor (DHT11) and rain detection sensors along with DC motor are used. This DC motor is connected to a water pump which pumps water to the crops when the DC motor is ON. The soil moisture sensor senses the moisture level in the soil. Depending on the level of moisture, Node MCU decides whether to water the crop or not.

Key words: NodeMCU; WSN; IOT etc.,

1. Introduction:

Agriculture is the major source of income for the largest population in India and is major contributor to Indian economy. However, technological involvement and its usability have to be grown still and cultivated for agro-sector in India. Although few initiatives have also been taken by the Indian Government for providing online and mobile messaging servicesto armer related to agricultural queries and agro-vendor's information to farmers. Based on the survey it is observed that agriculture contributes 27% to GDP, and Provides employment to 70% of Indian population.

IoT is changing the agriculture domain and empowering farmers to fight with the huge difficulties they face. The agriculture must overcome expanding water deficiencies, restricted availability of lands, while meeting the expanding consumption needs of a world population. New innovative IoT applications are addressing these issues and increasing the quality, quantity, sustainability and cost effectiveness of agricultural production.

This research work is confined to the cultivators mainly engaged. It provides details of the farm land, and environmental factors like water, soil, climate, groundwater, seasonal crop sand crop price. Based on the factors the design of DSIS helps getting information relating to the soil fertility level, ground water level, water nutrient content level, suggestions for sowing, seasonal based intercropping suggestions, estimate of crop production value and choice of the best crop for sales based on the crop price reaching farmers via their smart mobile phones. The main objective is to give suitable solutions to the farmers for yield improvement and help farmland maintenance at reasonable cost.

The model's brain of smart farming is that the ESP8266 is primarily based on the NodeMCU Wi-Fi module (12E). 4 sensing devices, in particular pressure sensor (BMP180),temperature and humidity sensor (DHT11), drop module and lightweight dependent resistor (LDR), are connected to the NodeMCU ". If such values cross a selected limit for each text, the owner of the device shall be assured of the appropriate measures.

Liver Cancer Detection Using Various Image Segmentation Approaches: A Review

Golla Mahalaxmi*, T Tirupal** and Syed Shanawaz***

Liver cancer is the main source of death in the globe. Manual cancer tissue diagnosis is monotonous and troublesome. Hence, the paper fosters a high-exactness automatic diagnosis strategy for liver cancer growth. The image processing approach can utilize Computer Aided Diagnosis (CAD) for the arrangement of liver malignant growth to help the specialist. The CAD system is used to give a robotized approach to deal with successful arrangement of liver malignancy using feasible arrangements. Early affirmation and finding of liver growth are crucial for the space of liver cancers. Medical image processing is utilized to isolate tumors in a non-prominent way. Different strategies for recognizing liver tumors dependent upon abnormal lesion size and shape have been made. In like manner, automatic procedures for dividing the liver and liver tumors are pursued in clinical practice. This paper examines out a combination of liver malignant growth determination algorithms and philosophies.

Keywords: Liver cancer, Computed Tomography (CT) scans hepato cellular carcinoma, Metastatic Carcinoma (MET), Segmentation, Classifier, Watershed transform, Gaussian Mixture Model (GMM), Deep Neural Network (DNN) model

Introduction

One of the fundamental sources of cancer death is Liver Tumor (LT). Exact acknowledgment and division of LTs from Computed Tomography (CT) pictures is fundamental, especially for early cancer determination and identification. Liver Tumor Segmentation (LTS) can be considered as an illustration affirmation issue, in which each voxel is allotted an imprint, either cancer or non-cancer class (Rajeswari and Reena, 2011; Zhang *et al.*, 2011; and Huang *et al.*, 2013). In this paper, a semiautomatic approach to deal with LT division is used. Earlier, experienced clinicians distinguished or fragmented liver cancers, anyway it was tedious and subjective, dependent upon the clinicians' capacities and experiences. In this way, minimal user involvement in the detection and segmentation of liver tumors is highly desired (Ali *et al.,* 2014; Meng *et al.,* 2014; and Yan and Fang, 2015).

*   Assistant Professor, Department of ECE, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India; and is the corresponding author. E-mail: mahalaxmi3807@gmail.com

**   Associate Professor, Department of ECE, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India. E-mail: tirutalari@gmail.com

*** Assistant Professor, Department of ECE, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India. E-mail: syedshanawaz495@gmail.com

Advanced Image Processing Algorithms for Categorizing and Evaluating Plant Diseases: A Study

G Mahalaxmi*, T Tirupal** and T Aditya Sai Srinivas***

The paper studies the approaches to detecting, evaluating and categorizing plant diseases from digital images in the visible spectrum using appropriate processing techniques. Despite the fact that disease symptoms might appear anywhere on the plant, only approaches that looked at obvious symptoms in leaves and stems were examined. This was designed for various reasons: to keep the report short and because methods dealing with roots, seeds, and fruits have some unique characteristics that would necessitate a separate survey. The concepts chosen are organized into three categories based on their goal: detection, severity quantification and categorization. Each classification is further categorized based on the algorithm's primary technical solution. The paper also examines and contrasts the benefits and drawbacks of different prospective strategies. Image acquisition, image preprocessing, feature extraction and neural network-based categorization are a few of the techniques included. Researchers working on both vegetable pathology and pattern recognition can benefit from this study, which provides a detailed and accessible summary of this vital field of research.

Keywords: Disease diagnosis, Image acquisition, Preprocessing

Introduction

India is predominantly a farming country, with agriculture providing employment to a vast majority of the population. Agricultural research aims at boosting productivity and food quality, while lowering costs and increasing profits. A complex interaction of soil, seed, and agrochemicals results in the agricultural production system. The most important agricultural products are vegetables and fruits. Product quality control is essentially required in order to obtain more useful products. Plant diseases have been shown in numerous studies to impair the quality of agricultural goods. Diseases are natural changes in a plant's state that disrupt or stop vital processes like

*   Assistant Professor, Department of Electronics and Communication Engineering, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India; and is the corresponding author. E-mail: mahalaxmi3807@gmail.com

**   Associate Professor, Department of Electronics and Communication Engineering, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India. E-mail: tirutalari@gmail.com

*** Assistant Professor, Department of Computer Science and Engineering, G Pullaiah College of Engineering and Technology, Kurnool 518002, Andhra Pradesh, India. E-mail: taditya1033@gmail.com

Categorization of Leaf Ailments Using Deep Learning Techniques: A Review

K Umamaheswari[1]

Computerized image processing techniques are extremely useful in agriculture. The technology can help detect plant diseases and improve cultivation quality. The study examines the advantages and disadvantages of previous research on the subject. To find the most effective image processing methods for diagnosing plant diseases, cutting-edge techniques are examined. To find plant pathogens, many computerized image processing methods are used. This review compares the results and many different approaches to develop algorithms such as Support Vector Machines (SVM) and Deep Learning Neural Networks (DLNN), which are important in the detection and classification of leaf diseases.

Keywords: Leaf diseases, Image processing, Feature Extraction, Segmentation, Classifiers

Introduction

Agriculture or crop cultivation is globally reliant on the quality and quantity of crop development. Identification of pathogens on infected plants or leaves is facilitated by the interaction of multiple image processing techniques (Qin and Zhang, 2005). Numerous elements, such as climatic conditions, pest infestations or diseases, contribute to the development of certain types of diseases in the plants. Due to manual diagnosis methods, farmers are unable to identify the diseases and its causing factors. As a result, it is highly recommended that the framework for automatic disease analysis be updated. Numerous methods for identifying and classifying the affected plant part are known (Sanyal and Patel, 2008; and Li *et al.*, 2011). The methodology envisions scenarios involving many crops and multiple diseases (Chaudhary *et al.*, 2012).

[1] Assistant Professor, Department of Electronics and Communication Engineering, G Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India; and is the corresponding author. E-mail: mahalaxmi3807@gmail.com

[2] Associate Professor, Department of Electronics and Communication Engineering, G Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India. E-mail: tirutalari@gmail.com

[3] Assistant Professor, Department of Computer Science Engineering, G Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India. E-mail: taditya1033@gmail.com

[4] Assistant Professor, Department of Electronics and Communication Engineering, G Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh, India. E-mail: Raziya.eee13@gmail.com

BER ANALYSIS IN MIMO-OFDM SYSTEM

[1]K. Vanitha, [2]B. Divya, [3]A. Bhagya Sri, [4]U. Madhuri, [5]D. Halima Beebi,
[1] Assistant Professor [2,3,4,5]M. Tech,
[1,2,3,4,5] Department of Electronics and Communications Engineering
[1,2,3,4,5]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract:

Higher data rates and reliability have been problem in wirelesscommunication systems from the outset. We can achieve reliability and high data rates through MIMO-OFDM with Space time block codes and spatial multiplexing techniques. This project explores to analyze different fading channels (Rayleigh and Nagakami) under AWGN environment on spatial multiplexing (SM) based MIMO-OFDM systems. The combination of MIMOOFDM technique can achieve large throughput, spectral efficiency and diversity gains in 4G wireless communications. Due to faded signal undergoing multipath effects, BER performance is degraded. The benefits of spatial multiplexing are the fact that it is able to provide additional data capacity. MIMO spatial multiplexing achieves this by utilizing the multiple paths and effectively using them as additional channels to carry data. MIMO-OFDM technology is a great source to achieve high spectral efficiency by transmitting multiple data streams.

Key words: Diversity, Spatial multiplexing, MIMO-OFDM, Wi-Max, Equalization,Fading Channels, Successive interferenceCancellation, STBC, Modulation Techniques.

1. Introduction

Higher data rates and reliability have been problems in the wirelesscommunication systems from the outset. It is essential and necessary even by deal with multiple antennas at both ends; simultaneously fading occurs to each link can be considered due to multipath propagation this leads to increase BER performance at the receiver. We can achieve reliability and high data rates through MIMO-OFDM with STBC and spatial multiplexing techniques are used respectively. This paper explores to analyze different fading channels (Rayleigh and Nakagami) under AWGN environment on spatial multiplexing (SM) based MIMO systems, zero forcing with Successive interference Cancellation (ZF-SIC), MMSE-SIC and ML equalization techniques are used to channel equalization. And of transmit diversity, STBC based MIMO-OFDM systems, Maximum Ratio Combining (MRC) technique is used. Simulation results showed with various modulation techniques (BPSK/QPSK/64QAM/32PSK) both Systems. Furthermore, BER performance of coded MIMO-Wi-Max systems also describes to transmit diversity.

2. Literature survey

K. Blocskei, E. Zurich, IEEE Members proposed an article that provides an overview of the basics of MIMO-OFDM technology and focuses on spacefrequency signaling, receiver design, multiuser systems, and hardware implementation aspects. The goal of this article is to provide a high-level review of the basics of MIMO-OFDM wireless systems with a focus on transceiver design, multiuser systems, and hardware implementation aspects. This contains a brief introduction into MIMO wireless and OFDM followed by discussion on Space Frequency signaling and corresponding.

Brijesh Kumar Yadav, Rabinder Kumar Singh and Sovan Mohanty, Senior Members, IEEE, authored, a paper that presents the performance of VBLAST and STBC on MIMO-OFDM.V-BLAST is superior in terms of spectral efficiency and bit error rate. The performance analysis of V-BLAST based multiple input multiple output orthogonal frequency division multiplexing (MIMO-OFDM) system also analyzed with respect to bit error rate per signal to noise ratio (BER/SNR) for various detection techniques i.e., zero forcing (ZF),

Electronic Device Control Using Hand Gesture Recognition for Differently Abled

[1]K Vanitha, [2] K Pallavi, [3] N Sahithi [4], K Naga Madhuri,[5] A Renuka,

[1] Assistant Professor [2,3,4,5,6] B.Tech Scholar,

[1,2,3,4,5] Department Of Electronics And Communications Engineering

[1,2,3,4,5,6]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract: Handgesturerecognitionsysteminwhichitdetectshandgestureinmidairandcontrols the device according to the given input gesture.Thisprojectputforwarda technique to control the appliances for hearing impaired or people in general so that they can operate the gadgets.This System is a prototype system that helps to recognize hand gesture to normal people in order to communicate more effectively with the special people. This focuses on the problem of gesture recognition in real time that sign language used by the community of deaf people. The problem addressed using Skin Detection, Image Segmentation, Image Filtering, and Template Matching techniques. This system recognizes gestures of ASL (American Sign Language) including the alphabet.

Key words: Image Filtering,ASL(American Sign Language),SkinDetection,TemplateMatching,Correlation-Coefficient,Image Acquisition etc

.

1. INTRODUCTION

Communication means to share thoughts, messages, knowledge or any information. Since ages communication is thetool of exchange of information through oral,writing, visuals signs or behavior. The communication cycle considers to be completed once the message is received by a receiver and recognizes the message of the sender. Ordinary people communicate their thoughts through speech to others. whereas the hearing-impaired community the means of communication is the use of sign language and ASL is 3rd most used sign Language.

2. LITERATURE SURVEY

Many novel methods have been developed in past few years, to facilitate communicationbetweenthesignlanguageusersandthos ewhocan'tspeaksignlanguage.Mrs.NeelaHarish,Dr.S. Poonguzhali,proposed a system which depends on flex sensors, accelerometersoutputvaluessuchas,coordinatesgivenb yaccelerometerandthebending values given by the flex sensors, for the interpretation ofsigns.In past works, distinctive algorithms have been utilized for hand gesture recognition system. "Hong Cheng, Lu Yang and Zicheng Liu have surveyed 3D hand gesture recognition in which they have overviewed shading hand gesture recognition utilizing shading gesture division and utilizing gloves. This method is long and the real test is the online recognition of 3D hand gestures".

There are already a lot of methodologies available for gesture recognition. In [5], author makes use of glove method in which the input is provided to computer through inertial tracking devices with high accuracy. But this technique is again in conflict with our idea of communication being natural and intuitive. Other techniques such as in marker method require the user to mark blackcircles on fingers. After processing the skin is represented with white pixels and black circles marked are counted. It is inconvenient and time consuming for the user to mark black circles and this method is also rotation variant.[6]Another method is use of depth aware cameras such as structured light beam cameras which provide information about the distance of points on hands to computer. Based on this a 3-d representation is generated and the gesture is identified [7].

Another method employs use of convex hulls for calculating the number of fingers, although in some cases if plane of all the fingers is not same this method fails to generate correct result.

The above mentioned are effective methods with high accuracy. However,the motive of this paper is to compete with above techniques

Smart Wi-Fi based country egg hatching incubator using Arduino

[1]M.A.Farida, [2]Kogatam Bharath, [3] M.Sharath Chandra rao,[4]P.Pradeep sai, [5]K.Naveen Kumar [6], D.Thaneesh Babu

[1] Assistant Professor [2,3,4,5,6] B.Tech Scholar,

[1,2,3,4,5] Department Of Electronics And Communications Engineering

[1,2,3,4,5,6]G. Pullaiah College of Engineering and Technology, Nandikotkur Rd, near Venkayapalle, Pasupula Village, Kurnool, Andhra Pradesh 518002, India.

Abstract:

The most subject of this extend is to plan and create an egg hatchery with savvy highlights This specific shrewd egg incubator works on the fundamental standards of thermodynamics and employments Arduino as its centre innovation. In this extend we are giving reasonable temperature to the eggs interior alongside satisfactory levels of stickiness. The wellbeing of the eggs is most important factor that's considered and took optimal care with the outlined model. By utilizing water and cooling fans ready to diminish the mugginess. Here in this project we will screen the temperature and mugginess values at any instant using login accreditations in Blynk app, this specific work is conceivable through Wi-Fi module called NodeMCU. We are able also control the number of revolutions that roller would make or sum of temperature that's have to be be provided to the eggs within the hatchery. We are settling a LCD screen modified by Arduino which is utilized to show the current values of temperature and humidity.We can roll the eggs for every 4 to 5 hours to make the heat supplied substantially.

Key words: Node MCU, LCD , Arduino, Blynk app

1. Introduction:

Egg incubation may be a technique utilized by the farmers generally to supply chicken from eggs without the presence of mother hen hatching them. An automatic incubator major idea is to regulate and monitor the subsequent parameters:

> ➢ Temparature
> ➢ Humidity
> ➢ Movement of the egg tray
> ➢ Required ventilation

Incubator generally means a circumscribed device to conserve a living organism. Electrically controlled incubator is employed for scientific incubation process within which the environment factors are monitored and controlled at any instant of your time. Egg incubator is one among the inventions that provide opportunity especially for who want to be excellent farmer. there's one in every of easy and fastest way that may make a product. This invention will upgrade the egg incubator that has already within the market today. The systems will automatically control the temperature and humidity of the incubator for various forms of egg. The function of the incubator is to require over an animal job to incubate an egg until hatching. The modern manager's hatchery objective is to provide large number of uniform and robust eggs. The Robustness can be a health criterion, originating with embryonic life stage of chicken correlating directly with performance and resistance of individual chicks under different farm conditions.

Incubating conditions:

Eggs need to be fertilized to reduce hatching. Before incubation, fertilized eggs should be stored in a cold and dry place. It is usually up to 60 degrees Fahrenheit and should not be stored in the refrigerator. Fertilized eggs can be placed in a warm incubator and harvested in 21 days under optimal conditions and settings. The components that need to be controlled by the incubator are temperature, humidity. The temperature depends on the type of egg. Incubator must be able to maintain a constant temperature in order to hatch a significant proportion of fertilized eggs. Be sure to maintain humidity during the breeding season.

REVIEW PAPER

Comparative Study of Analog Parameters for Various Silicon-Based Tunnel Field-Effect Transistors

M A Farida[1] · **Sandip Swarnakar**[1] · **Sabbi Vamshi Krishna**[2]

Abstract

In this ultramodern scenario, low power, less cost and reduced storage devices are in great demand. Because the majority devices operate on a remote power supply, low-power memories are enticing the unified VLSI industry. For reduced power consumption, high energy efficiency circuit, TFET is a feasible alternate to MOSFET as it is a p-type, intrinsic, n-type (p-i-n) diode whose tunnel current drifts amidst of the bands of channel and source having a minimum leakage current and reduced sub-threshold slope (SS). The sole difference between TFET and MOSFET is the switching mechanism: TFETs use band-to-band tunnelling (BTBT), while MOSFETs use thermionic emission. In this survey, various types of TFET structures are described considering analog, linearity and device parameters like on-current (I_{ON}), SS, off-current (I_{OFF}), current ratio (I_{ON}/I_{OFF}), threshold voltage (V_T) etc., and comparison is done among the designed TFET structures.

Keywords Current ratio · On-current · Short-channel-effects · Off-current · Sub-threshold slope · Band-to-band tunnelling

1 Introduction

Complementary metal-oxide-semiconductor (CMOS) is the prominent switch used in semiconductor devices which allows for greater on-current (I_{ON}) and cut-off frequency (f_T) with downscaling Semiconductor devices [1, 2]. CMOS scaling with respect to G. Moore's law anticipates that transistor count in device will double in every 24 months [3]. However, CMOS has now reached the nanometre range, making power management challenging for further rise in MOS field-effect transistor (MOSFET); shows many difficulties like coupling and parasitic effects, gate tunnel current, exceeding 60 mV/decade sub-threshold slope (SS), short-channel-effects (SCE) include the drain induced barrier lowering (DIBL), increased leakage current (I_L) and low current ratio (I_{ON}/I_{OFF}) [4, 5]. Taking into consideration,

tunnel FETs (TFETs) could be used instead of MOSFET for the ultra-low power (LP), high speed in energy efficient integrated circuits [6–10].

TFET emerged in 1992 by T. Baba, which get its name from the tunnel structure of charge carriers that leads in outstanding switching properties [11–14]. MOSFETs modulate thermionic emission over a barrier, whereas TFETs experience the switching system of modulating quantum tunneling via a barrier [15–17]. TFETs have SS less than 60 mV/decade at room temperature (temp.), whereas CMOS has SS of greater than or equal to 60 mV/decade [18–21]. Due to the band-to-band tunneling (BTBT), the boltzmann limit of TFET is steeper to standard MOSFETs, and so it is employed for LP applications [22–24]. The TFET device promises the negligible SCE and random-dopant fluctuations (RDF) [25, 26]. Now-a-days, TFETs are in huge demand due to its benefits over traditional MOSFETs [27–30]. Despite, the construction of both FETs is similar, but the doping type in the drain and source is reversed [31–35]. The main challenges of TFET are high I_{ON}, low I_{OFF}, high I_{ON}/I_{OFF} and SS less than 60 mV/decade.

During the last few years, TFETs are in demand due to the upgrade of Internet of Things (IoT) and mobile applications, which comprise a profusion of always-on sensor nodes, has raised the demand for low supply voltages and low-leakage operation devices. The TFET intends to meet the demand by

✉ Sandip Swarnakar
  sandipswarnakar.2008@gmail.com

1   Photonics Lab, Department of Electronics
    and Communication Engineering, G. Pullaiah
    College of Engineering and Technology, Kurnool,
    Andhra Pradesh 518002, India

2   Department of Electronics and Communication Engineering,
    Ravindra College of Engineering for Women, Nandikotkur
    Road, Kurnool, Andhra Pradesh 518452, India

Comparative Study of Analog Parameters for Various Silicon-Based Tunnel Field-Effect Transistors

A Parvathi[1] · Sandip Swarnakar[1] · Sabbi Vamshi Krishna[2]

Abstract
In this ultramodern scenario, low power, less cost and reduced storage devices are in great demand. Because the majority devices operate on a remote power supply, low-power memories are enticing the unified VLSI industry. For reduced power consumption, high energy efficiency circuit, TFET is a feasible alternate to MOSFET as it is a p-type, intrinsic, n-type (p-i-n) diode whose tunnel current drifts amidst of the bands of channel and source having a minimum leakage current and reduced sub-threshold slope (SS). The sole difference between TFET and MOSFET is the switching mechanism: TFETs use band-to-band tunnelling (BTBT), while MOSFETs use thermionic emission. In this survey, various types of TFET structures are described considering analog, linearity and device parameters like on-current (I_{ON}), SS, off-current (I_{OFF}), current ratio (I_{ON}/I_{OFF}), threshold voltage (V_T) etc., and comparison is done among the designed TFET structures.

Keywords Current ratio · On-current · Short-channel-effects · Off-current · Sub-threshold slope · Band-to-band tunnelling

1 Introduction

Complementary metal-oxide-semiconductor (CMOS) is the prominent switch used in semiconductor devices which allows for greater on-current (I_{ON}) and cut-off frequency (f_T) with downscaling Semiconductor devices [1, 2]. CMOS scaling with respect to G. Moore's law anticipates that transistor count in device will double in every 24 months [3]. However, CMOS has now reached the nanometre range, making power management challenging for further rise in MOS field-effect transistor (MOSFET); shows many difficulties like coupling and parasitic effects, gate tunnel current, exceeding 60 mV/decade sub-threshold slope (SS), short-channel-effects (SCE) include the drain induced barrier lowering (DIBL), increased leakage current (I_L) and low current ratio (I_{ON}/I_{OFF}) [4, 5]. Taking into consideration,

tunnel FETs (TFETs) could be used instead of MOSFET for the ultra-low power (LP), high speed in energy efficient integrated circuits [6–10].

TFET emerged in 1992 by T. Baba, which get its name from the tunnel structure of charge carriers that leads in outstanding switching properties [11–14]. MOSFETs modulate thermionic emission over a barrier, whereas TFETs experience the switching system of modulating quantum tunneling via a barrier [15–17]. TFETs have SS less than 60 mV/decade at room temperature (temp.), whereas CMOS has SS of greater than or equal to 60 mV/decade [18–21]. Due to the band-to-band tunneling (BTBT), the boltzmann limit of TFET is steeper to standard MOSFETs, and so it is employed for LP applications [22–24]. The TFET device promises the negligible SCE and random-dopant fluctuations (RDF) [25, 26]. Now-a-days, TFETs are in huge demand due to its benefits over traditional MOSFETs [27–30]. Despite, the construction of both FETs is similar, but the doping type in the drain and source is reversed [31–35]. The main challenges of TFET are high I_{ON}, low I_{OFF}, high I_{ON}/I_{OFF} and SS less than 60 mV/decade.

During the last few years, TFETs are in demand due to the upgrade of Internet of Things (IoT) and mobile applications, which comprise a profusion of always-on sensor nodes, has raised the demand for low supply voltages and low-leakage operation devices. The TFET intends to meet the demand by

✉ Sandip Swarnakar
  sandipswarnakar.2008@gmail.com

1   Photonics Lab, Department of Electronics
    and Communication Engineering, G. Pullaiah
    College of Engineering and Technology, Kurnool,
    Andhra Pradesh 518002, India

2   Department of Electronics and Communication Engineering,
    Ravindra College of Engineering for Women, Nandikotkur
    Road, Kurnool, Andhra Pradesh 518452, India

applied optics

Design and characteristic analysis of an all-optical AND, XOR, and XNOR Y-shaped MIM waveguide for high-speed information processing

A Parvathi,[1] Ipshitha Charles,[1] Sandip Swarnakar,[1,*] Sabbi Vamshi Krishna,[2] and Santosh Kumar[3,4] (iD)

[1]*Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh – 518002, India*

[2]*Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh -518452, India*

[3]*Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun 248009, Uttarakhand, India*

[4]*Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng - 252059, Shandong, China*

*Corresponding author: drsandipece@gpcet.ac.in

All-optical logic gates are exceptionally suited for Boolean ultrahigh-speed operation and logical comput-ing. This study presents a plasmonic model that uses a Y-shaped metal–insulator–metal waveguide structure that realizes the ultrafast all-optical AND, XOR, and XNOR gate operation that is developed at a footprint of 6.6 μm × 3.4 μm with a wavelength of 1.55 μm. This construction relies on the notion of linear interference. The insertion loss and extinction ratio of the model are observed as 1.49 dB and 21.49 dB for AND, 1.03 dB and 18.97 dB for XOR, and 2.06 dB, and 10.92 dB for XNOR, respectively. The transmission efficiency, response time, and speed of the structure also are calculated and are used to improve the performance of any complex circuit in the future. The theoretical analysis of the proposed structure is carried out using the finite-difference time-domain method. © 2022 Optica Publishing Group

1. INTRODUCTION

The semiconductor industry has made enormous progress during the last few decades creating smaller, quicker, and more potent electronic devices, despite limits in low switching time, high input power, high power dissipation, limited bandwidth, and connectivity delays [1,2]. To overcome these limits, opti-cal communications emerged and rapidly gained popularity because it replaced electrons with photons to transmit infor-mation [3]. Because of its enormous operational bandwidth, minimal electromagnetic interference (EMI), rapid speed, and massive data transmission capability, optics outperforms elec-tronic systems [4,5]. As a result, optical circuits are seen as very bright prospects for signal transmission and processing, which can provide promising solutions [6].

Electronics or photonics are the most commonly used tech-nologies in communications systems [7]. However, both face limitations in terms of speed and miniaturization [8,9]. As a result, researchers are developing a new technology called plasmonics [10]. The term plasmonics comes from plasmons, which are quanta linked with collective excitation of unpaired electrons in metals. Plasmonics is a technique used to compress

electromagnetic waves into tiny structures, which could lead to a new generation of ultrafast computer circuits and ultrasensitive detectors [11]. Surface plasmon polaritons (SPPs) are generated, manipulated, and detected through the science of plasmonics, which avoids the diffraction limit found in photonics [12]. Plasmonics allow light to be manipulated at subwavelength scales, potentially bridging the gap between traditional optics and nanoelectronics. Plasmon waves operate at optical frequen-cies that are a million times greater than the frequency of an electronic microprocessor. The higher the frequency of the wave, the more information we can transport [10–12]. Loss inside SPs has inhibited the use of plasmonics; however, this has been addressed by employing multiple waveguides serving as a metal–insulator–metal (MIM) structure [13–16], or a metal-slot and insulator–metal–insulator (IMI) structure [17]. Only MIMs have the strength to confine light to deep subwavelengths and route light at the nanoscale. MIM is combined with a variety of nanocavities to create all-optical tiny switching devices.

Logic gates are the crucial tenets in all digital devices. A Mach–Zehnder interferometer (MZI) based on a semiconduc-tor optical amplifier (SOA) and a MZI based on lithium-niobate $LiNbO_3$ were used to build logic gates. Electrical signals are

Design and analysis of a photonic crystal-based all-optical 3-input OR gate for high-speed optical processing

K Vinod Kumar [1] · **Sandip Swarnakar**[1] (ID) · **Sabbi Vamshi Krishna**[2] ·
Santosh Kumar[3,4]

Abstract

The implementation of an optimized three-input OR gate has been accomplished through the use of T-shaped two-dimensional photonic crystals, which are made of silicon material submerged in an air background. Several parameters, such as refractive indices and radius, have been varied and the ON-to-OFF contrast ratios for the various parameters have been compared in order to reduce the probability of an error in the designed structure being produced. The simulation has been carried out for various combinations of OR gate and electric field intensities have been calculated at a specific wavelength of 1550 nm using the Finite-difference-time-domain method. Furthermore, the designed structure has achieved a contrast ratio of approximately 8.66 dB, a response time of 12 fs, transmission efficiency for the minimum and maximum values of 23% and 169%, insertion loss of 2.27 dB, and an operating speed of 83.3 Tbps, making it suitable for use in optical signal processing.

1 Introduction

The present electronic industries are in thirst of updating the new technologies in agreement to the user requirements. So, at present in this updating scientific world, nanotechnology is in the vicinity of emerging technology in many different areas of activity like Biomedicine, energy, textiles, food including electronics which raised the capability of

✉ Sandip Swarnakar
  drsandipece@gpcet.ac.in

1   Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh 518002, India

2   Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India

3   Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun 248009, Uttarakhand, India

4   Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

Design and analysis of a photonic crystal-based all-optical 3-input OR gate for high-speed optical processing

K Vinod Kumar [1] · **Sandip Swarnakar**[1] · **Sabbi Vamshi Krishna**[2] · **Santosh Kumar**[3,4]

Abstract

The implementation of an optimized three-input OR gate has been accomplished through the use of T-shaped two-dimensional photonic crystals, which are made of silicon material submerged in an air background. Several parameters, such as refractive indices and radius, have been varied and the ON-to-OFF contrast ratios for the various parameters have been compared in order to reduce the probability of an error in the designed structure being produced. The simulation has been carried out for various combinations of OR gate and electric field intensities have been calculated at a specific wavelength of 1550 nm using the Finite-difference-time-domain method. Furthermore, the designed structure has achieved a contrast ratio of approximately 8.66 dB, a response time of 12 fs, transmission efficiency for the minimum and maximum values of 23% and 169%, insertion loss of 2.27 dB, and an operating speed of 83.3 Tbps, making it suitable for use in optical signal processing.

1 Introduction

The present electronic industries are in thirst of updating the new technologies in agreement to the user requirements. So, at present in this updating scientific world, nanotechnology is in the vicinity of emerging technology in many different areas of activity like Biomedicine, energy, textiles, food including electronics which raised the capability of

✉ Sandip Swarnakar
  drsandipece@gpcet.ac.in

1 Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh 518002, India

2 Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India

3 Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun 248009, Uttarakhand, India

4 Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

Check for
updates

Enhanced all-optical Y-shaped plasmonic OR, NOR and NAND gate models, analyses, and simulation for high speed computations

P Bindu Swetha [1] · Alluru Sreevani[1] · Sabbi Vamshi Krishna[2] · Sandip Swarnakar[1] ·
Prabha Shankar Sharma[3] · Santosh Kumar[3,4]

Abstract
In this digital era, all-optical logic gates (OLGs) proved its effectiveness in execution of high-speed computations. A unique construction of an all-optical OR, NOR, and NAND gates based on the notion of power combiner employing metal–insulator-metal (MIM) waveguide in the Y-shape with a minimal imprint of 6.2 $\mu m \times 3$ μm is presented and the structure is evaluated by finite-difference time-domain (FDTD) technique. The insertion loss (IL) and extinction ratio (ER) for proposed model are 6 dB and 27.76 dB for NAND gate, 2 dB and 20.35 dB for NOR gate and 6 dB and 24.10 dB for OR respectively. The simplified model is used in the construction of complex circuits to achieve greater efficiency, which contributes to the emergence of a new technique for designing plasmonic integrated circuits.

✉ Sandip Swarnakar
drsandipece@gpcet.ac.in

✉ Santosh Kumar
santosh@lcu.edu.cn

1   Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India

2   Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India

3   Department of Electrical and Electronics and Communication Engineering, DIT University, Dehradun, Uttarakhand 248009, India

4   Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

⌔ Springer

Enhanced all-optical Y-shaped plasmonic OR, NOR and NAND gate models, analyses, and simulation for high speed computations

P Bindu Swetha [1] · Alluru Sreevani[1] · Sabbi Vamshi Krishna[2] · Sandip Swarnakar[1] ·
Prabha Shankar Sharma[3] · Santosh Kumar[3,4]

Abstract
In this digital era, all-optical logic gates (OLGs) proved its effectiveness in execution of high-speed computations. A unique construction of an all-optical OR, NOR, and NAND gates based on the notion of power combiner employing metal–insulator-metal (MIM) waveguide in the Y-shape with a minimal imprint of 6.2 μm×3 μm is presented and the structure is evaluated by finite-difference time-domain (FDTD) technique. The insertion loss (IL) and extinction ratio (ER) for proposed model are 6 dB and 27.76 dB for NAND gate, 2 dB and 20.35 dB for NOR gate and 6 dB and 24.10 dB for OR respectively. The simplified model is used in the construction of complex circuits to achieve greater efficiency, which contributes to the emergence of a new technique for designing plasmonic integrated circuits.

Keywords All-optical logic gate · MIM waveguide · Plasmonic waveguide · Y-power combiner · Finite-difference time-domain (FDTD)

✉ Sandip Swarnakar
  drsandipece@gpcet.ac.in

✉ Santosh Kumar
  santosh@lcu.edu.cn

[1] Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India

[2] Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India

[3] Department of Electrical and Electronics and Communication Engineering, DIT University, Dehradun, Uttarakhand 248009, India

[4] Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

Design and analysis of optical three-input AND gate using photonic crystal fiber

B Praveena,[1] Sandip Swarnakar,[1,*] Sabbi Vamshi Krishna,[2] Santosh Kumar[3,4] iD

[1]*Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh -518002, India*

[2]*Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh -518452, India*

[3]*Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun, Uttarakhand 248009, India*

[4]*Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng, Shandong 252059, China*

*Corresponding author: drsandipece@gpcet.ac.in

In this paper, a three-input AND logic gate is employed using a 2D photonic crystal T-shaped waveguide using a silicon in an air medium. In contrast to other gates, the key functions of employing an AND gate are recognition, error correction, code conversion, data encryption/decryption, and arithmetic operations. The proposed footprint is 8.4 µm × 5.4 µm, which is a modest size. The performance of the proposed AND gate is investigated by employing the finite-difference time-domain approach, and the outputs are validated at wavelength (λ) of 1.55 µm. The outcomes clearly show the higher contrast ratio (CR) of 24.533 dB and the worst case CR of is 8.6 dB; transmission efficiency values for minimum and maximum values are 19.6% and 142%; reaction time is 26 fs; insertion loss is 1.52 dB; and bit rate is 38.4 Tbps, which can be used in high-speed optical signal processing. The suggested circuit's primary objective is to consume minimal space and possess high CR.   © 2021 Optical Society of America

https://doi.org/10.1364/AO.443424

1. INTRODUCTION

Electronic devices will be phased out in favor of all-optical devices in the future as a result of their qualities like rapid speed, low power usage, and noise controlling ability, among others [1]. The growing demand for larger capacity and smaller size has led to work in the realm of photonic crystals (PhCs), where the data is transmitted via photons rather than electrons [2]. The photonic crystal fiber (PCF) plays an essential role in the development of optical devices with periodic microstructures and offers numerous advantages, including the capacity to disperse light in a medium and the ability to inject gas or fluid through air holes, which becomes a fundamental concept for detecting samples, and other consequences are variable area, cladding size, and core size. Unlike electronics, the use of PhCs minimizes structure complexity and noise [3]. PhCs are exploited in the structure of logic gates (LoG) for designing processors. All-optical LoG (OLG) have recently attracted a lot of attention due to their potential applications in optical communication systems because of their significance in addressing, switching, encrypting, data encoding, signal regeneration, and conflict resolution. PhCs can be manufactured in 1D, 2D and 3D [4]. In the past few years, various approaches have implemented for

optical LoG like interferometry, semiconductor optical amplifiers (SOAs) [2], Mach–Zehnder interferometers (MZIs) [3], PhCs, photonic crystal ring resonators (PhCRRs) [5–7], plasmonics [3], and photonic crystal waveguides (PhCWs) [8,9]. The merits of logic devices relying on SOA are compactness and minimal input signal power, although they have a huge size and low throughput. OLGs based on MZIs have a difficult integration process [3]. PhCRRs have limitations since they have sophisticated architecture and demand significant high power input [4]. PhCWs are employed to alleviate these disadvantages, because of their distinctive features such as compactness, a high containment of light, and reduced power dissipation [4]. PhCs are periodic nanostructures with a photonic band gap (PBG) that specifys a frequency spectrum in which electromagnetic waves cannot penetrate. A vast number of implementations are possible with PBG-based PhCs, which could transform manufacturing and innovation. Si [10–12], Ge, and GaAs [13] are three of the most often exploited semiconductor materials. Each material's features influence the characteristics of OLGs [14].

A logic gate is an aspect of digital circuits that serves as a core component. It is followed by two binary conditions: false or true. True stands for 1, while false stands for 0. Depending on the type of LoG and the number of inputs, the binary response

High-speed optimisation of an all-optical half adder using a T-shaped photonic crystal waveguide with an improved contrast ratio

B PRAVEENA[1], SANDIP SWARNAKAR[1] ,*, NOONEPALLE HARI PRIYA[1],
SABBI VAMSHI KRISHNA[2], PRABHA SHANKAR SHARMA[3] and SANTOSH KUMAR[3,4],*

[1]Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool 518 002, India
[2]Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool 518 452, India
[3]Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun 248 009, India
[4]Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, People's Republic of China
*Corresponding authors. E-mail: drsandipece@gpcet.ac.in; santosh@lcu.edu.cn

Abstract. In digital the detection techniques, the half adder is a component of electronic systems that performs calculations faster than the other logic gates. This article focusses on an all-optical half adder logic gate using a two-dimensional T-shaped photonic crystal waveguide and silicon in an air medium. The half adder design is predicated on the concept of constructive (in-phase) and destructive (out-of-phase) interferences. The high-intensity output is achieved by carefully selecting the lattice constant, rod radius and refractive index of the half adder structure. The effectiveness of the half adder is investigated using finite-difference time-domain and plane-wave expansion techniques at 1.55 μm wavelength. The suggested structure features a minimal size of 8.4 μm × 8.4 μm. For this structure, the CARRY has a greater contrast ratio of 18.96 dB and SUM of 8.7 dB, as expressed by the results. SUM and CARRY have bit rates of 28.5 Tbps and 23.8 Tbps, respectively. The proposed circuit's primary objective is to be compact and to have a high contrast ratio.

Keywords. Photonic crystals; half adder; T-shaped waveguide; finite-difference time domain; contrast ratio.

PACS Nos 71.20; 42.70.Q; 42.82.Gw; 02.70.Bf

1. Introduction

All-optical devices will eventually supplant electronic devices in the physical world due to their superior performance, low power consumption, noise reduction and small die size [1]. The disadvantages of the electronic components are signal jitter and high-power consumption. A relatively fast optical signal is investigated as a transmission signal to address these shortcomings. Optical communication transmits data via light rather than electrons. The term 'photonics' implies the usage of photons (light) for conveying and processing data. All-optical components and circuits are required to operate optical networks and communication technologies. Today's telecommunication networks strive for high bandwidth and speed, which is extremely difficult to accomplish with electronic-based technologies. Consequently, optical and photonics engineers are working to create all-optical components. As a result, photonics has emerged as a critical paradigm for enabling optics-based microprocessors on integrated circuit chips. Photonic crystals (PhC) have recently received significant attention due to their ability to propagate light in photonic integrated circuits and photonic crystal fibres [2]. PhC is gaining traction as a critical tool for manipulating photon flow at ultrasmall scales [3]. There are numerous advantages of employing PhC to generate optical components, including low transmission losses, high computing speed, large bandwidth and the ability to interact with multiple channels
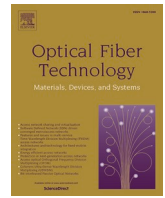
Recent advances in photonic crystal fiber-based sensors for biomedical applications

Sofia Saba [a], Ipshitha Charles [a], Sandip Swarnakar [a,*], Sabbi Vamshi Krishna [b], Santosh Kumar [c,*]

[a] *Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India*
[b] *Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India*
[c] *Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China*

ARTICLE INFO

ABSTRACT

Nowadays, the usage of photonic crystal fibers (PCF) has become a very quick and prevalent innovation in sensor implementation. PCFs have unique features and capabilities due to their geometric design, which makes them ideal choice for sensing applications. In this study, various simulations of biomedical sensors are analyzed. A biosensor is a type of an analytical device that analyses a biological system using either chemical or biological components. By filling the solutions into PCF shows good results in diagnosing disease, malignancies, hemoglobin concentrations and antibodies. PCF type biosensors are widely used in biological research, clinical trials, medication development and other applications. This research proposes a survey for different shapes of PCFs in biomedical sensors. This research paper main objective is to describe the numerous applications of biomedical sensors like glucose, blood, protein, and DNA sensors. The sensitivity and confinement loss are compared using this different-shaped PCF with different background materials.

Abbreviations

S. No.	Name	Abbreviations
1.	PCF	Photonic Crystal Fiber
2.	EM	Electromagnetic
3.	OF	Optical Fibers
4.	SC	Solid Core
5.	HC	Hollow Core
6.	HC-PCF	Hollow Core- Photonic Crystal Fiber
7.	AH	Air Holes
8.	HXG	Hexagonal
9.	'n'	Refractive Indices
10.	PBG	Photonic Band Gap
11.	1-D	One-Dimensional
12.	2-D	Two-Dimensional
13.	3-D	Three-Dimensional
14.	HB	Highly Birefringent
15.	PhC	Photonic Crystal
16.	DNA	Deoxyribo Nucleic Acid
17.	PhCW	Photonic Crystal Waveguide
18.	C_6H_6	Benzene

(continued on next column)

Abbreviations *(continued)*

S. No.	Name	Abbreviations
19.	H_2O	Water
20.	CH_3CHO	Ethanol
21.	FEM	Finite Element Method
22.	CL	Confinement Loss
23.	DL	Dispersion Loss
24.	O-PCF	Orthogonal-PCF
25.	Q-PCF	Quasi-PCF
26.	THz	Terahetz
27.	MEEP	Mit Electromagnetic Equation Propagation
28.	NW	Nanowires
29.	GMCC	Gelated Monolayer Colloidal Crystal
30.	MCC	Monolayer Colloidal Crystal
31.	4- BBA	4-Boronobenzaldehyde
32.	RR	Ring Resonator
33.	T-PCF	Tri-Core PCF
34.	TEC-PCF	Twin Elliptical Core Photonic Crystal Fiber
35.	TiN	Titanium Nitride
36.	Ti o^{-2}	Titanium Oxide
37.	WBCs	White Blood Cells

(continued on next page)

Performance analysis of an SMF-/MMF-based single/double/quadruple tapered optical fiber structure

Wen Zhang,[1] Zhi Wang,[1] Ragini Singh,[2] Yiran Wang,[1] Yiyan Xie,[1] Xiancui Su,[1] 🆔
Feilong Gao,[1] 🆔 Guoru Li,[1] Sofia Saba, Rui Min,[4] Bingyuan Zhang,[1,5]
Santosh Kumar[1,6] 🆔

[1]*Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng—252059, China*
[2]*School of Agronomy, Liaocheng University, Liaocheng—252059, China*
[3]*Photonics lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh—518002, India*
[4]*Center for Cognition and Neuroergonomics, State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University at Zhuhai, 519087 Zhuhai, China*
[5]*e-mail: zhangbingyuan@lcu.edu.cn*
[6]*e-mail: santosh@lcu.edu.cn*

This paper primarily discusses the structural performance analysis of a single/double/quadruple tapered optical fiber (TOF) structure based on single-mode fiber (SMF) and multi-mode fiber (MMF). Furthermore, the TOF's performance, including its diameter distribution, transmitted intensity, and reproducibility, is also evaluated. According to the experimental results, it can be concluded that the quadruple TOF structure based on SMF has a higher density of evanescent waves (EWs) on the surface of the tapered area, which is essential for the fabrication of high-sensitivity optical fiber sensors. The structure proposed in this article is feasible, and it can be used for optical fiber sensing while offering significant practical and promising applications as well.   © 2022 Optica Publishing Group

https://doi.org/10.1364/AO.453486

1. INTRODUCTION

At present, the application of optical fiber as a transmission medium has achieved great success. The history of optical fiber used in sensing can be traced back to the 1970s. They are widely used in various fields because fiber-optic sensors have the superiority of high precision, low loss, rapid response, and strong anti-electromagnetic interference ability [1]. Including environmental monitoring [2], gas detection [3], building structure monitoring [4], etc., especially in biomedicine, has huge application potential. Because tapered fiber has the superiority of compact structure [5], simple production, high precision, and other unique structural features and optical characteristics [6], tapered fiber has become a research hotspot. Optical fiber has been investigated extensively in the field of biosensing by a number of researchers. A high-sensitivity fiber-optic sensor probe with a periodic tapered structure was proposed by Zhu *et al.* [7], which was immobilized by gold nanoparticles and graphene oxide, and used the principle of localized surface plasmon resonance to detect different concentrations of ascorbic acid. A label-free ultra-sensitive TOF sensor was proposed by Liyanage

et al. [8]. The TOF plasma biosensor has good selectivity and has shown high sensitivity in detecting target microRNAs. Mohsin *et al.* [9] proposed a TOF sensor to detect α_{s1}-casein. The sensitivity of the sensor is very high and can effectively detect α_{s1}-casein in the range of 0.1–1.0 nM.

The earlier tapered optical fiber (TOF) manufacturing processes include the chemical corrosion method [10], fusion taper method [11], and flame taper method [12]. However, the chemical corrosion method is more complicated and unsafe to make reagents; the fusion taper method and flame taper method are not uniformly heated and have poor structural repeatability. In this work, we use a combiner manufacturing system (CMS) ultra-stable plasma heating technology to fabricate TOF. CMS has reached the industry's highest optical processing performance and processing optical fiber devices with high stability and high reproducibility. With its unique three-electrode [13] operation mode, CMS makes the heating temperature uniform and symmetrical and supports maximizing the flexibility of the heating zone. The speed and length of optical fiber stretching are controlled by a specific computer program, which can easily control the tapered profile, with low surface roughness and high

Stability of ash dykes using finite element analysis

K Anil Kumar[1], Sabbi Vamshi Krishna[2], Sandip Swarnakar[3,*]

[1]Department of Civil Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh -518002, India

[2]Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh -518452, India

[3]Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh -518002, India

[*]Corresponding Author's Email address: drsandipece@gpcet.ac.in

Abstract:

Stability of slopes is one of the important aspects in the area of geo-technical engineering. In this study, the factor of safety of ash dyke, horizontal settlement, vertical settlement, effective pore water pressure of the model is determined in every construction stage. The slope stability analyze is done by using the finite element method. The ash dyke is created by keeping the cohesion value of starter dyke is 8 kPa and the cohesion value of raisings are 10 kPa ,15 kPa and 20 kPa respectively and the cohesion value of starter dyke is changed to 9 kPa and the raisings cohesion values 10 kPa ,15 kPa and 20 kPa respectively. Every model is being analyzed with the factor of safety value at different construction stage like starter dyke, first raising, second raising, third raising etc. The slope angle of starter dyke and raisings and angle of internal friction values are taken constant and the results are compared with varying cohesion values of starter dyke and raisings.

Keywords: factor of safety, finite element method, strength reduction technique, starter dyke

1. Introduction

The calculation of slope stability safety factors is a routine practice. In general, it involves two steps: First, calculate the factor of safety for a specified slip surface using the method of slices. Extensive studies have been undertaken in this area, and varieties of these methods are available for generalized slip surfaces. Second, find, among many potential slip surfaces, the "critical" surface that is associated with the minimum factor of safety [1]. The failure surface of a natural landslide usually exhibits a complex shape, often controlled by geological features. Failure surfaces are not necessarily spherical or log-spiral, as has been employed by some researchers

The design, analysis, and simulation of an optimized all-optical AND gate using a Y-shaped plasmonic waveguide for high-speed computing devices

Surya Pavan Kumar Anguluri[1] · Srinivas Raja Banda[1] · Sabbi Vamshi Krishna[2] · K Anil Kumar[3]
Santosh Kumar[4,5]

Abstract

All-optical logic gates have proven their significance in the digital world for the implementation of high-speed computations. We propose herein a novel structure for an all-optical AND gate using the concept of a power combiner based on a Y-shaped metal–insulator–metal waveguide with a 4 µm × 7 µm footprint. This design works based on the principle of linear interference. The insertion loss and extinction ratio of the design are given as 0.165 and 14.11 dB, respectively. The design is analyzed by using the finite-difference time-domain (FDTD) method and verified using MATLAB. The minimized structure can be used to design any complex logic circuit to achieve better performance in the future.

1 Introduction

Communication now plays a unique role in everyday human life. As technology advances, the need for faster communication also advances at the same pace. Along with the speed of communication, several other factors must be considered when designing a device, including the cost of the individual circuit, the size of the device, its power handling capacity, heat dissipation issues, and interconnect delays [1]. The first generation of electronics was based on semiconductor technology, making use of vacuum tube-based transistors for logical operations, but suffering from effects such as strong heat dissipation and interconnect delays [2]. These limitations were somewhat mitigated by the next technology, called photonics [3, 4]. In this field, instead of electrons, photons are used to exchange information [5]. However, optical devices suffer from the diffraction limit when their size approaches the operating wavelength [6]. Also, the size of optical components is nearly 1000 times larger than electronic devices, which represents another drawback [7]. The next generation of technology came with a new proposal called surface plasmons, where optical signals interact with metallic structures at the nanoscale, resulting in the new field called plasmonic [8, 9] that combines the effects of a miniaturized version of electronics with the capacity of photonics [10]. When light of a certain wavelength is incident on a metal surface, free electrons are excited by absorbing the energy from the light but are bound at the interface between the metal and dielectric [11]. These surface plasmon polaritons (SPPs) can avoid the diffraction limit found in photonics

1   Department of Electronics and Communication Engineering, Godavari Institute of Engineering and Technology, Chaitanya Knowledge City, East Godavari, Rajahmundry, Andhra Pradesh 533296, India

2   Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Nandikotkur Road, Kurnool, Andhra Pradesh 518452, India

3   Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India

4   Department of Electrical and Electronics and Communication Engineering, DIT University, Dehradun, Uttarakhand 248009, India

5   Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

Design and modelling of all-optical NAND gate using metal–insulator–metal (MIM) waveguides-based Mach–Zehnder interferometers for high-speed information processing

D Imran[1] · Siva Koti Reddy[2] · Ramanand Harijan[3] · Santosh Kumar[4,5]

Abstract

All the basic logic gates play a major role in carrying out the mathematical computation. The drawbacks of conventional electronics are alleviated by all-optical integrated circuits with a great application of high-speed computing and information processing. In this paper, plasmonic metal–insulator–metal (MIM) waveguides have an excellent property of propagating the surface plasmons beyond the diffraction limit up to deep sub-wavelength scale. All-optical NAND gate design is optimized by using MIM plasmonic waveguide-based Mach–Zehnder interferometers (MZIs) in the footprint of 36 μm × 8 μm that works at 1.55 μm operating wavelength. The better performance of the proposed device is achieved, such as the extinction ratio is 10.55 dB, insertion loss is obtained as 0.506 dB, and response time is 262 ps. The proposed design is verified by using the finite-difference time-domain (FDTD) technique and further analysis are carried out by mathematical computation and MATLAB simulation results.

[1]   Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India

[2]   Department of Electronics and Communication Engineering, Godavari Institute of Engineering and Technology, Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh 533296, India

[3]   Department of Electronics and Communication Engineering, BM Group of Institutions, Hari Nagar (Dumha), Farrukh Nagar, Gurugram, Haryana 122506, India

[4]   Department of Electrical and Electronics & Communication Engineering, DIT University, Dehradun 248009, Uttarakhand, India

[5]   Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China

ORIGINAL PAPER

Design and analysis of miniaturized all-optical binary to gray code converter using Y-shaped plasmonic waveguide for optical processors

D Imran[1] · Surya Pavan Kumar Anguluri[2] · Santosh Kumar[3]

Abstract

In this paper, an all-optical miniaturized binary to gray code converter is designed and analyzed. The all-optical domain is now an alternative for electronic devices, where performance and speed are the key issues. Code converters are significantly used in digital data transmission in the areas of error detection and correction. Gray code is one of the cyclic codes, where the cyclic shift of each codeword is also a code word. An all-optical XOR gate, realized using a Y-shaped power combiner is used in this design to generate the desired gray code from the given binary code. The insertion loss and extinction ratio parameters are found to be 0.347 dB and 22.26 dB, respectively. The entire simulation is carried out using finite-difference time-domain method. The obtained practical results are verified mathematically using MATLAB.

1 Introduction

With an increasing demand for a faster communication, signal processing, and several cloud services, the need for an optical domain is increasing at an exponential rate. The use of optical communication in these areas will significantly improve the overall performance. The necessity of data at high transfer rates increases the hunger for faster communication. Each second several gigabits of data are being processed and transferred across the globe through several media. This rate of transfer may increase in upcoming years

and to satisfy the same, we should have the cutting-edge technology to handle it. To control this huge data internet traffic across the globe, we need a terabit speed of operation. This gap is best filled by the research technology called plasmonic [1, 2]. This generation succeeded its predecessors like semiconductor optical amplifiers (SOA), electronics [3], and photonics [4–6]. The major characteristics which determine the performance are speed, cost, size, and power consumption. The SOA devices are very large and require more power to operate [7]. It lags due to more heat dissipation that accounts for energy losses. The semiconductor electronic devices are smaller than SOA, but lag in noise factor, poor performance in high frequency, and low life span. Photonics, on the other hand, uses photons as carriers suffer diffraction limit when the size of the device is close to the operating wavelength [8, 9]. All these difficulties are alleviated by the use of plasmonic circuits [10–12]. The surface plasmons excited as a result of surface plasmons resonance (SPR) phenomenon can confine light to the deeper sub-wavelength thereby eliminating the diffraction limit in photonics [13–17]. Various waveguide configurations like insulator–metal–insulator (IMI), metal–insulator–metal (MIM) [18, 19], etc., are available based on the application usage. With the help of this, all-optical logic gates like AND, OR, NOT, XOR, XNOR, and universal gates like NAND and NOR are designed [20–27]. Apart from this, several other combinational and sequential circuits like

✉ Santosh Kumar
santoshrus@yahoo.com

1 Photonics Lab, Department of Electronics and Communication Engineering, G. Pullaiah College of Engineering and Technology, Nandikotkur Road, Kurnool, Andhra Pradesh 518002, India

2 Department of Electronics and Communication Engineering, Godavari Institute of Engineering and Technology, Chaitanya Knowledge City, Andhra Pradesh, Rajahmundry, East Godavari 533296, India

3 Shandong Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information Technology, Liaocheng University, Liaocheng 252059, Shandong, China