SCHOOL OF micro ELECTRONIC ENGINEERING

MICROELECTRONIC
INTERNAL RESEARCH SYMPOSIUM
2012

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ABSTRACT BOOK

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TO PRODUCE A HOLISTIC HUMAN CAPITAL THAT CONTRIBUTES TO THE NATION'S DEVELOPMENT AND INDUSTRIAL COMPETITIVENESS AGENDA

VISION

AN INTERNATIONALLY COMPETITIVE ACADEMIC AND RESEARCH INSTITUTION SCHOOL OF MICROELECTRONIC ENGINEERING'S

School of Microelectronic Engineering's

MISSION

TO REALISE THE NATIONS ASPIRATIONS AND CONTRIBUTE TO THE TECHNOLOGICAL ADVANCEMENT IN MICROELECTRONIC ENGINEERING

VISION

WORLD CLASS ACADEMIC AND RESEARCH CENTRE IN MICROELECTRONIC ENGINEERING

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Message from the Symposium Chair

WELCOME TO THE PROCEEDINGS OF THE 1ST MICROELECTRONIC RESEARCH SYMPOSIUM OR IRSME 2012. ALONG WITH UNIVERSITI MALAYSIA PERLIS'S VISION TO BECOME AN ACADEMIC AND RESEARCH INSTITUTION THAT CAN COMPETE IN THE INTERNATIONAL ARENA, RESEARCH AND PUBLICATION MUST BE THE MAIN CRITERIA TO ACHIEVE THIS VISION. KNOWLEDGE AND AWARENESS OF THESE MATTERS SHOULD BE APPLIED TO ALL THE ACADEMIC STAFF AND POSTGRADUATE STUDENTS. IN CARRYING OUT THE FOREGOING, THE SCHOOL OF MICROELECTRONIC ENGINEERING IS PROUD TO HOLD ITS FIRST EVER RESEARCH SYMPOSIUM TO FOSTER A CULTURE OF RESEARCH AND PUBLICATION AMONG THE STAFF AND STUDENTS OF THE SCHOOL OF MICROELECTRONIC ENGINEERING. THIS SYMPOSIUM IS SET TO GATHER RESEARCHERS OF THE SCHOOL FROM VARIOUS BACKGROUNDS, MICROFABRICATION, IC DESIGN, PHOTONICS, INSTRUMENTATION AND OTHERS TO PRESENT THEIR RESEARCH FINDINGS. THIS SYMPOSIUM ALSO INTENDS TO INCREASE THE NUMBER OF JOURNALS OR CONFERENCE PROCEEDINGS INDEXED BY SCOPUS FOR THE UNIVERSITY. WE WOULD LIKE TO THANK ALL THE COMMITTEE MEMBERS FOR THEIR ENORMOUS AND VITAL SUPPORT IN ENSURING THE SYMPOSIUM IS A SUCCESS.

WAN MOKHDZANI WAN NOR HAIMI
IRSME 2012 CHAIR

Tentative

5 September 2012

0830: Arrival of PPK Microelectronics Researchers

0900: Arrival of VIPs

0905: Prayer Recital / Wawasanku

0915: Welcoming Speech by the Dean of School of Micro-e

0925: Opening Speech by Y. Bhg Dato 'Vice Chancellor UniMAP

0950: Refreshments

1005: First Session Presentations

1230: Lunch

1400: Second Session Presentations

1600: Refreshments

1620: Award Presentation Ceremony

1640: Sedekad Gemilang

1650: Disperse

First Session Presentation

A Study on the Effect of Workload Variation With Respect to the Stored Energy in an Embedded Micro System Powered By Energy Harvested From Vibration.

N.A Khairi & A.B. Jambek

Abstract- This paper discussed on how to design a wireless temperature sensor node using Microchip's PIC microcontrollers, Digi International's XBee modules, a temperature sensor and liquid crystal displays (LCDs) In the transmitter part, the temperature was measured from a temperature sensor. The analogue signal from the temperature sensor was sent to a PIC to be converted into a digital value. The digital value which was the temperature measurement was displayed onto an LCD and the value also will be transferred to another wireless sensor node (WSN) through an XBee module. The other WSN which was the receiver part captured the signal and displayed the temperature onto an LCD.

1ˢᵗ Presenter

Intelligent Optimizer for OpAmp by Applying Artificial Intelligence

I.S Ishak, S.C Neoh & S.A.Z Murad

Abstract – This review paper presents a study on Operational Amplifier (Op-Amp) design Optimization. A number of optimization methods and applications on Op-Amp design have been studied. Particular interest is focused on the application of Artificial Intelligence (AI) technique in order to improve the Op-Amp design performance. Specifications, design goals, and complexities of Op-Amp design are also discuss in this paper. Essentially, the study focus on the capability of the optimization technique in achieving the required constraints and performance of Op-Amp.

2ⁿᵈ Presenter

Preparation and Characterization of Bulk Nanoporous Sn and SnO₂

M. L. A Shahar, S.A. A. Rais, M.H.A. Wahid & M. F. Ahmad

Abstract— EUV lithography has received much attention because of leading the next generation lithography for more compact, with node size as small as 40nm integrated circuit (IC) fabrication process. Additional, the EUV lithography has been extensively researched around the world for semiconductor future road map. Bulk nanoporous of Sn and SnO_2 become reliable candidate to generate EUV lithography. This paper is focused on preparation and characterization of bulk nanoporous material of Sn and SnO_2 to overcome debris problem. The sample was prepared by reaction solid-state of powder Sn without organic binder and SnO_2 with organic binder with compacting and sintering process. The samples are characterized by morphology identification (SEM) and phase identification (XRD). The result is proposed as prospect for future EUV lithography research to get solid low plasma density target.

3ʳᵈ Presenter

Review on artificial intelligence and its approach in MEMs and Medical Application

N. A. Ismail, S.C Neoh, N. Sabani & B.N Taib

Abstract – In this paper, a review of Artificial Intelligence (AI) is presented. The review included the definition, basic types, method and application of Artificial Intelligence. A lot of methods have been developed within the Artificial Intelligence field for solving hard conditions that require intelligence from human perspective. The main focus in this paper is based on the approach of Artificial Intelligence method in MEMS and medical application, as these two fields are very connected to each other. The different types and method of AI that have been used in MEMS and medical application optimization were compared in this research.

4th Presenter

A Review of Artificial Intelligence Approaches for Optimization Method

A. F.M. Shukor

Abstract— This paper presents a review of Artificial Intelligence (AI) approaches focusing on biomedical application and microelectromechanical systems (MEMS). Particular attention is given to the study of the AI capabilities in optimizing the design variables involved for biomedical and MEMS applications. Investigation study is carried out extensively on the optimization procedures and algorithms. In this paper, several AI approaches which are Evolutionary Algorithms (EA), Genetic Algorithms (GA) and Artificial Neural Network (ANN) have been studied in which advantages and weaknesses of each method are reviewed. In addition to the review, possible future advancement of hybrid AI techniques in the design of biomedical and MEMS instruments are discussed.

5th Presenter

The Cross Phase Modulation based on SOA in NOLM

R. Rostam, M.H.A. Wahid, S.A. A. Rais, & M. F. Faridus

Abstract- The performance of optical transmission systems are limited by nonlinear fiber effects in cross phase modulation (XPM). The XPM has an important impact on today's high speed dense wavelength division multiplexing optical fiber communication systems. In order to obtain high conversion speed and strong nonlinearity, semiconductor optical amplifier nonlinear optical loop mirror (SOA-NOLM) is operated with large bias current and high optical powers. This paper study of the investigation of XPM on the SOA based NOLM with reference to variables SOA current, repetition rate and switching window. the SOA is a promising candidate for cascaded optical fiber systems and optical grating because of the entire fiber transmission window and the possibilities for integration and low cost. The operating conditions under which a SOA based NOLM with optical feedback can have two stables modes of operation at switching rate faster than the gain recovery rate of the SOA. Furthermore, signal induced phase shift dependence on bias current of the SOA and optimized loop parameters are also included.

6th Presenter

Optimisation of 1:2 Y-branch Splitter for Evanescent Field Biosensor

Khor Kang Nan, M. Mohamad Shahimin, F. R. M. Adikan

Abstract— Evanescent field had been widely used in bio and chemical sensors. However in most cases, evanescent field is not maximized and thus the performance of the sensor is not optimized. It is the aim of the paper to optimize the design of 1:2 Y-branch splitter through simulation by using FD-BPM. Linear waveguide is simulated separately with manipulation of physical dimensions of waveguide and polarization of optical source. Y-branch splitter without taper are simulated to optimize the power loss. Width of waveguide and effective angle are manipulated in the power loss optimization. The result shows that evanescent field is maximized at optimized thickness and width. Besides, result also shows that TM-polarization result in 15.5 times stronger evanescent field at optimized physical dimension compare to TE polarization. The result suggests that Y-branch splitter with width of 25um, effective angle of 6.24 degree is the best design for evanescent field sensor application with both high sensitivity and signal to noise ratio. Combination of both minimum power ($Pout$) loss of Y-branch splitter and maximum output electric field intensity ($Eout$) of output waveguide enable the realization of sensor with both high sensitivity and signal to noise ratio.

7th Presenter

Circuit Design Optimization By Multi-Objective Algorithm

Lim Wei Jer & S.C Neoh

Abstract— This paper presents a Multi-objective optimization (MOO) approach for assisting circuit design. There are three objectives (gain, cutoff frequency, and ripple) have to optimize in order to fulfill the standard low pass filter design specifications. Fast Non-dominated Sorting Genetic Algorithm (NSGA-II) proposed as the search engine for optimization. Pareto optimality is the line which all optimal objectives lies on, thus NSGA-II will finds the best solution which is nearest to the pareto front line.

8th Presenter

Application of Genetic Algorithm in automatic detection of voice disorders : A Review

Sindhu Ravindran S.C Neoh & M.Hariharan

Abstract- Acoustic analysis is a perspective vocal pathology diagnostic tool which complement other methods, based on direct vocal fold observation. There are several approaches and algorithms for feature extraction from acoustic speech signal and their discrimination . Among them, long-time acoustical parameters are utilized by many researchers. It is more significant to choose the best long-time acoustical parameters, to achieve better classification accuracy with a minimal feature set. Different feature reduction and feature selection methods are used for the prognosis, treatment and care of pathological factors which determine the functional behavior of speech production system. GA is one of the wrapper based feature selection methods, which selects the appropriate long-time acoustical features feature subset from the pool of features. This paper provides a comparative study on GA, as a feature selection method and its applications on distinct vocal fold problems. Our main focus is to emphasize GA, in achieving the optimal feature set and thereby diminishing the computational complexity.

9th Presenter

Microcontroller Based Portable Light Analyzer (PORLI)

T.S Ong, Z. Sauli, V. Retnasamy, W.M.W.N Haimi, S. Taniselass, A.H. Shapri & N.A Rahman

Abstract — Different type of materials has been distinguished with a surface characterization device that utilizes the surface reflectivity properties of the materials. The setup mainly consists of a laser emitter which was used as the light source and a photodiode as its sensing element. Both components are placed in black box. The photodiode detects light intensity of the reflected photon from the surface. The photodiode was connected to the Analog Digital Converter (ADC0808) to convert analog voltage value to digital voltage value to display in Liquid Crystal Display (LCD). This circuit contains photodiode and ADC connected with 8051 microcontroller which was interfaced with the LCD display. The reflective properties of the surface samples are recorded inside the black box itself. Comparisons of different reflective intensities from different materials will identify different surface material. Besides that, the light reflectance in each material gives good assumption about the material surface structure.
10th Presenter

Human Skin Stress Investigation

Nadzri. NS, Z. Sauli, V. Retnasamy, W.M.W.N Haimi, S. Taniselass, A.H. Shapri & N.A Rahman

Abstract — Imaging studies are commonly used to help physicians detect abnormalities in the human body. X-rays, CT and MRI scans are common tools used to examine the human body. However in this project, fringe projection technique is used to measure human skin stress and detect tumor growth on the skin surface as well. Besides known for its simplicity, flexibility, this optical measurement method is obviously cost effective and safe from any side effects compared to current medical imaging method. Theoretically, a force will be applied to the test sample which reacts as human skin and distortion result after fringe projection shows abnormal growth on the skin.
11th Presenter

The Role of Reactive Ion Etching(RIE) on Wirebond Formation: A Study on Successful Rate of Thermosonic Gold Wire on Aluminium Bonpad

Moganraj P, Z. Sauli, V. Retnasamy, S. Taniselass, W.M.W.N Haimi, A.H. Shapri & N.A Rahman

Abstract—Wire bond has been an important tool in the world of microelectronic interconnections. The effect of Reactive Ion Etching (RIE) on the successful rate of thermosonic bonding using gold wire on aluminium pad is studied. Surface morphology images from Atomic Force Microscopy (AFM) are used as correlation comparison. In this work wire bonding adhesion is studied on two different surface conditions, which are treated with RIE and the other without RIE treatment. In this experiment only the bonding time was varied for each set of experiments. Results of the wire bond from both samples, with and without RIE were compared. The RIE treated surfaces yield better adhesion results in this work.
12th Presenter

Interaction of Surface Roughness and Copper Ball Adhesion Using Shearing Simulation

Rajendran V, Moganraj P, Z. Sauli, V. Retnasamy, S. Taniselass, W.M.W.N Haimi, A.H. Shapri & N.A Rahman

Abstract– Wire bonding is one of the commanding interconnection techniques used at the back end of line due to its vast adaptability to the advancing trend of circuit designs. Wire bond shear test method is utilized to examine adhesion strength of the bonded wires. In this paper, the stress response of copper ball bond during wire bond shear test is investigated The influences of three types of bond pad surface; flat surface, hemisphere surface and sharp groove surface on the stress response of copper ball bond during wire bond shear test were evaluated. The simulation was done using Ansys version 11.The simulation results showed the bond pad surface had a significant influence on the stress response of copper ball bond. At the shear ram displacement distance of $35\mu m$, the peak stress responses for all three bond pad surface were obtained.
13th Presenter

Second Session Presentation

Simple Distributed Brillouin Scattering Modelling for Temperature and Strain Sensing

S. Azizan, M. M. Shahimin & S. A. Z. Murad

Abstract— This paper presents in detail the synthesis of the distributed Brillouin scattering modeling in optical fibers using a newly developed algorithm. The simulations of a distributed fibre optic sensor are carried out with the aim for temperature and strain sensing. The behaviours of Brillouin scattering in optical fibres are studied through the backscatter signals. The analyses of backscattered Brillouin signal under various operating parameters along the optical fibers are also presented using the developed MATLAB codes. The analysis includes the characteristics of backscatter signals when affected by temperature and strain. All the developed simulation models exhibit exceptional analysis accuracy as verified through comparison with the published measurement results.
1st Presenter

Fabriation of Nanostructure ZnS:Cu as anti-reflecting coating for silicon solar cell

I.S. Mohamad, H. Abdullah & S. Habibi

Abstract- In this study, thin films of Cu doped with ZnS were synthesized using sol-gel method; the effect of Cu doping on crystallinity, micrstructural and the relation to the electrical properties. This research involving five different Cu concentrations which being doped to the ZnS and then the thin film were heated at 550^0C for 1hour. The thin film XRD characterization shows 2 consistent peaks of monoclinic structure at (2 0 0) and (1 2 2) while SEM result shows the formation of flakes morphology. This study also work on fabrication of silicon solar cell and the efficiency of cell which deposited with anti-reflecting coating and the one without anti-reflecting coating were compared. From the I-V curve plotted and efficiency calculation, it was proved that anti-reflecting coating really helps to increase the quantity of light absorbed, thus increase the solar cell's efficiency.

2nd Presenter

The challenge of detecting mangos from complex background image

M. Rizon, Haniza Yazid & R. Hussin

Abstract-The use of computer to analyze images has many potential applications for automated agricultural tasks. But the variability of the agricultural objects makes it very difficult to adapt the existing industrial algorithm to the agricultural field. There are many process needed in the agricultural domain where decision are made based on the appearance of the product. Human are easily able to perform any tasks but recently several approaches have been studied to automate the human task to robotic. This work is carried out in order to assist the gripping task of the object in the agricultural domain. The object that has been considered to be used is the 'Harum-Manis' mango. The objective of this project is to help for plucking the mango from a tree using image processing techniques and it will be faster, easier and convenient than the manual plucking.The principle of this project is to develop a software to detect the mango location from an input image. The task is divided into seven main objectives as follows to identify features for algorithms detecting mango using edge detectors, to identify features for algorithms detecting mango using template matching, to identify features for algorithms detecting mango using neural networks, to identify features for algorithms detecting mango using ellipse equation, to develop algorithms to delete the complex background in the input image such as leaves, tree stems using image processing techniques, to develop algorithms to delete the complex background in the input image such as leaves, tree stems using colour informations and to determine the size and shape of each mango in an input image using ellipse equation.

3rd Presenter

A Simulation Study of the Effect Engineered Tunnel Barrier to the Floating Gate Flash Memory

M.R. Zakaria, U. Hashim, R.M Ayub &Z. Zailan

Abstract- Flash memory is a device that is used as a tool to store data electrically. The main advantage of this device is in the non-volatility which can store data without power supply, thus make the device very popular in broad application. Conventional Flash memory generally uses single tunnel oxide with a thickness of 7 nm to 10 nm as a tunnel barrier. In order to obtain good device performance, the thickness of the tunnel barrier must be reduced. If the thickness of the oxide is reduced below than 5 nm, device performance will be better but suffer from problems such as current leakage and data retention. To overcome this problem, a technique identified as Engineered Tunnel Barrier is used to replace the single oxide used in conventional flash memory. The programming characteristic of memories with different tunnel barrier stacks single layer oxide, symmetric layer and asymmetric layer dielectric are investigated using TCAD simulator. The T-suprem-4 was used for device process fabrication and MEDICI simulator used for electrical characteristics. From theoretical, confirmed that the memory with the multilayer tunnel barrier exhibits better programming characteristics in term of, programming tunneling current, programming speed and programming voltage.

4th Presenter

2D Velocity Streamline Visualization of Microfluid Flow in Backward Facing Step Microchannel

Steven Taniselass, Z. Sauli, V. Retnasamy, W.M.W.N Haimi, A.H. Shapri & N.A Rahman

Abstract— Study on microfluid flow characteristic can be useful for most practical engineering application such as flows in inkjet printhead, drug delivery devices and micro-thermal technologies. Hence, in this paper, simulation of microfluid flow in Backward Facing Step (BFS) microchannel has been performed to visualize the flow characteristic at the step region. The microchannel used in this simulation has a step with a step height of 25% from the outlet height. The simulation has been carried out for various Reynolds numbers ranging from 0.1 to 500. The simulations result shows a recirculation zone is appeared at the edge of step for Reynolds numbers of 100, 300 and 500. Moreover, the radius of recirculation is increased further for the further increment of Reynolds numbers. Ansys CFX 11.0 software is used to perform the simulation.

5th Presenter

Gold Ball Shear Stress Analysis on Different Surface Morphology

W.M.W.N Haimi, S.Taniselass, Z. Sauli, V. Retnasamy, A.H. Shapri, N.A Rahman, R. Vairavan

Abstract– As the trend of integrated circuit is lashing towards miniaturized facet, wire bonding interconnection is still vastly being utilized in the first level of electronic packaging. The bond strength of the bonded wires is scrutinized by wire bond shear test. Hence in this paper, the effects of bond pad surface on the stress response of gold ball bond during wire bond shear test were investigated through simulation. Three types of bond pad surface, flat surface, hemisphere surface and sharp groove surface are utilized for comparison purpose in this study. Ansys version 11 was used for the simulation. The simulation results showed that the gold ball bond on sharp groove surface bond pad obtained the highest stress response. The maximum stress responses for all three types of bond pad surface were obtained at the shear ram displacement distance of 35µm.

6th Presenter

Shear Stress Analysis Study Using Surface Morphology Correlation with Aluminum Ball Adhesion

V. Retnasamy, S.Taniselass, Z. Sauli, A.H. Shapri, N.A Rahman, R. Vairavan & W.M.W.N Haimi,

Abstract– Wire bonding method are utilized to facilitate the interconnection in the demanding development of integrated circuits. Wire bond shear test method is utilized in the industry to scrutinize the quality of the wire bond.This paper discusses about the simulation of wire bond shear test using aluminum wire. This study is focused on evaluating the effects of bond pad surface on the stress response of aluminum ball bond during wire bond shear test. The aluminum ball bond will bonded on three types of bond pad surface, flat surface, hemisphere surface and sharp groove surface and the stress response of each type of bond pad surface are then compared. The results obtained showed that the aluminum ball bond bonded to the sharp groove surface acquired the highest stress response of 311.55 MPa. The simulation was done using Ansys version 11.

7th Presenter

Shearing Speed Induced Stress Comparison on Gold and Copper Ball Interconnection

Z. Sauli, V. Retnasamy, S.Taniselass, A.H. Shapri, N.A Rahman, R. Vairavan & W.M.W.N Haimi

Abstract–As the trend for semiconductor packaging is heading towards BGA and flip chip interconnection methods, the conventional wire bonding process still dominates the industry primarily due the flexibility of wire bonds. The reliability of the bonded wires is assessed through wire bond shear test. In this study, the effects of shear ram speed on the stress response of bonded wires during wire bond shear test were investigated. The stress response of two wire materials, gold(Au) and copper(Cu) at varied shear ram speed were evaluated.A 3D non-linear finite element model was developed for the simulation. The shear ram speed of 100 µm/sand 1mm/s were used in this study. The results showed that the shear ram speed has significant effects on the stress response of the bonded wire. The simulation was done using Ansys version 11.
8th Presenter

Polymer Core BGA Vertical Stress Loading Analysis

A.H. Shapri, N.A Rahman, Z. Sauli, V. Retnasamy, S.Taniselass, R. Vairavan & W.M.W.N Haimi

Abstract– Tremendous effort is put into enhancing reliability of Ball grid array (BGA) solder joints. The BGAs are utilized as interconnection method in the electronic packaging industry due to its vast advancement in circuit miniaturization. New materials are introduced to further improve the reliability of the BGA solder joint. In this study, the stress response of BGA solder ball during vertical loading is scrutinized through simulation. The Micropearl BGA solder joint and normal BGA solder joint were utilized in this study for stress response comparison purpose. Both BGA models were subjected to vertical loading forces of 1N, 3N and 5N respectively. Ansys version 11 was employed for the simulation process. The normal BGA solder joint exhibited higher stress response when compared with the Micropearl BGA solder joint at all vertical loading force due to differences in the core structure.
9th Presenter

Stress Analysis on Centric Through Hole PCB

A.H. Shapri, N.A Rahman, Z. Sauli, V. Retnasamy, S.Taniselass, R. Vairavan & W.M.W.N Haimi

Abstract–In this study, the bending process of PCB during depaneling is simulated. The stress response during the bending process is evaluated using a computational program Ansys. Two PCB plate model were developed:One of the model with centric through hole and other model without hole. The stress response of the two models are compared. From the simulation, it has been observed that the value of stress response of the PCB increases with increasing displacement height. The without hole PCB model exhibited a slightly higher stress response compared to the with centric through hole PCB model. Highest stress response for both models were recorded at the displacement height of 5cm.
10th Presenter

Comparison of Delays Between 4-Bits Ripple Carry Adder and 4-Bits Carry Look-Ahead Adder Using Logical Effort Method

S. N. Che Yahaya, N. Idris

Abstract—Two types of circuit topologies has been designed which are 4-Bits Ripple Carry Adder Circuit (RCA) and 4-Bits Carry Look-ahead Adder Circuit (CLA). Delays in RCA circuit will be compared between before and after applying the Logical Effort method to determine which circuit is good in term of having fast response. Besides, RCA circuit also will be compared with CLA circuit to shows that different circuit topologies with same circuit function would have different circuit delay. In Logical Effort method, it will has some steps such as path effort computation, best number of stages computation, minimum delay estimation, best stage effort determination and sizing the gates in RCA circuit. After applying the Logical Effort method, the circuits will have least delays compared to circuits before this method being applied, which average improvement is about 44.15%. Meanwhile the average improvement of CLA over RCA is about 64.85%. The more complex a circuit is (having many inputs) it produces more delays. Gates number did not influence the delays in a circuit which sometimes, by having addition of some stage(but same circuit function) it can improve the delays and produced fast response circuit.

11th **Presenter**

Improved Subtraction Function for Logarithmic Number System

R.C Ismail, S.A.Z Murad, R. Hussin

Abstract—Logarithmic number system can be highly considered as an alternative to floating-point, specifically for applications that require a wide dynamic range of numbers for their arithmetic operations. To date, its implementation is still restricted by complexity of performing addition and subtraction functions as a result of using large lookup tables. In this paper, a method is revealed to substantially reduce these tables by means of using second order co-transformation procedure. The results predominantly show that the proposed technique offers significantly better speed, area and accuracy than current state-of-the-art logarithmic number system.

12th **Presenter**

Design and Simulation of SOA-NOLM based XOR and XNOR Photonics Logic Gates

Mohd.Azarulsani Md. Azidin, M.H.A. Wahid

Abstract— Digital logic in electronic domain has created wonders by helping humans in their daily lives in terms of processing and calculation speed. Electronic domain has existed for quite a while but lately, the photonic domain has started to emerge alongside its electronic counterpart. Previously, several researches have been conducted by using either Semiconductor Optical Amplifier (SOA)[1] or Non-linear optical Loop Mirror (NOLM)[2] alone as part of the all-optical logic gates m hods which proved their own strengths and advantages. In this paper, we propose a simple method to realize all-optical functions which base on the Terahertz Optical Asymmetric Demultiplexer (TOAD) method [3], which is similar to that of SOA-NOLM methods. We experimentally demonstrate XOR logic function running at 10Gb/s, which portrays in accordance to its logic gates properties. Finally, we will observe its characteristics in terms of signal power, noise power and Optical Signal-to-Noise Ratio (OSNR).

13th **Presenter**

Fall down seven times, get up eight.

Thank You