Online ISSN : 2249-4596
Print ISSN : 0975-5861

Global Journal

of Researches in Engineering: F

Electrical and Electronic Engineering

Highlights

A Novel Control Method

Three-Phase Multilevel Inverter

Power Factor Detection

Input Voltage Fluctuation

Discovering Thoughts, Inventing Future

VOLUME 15 ISSUE 3 VERSION 1.0

Global Journal of Researches in Engineering: F
Electrical and Electronics Engineering

Global Journal of Researches in Engineering: F
Electrical and Electronics Engineering
Volume 15 Issue 3 (Ver. 1.0)

Open Association of Research Society

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals Headquarters
301st Edgewater Place Suite, 100 Edgewater Dr.-Pl,
Wakefield MASSACHUSETTS, Pin: 01880,
United States of America
USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Global Journals Incorporated
2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey,
Pin: CR9 2ER, United Kingdom

Packaging & Continental Dispatching

Global Journals
E-3130 Sudama Nagar, Near Gopur Square,
Indore, M.P., Pin:452009, India

Find a correspondence nodal officer near you

To find nodal officer of your country, please email us at *local@globaljournals.org*

eContacts

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investors@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

Pricing (Including by Air Parcel Charges):

For Authors:

22 USD (B/W) & 50 USD (Color)

Yearly Subscription (Personal & Institutional):

200 USD (B/W) & 250 USD (Color)

Integrated Editorial Board
(Computer Science, Engineering, Medical, Management, Natural Science, Social Science)

Dr. Bart Lambrecht
Director of Research in Accounting and FinanceProfessor of Finance
Lancaster University Management School
BA (Antwerp); MPhil, MA, PhD (Cambridge)

Dr. Carlos García Pont
Associate Professor of Marketing
IESE Business School, University of Navarra
Doctor of Philosophy (Management), Massachusetts Institute of Technology (MIT)
Master in Business Administration, IESE, University of Navarra
Degree in Industrial Engineering, Universitat Politècnica de Catalunya

Dr. Fotini Labropulu
Mathematics - Luther College
University of ReginaPh.D., M.Sc. in Mathematics
B.A. (Honors) in Mathematics
University of Windso

Dr. Lynn Lim
Reader in Business and Marketing
Roehampton University, London
BCom, PGDip, MBA (Distinction), PhD, FHEA

Dr. Mihaly Mezei
ASSOCIATE PROFESSOR
Department of Structural and Chemical Biology, Mount Sinai School of Medical Center
Ph.D., Etvs Lornd University
Postdoctoral Training,
New York University

Dr. Söhnke M. Bartram
Department of Accounting and FinanceLancaster University Management SchoolPh.D. (WHU Koblenz)
MBA/BBA (University of Saarbrücken)

Dr. Miguel Angel Ariño
Professor of Decision Sciences
IESE Business School
Barcelona, Spain (Universidad de Navarra)
CEIBS (China Europe International Business School).
Beijing, Shanghai and Shenzhen
Ph.D. in Mathematics
University of Barcelona
BA in Mathematics (Licenciatura)
University of Barcelona

Philip G. Moscoso
Technology and Operations Management
IESE Business School, University of Navarra
Ph.D in Industrial Engineering and Management, ETH Zurich
M.Sc. in Chemical Engineering, ETH Zurich

Dr. Sanjay Dixit, M.D.
Director, EP Laboratories, Philadelphia VA Medical Center
Cardiovascular Medicine - Cardiac Arrhythmia
Univ of Penn School of Medicine

Dr. Han-Xiang Deng
MD., Ph.D
Associate Professor and Research Department Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical NeuroscienceNorthwestern University
Feinberg School of Medicine

Contents of the Issue

Global Journal of Researches in Engineering: F
Electrical and Electronics Engineering
Volume 15 Issue 3 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

A Novel Control Method for Improvement of Voltage Utilization Factor in Three-Phase Multilevel Inverter Considering the Input Voltage Fluctuation

By S. Narasimha & M. Sushama

Jawaharlal Nehru Technological University College of Engineering Hyderabad, India

Abstract- In This paper wind, solar and fuel cells based stand alone cogeneration systems are presented for remote area utilities applications. This type of co generation system output voltages are not constant or stable in always. The generated output voltages are directly connected to the loads, without battery bank or energy storage devices. The PI, fuzzy control method was proposed in this paper using svpwm, such that the output voltage of converter circuit is constant even though input voltages are fluctuation conditions. A three phase multilevel inverter with static and dynamic load was examined to validate for proposed work in MATLAB environment.

Keywords: space vector PWM; PI-controller; FUZZY-controller; cogeneration systems; cloosed loop control system.

GJRE-F Classification : *FOR Code: 290903*

ANOVELCONTROLMETHODFORIMPROVEMENTOFVOLTAGEUTILIZATIONFACTORINTHREEPHASEMULTILEVELINVERTERCONSIDERINGTHEINPUTVOLTAGEFLUCTUATION

Strictly as per the compliance and regulations of :

Research | Diversity | Ethics

A Novel Control Method for Improvement of Voltage Utilization Factor in Three-Phase Multilevel Inverter Considering the Input Voltage Fluctuation

S. Narasimha [α] & M. Sushama [σ]

Abstract- In This paper wind, solar and fuel cells based stand alone cogeneration systems are presented for remote area utilities applications. This type of co generation system output voltages are not constant or stable in always. The generated output voltages are directly connected to the loads, without battery bank or energy storage devices. The PI, fuzzy control method was proposed in this paper using svpwm, such that the output voltage of converter circuit is constant even though input voltages are fluctuation conditions. A three phase multilevel inverter with static and dynamic load was examined to validate for proposed work in MATLAB environment.

Keywords: space vector PWM; PI-controller; FUZZY-controller; cogeneration systems; cloosed loop control system.

I. Introduction

The last decades growth in the production of electric energy from renewable energy sources has led to an increased focus on power electronics. Renewable energy sources like photovoltaic, wind and wave energy are relying on power converters in order to exchange power with the grid. Anyone who wants to produce power for the grid has to make sure that their facilities are complying with national grid codes. The grid codes has strict regulations when it comes to the voltage quality, including limits for rapid voltage variations, flicker and harmonic distortion. Rapid voltage variations and flicker are matters of control of the inverter system, but harmonic distortion is created by the pulse width modulated switching of the converter. Different filters topologies can be used in order to reduce the harmonics generated by the switching action in the converter.

The technology growth in the recent years, most of the electrical and electronics equipments are playing the major role in the social growth. Accordingly more and more amount of power demand has an increased. One solution that to meet the power demands in rural and remote area are cogeneration systems, witch an includes hybrid renewable energy sources. In case of the system power generation with natural energy and fuel cell, comparatively large amount of fluctuation is generated at the DC voltage.

The circuit wich converts the DC power in to AC power using multilevel inverter circuit was implemented considering the input dc voltage fluctuations. However the space vector pulse width modulation method was applied in order to improve the voltage utilization factor and stabilization of output voltage.

In this paper, the new control method which an introduced the control of the output voltage feedback control is proposed. It applied to the control circuit, multilevel inverter and operational principle with are explained.

II. Diode Clamped Multilevel Inverter

The diode-clamped inverter provides multiple voltage levels through connection of the phases to a series bank of capacitors. According to the original invention, the concept can be extended to any number of levels by increasing the number of capacitors. Early descriptions of this topology were limited to three-levels where two capacitors are connected across the dc bus resulting in one additional level. The additional level was the neutral point of the dc bus, so the terminology neutral point clamped (NPC) inverter was introduced. However with an even number of voltage levels, the neutral point is not accessible, and the term multiple point clamped (MPC) is sometimes applied. Due to capacitor voltage balancing issues, the diode-clamped inverter implementation has been mostly limited to the three level. Because of industrial developments over the past several years, the three level inverter is now used extensively in industry applications. Although most applications are medium-voltage, a three-level inverter for 480V is on the market.

The three phase 3-level diode clamped multilevel inverter is the common multilevel inverter used for various applications. A three phase 3-level diode clamped multilevel inverter is adopted in this project. It is obtained from a configuration of twelve switching devices and six clamping diodes as shown in figure.

*Author α: Research Scholar, Dept. of E.E.E, JNTUHCEH, India.
e-mail: snarasimha.999@gmail.com
Author σ: Professor, EEE, JNTUHCEH., India.
e-mail: M73sushama@yahoo.com*

The pairs Sa1 Sa1', Sa2 Sa2', Sb1 Sb1', Sb2 Sb2', Sc1 Sc1' and Sc2 Sc2' are complementary. Therefore, Sa1'=1–Sa1, Sa2'=1– Sa2, Sb1'=1–Sb1,Sb2'=1–Sb2,Sc1'=1–Sc1 and Sc2'=1–Sc2. There are twelve active combinations were taken using these switching states which produce twelve active voltage vectors. The nonzero voltage vectors are from V1 to V12.

The sector is identified from three phase reference voltage and the corresponding voltage vector is selected from the switching table to generate the gating pulses for the inverter. The vector sequence is V1, V2 , V3 , V4 , V5 , V6 ,V7 , V8 , V9 , V10 , V11 , V12 , V1 each for 30°.

The angle of reference is found using equation $= \tan^{-1}\left(\frac{v_{ld}}{v_{lq}}\right)$. In 3-level inverter one cycle is split into twelve sectors with each 30°. Sector 1 is from 0 to +30°, sector 2 is from +30° to +60°, sector 3 is from +60° to +90°, sector 4 is from +90° to +120°, sector 5 is from +120° to +150° and the sector 6 is from +150° to +180°, Sector 7 is from -180° to 150°,sector 8 is from -150° to -120°, sector 9 is from - 120° to -90°, sector 10 is from -90° to -60°, sector 11 is from -60° to -30° and the sector 6 is from -30° to 0°.

The switching table is formed using the sector, the corresponding voltage vector and the switch state. For example, the angle of the reference voltage is between 0° and 30°, it is in sector 1 and it selects the voltage vector V1. The corresponding switching state is 110000. Switches Sa1 and Sa2 are in on state. Switches Sb1, Sb2, Sc1and Sc2 are in off state. Switches Sa1', Sa2', Sb1', Sb2', Sc1'and Sc2' are complementary.

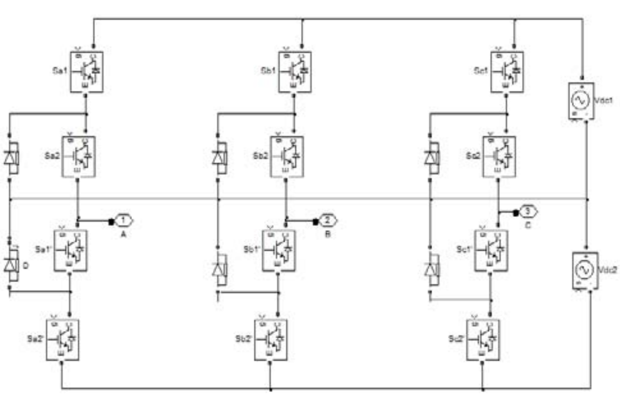


Figure 1 : 3-level diode clamped inverter

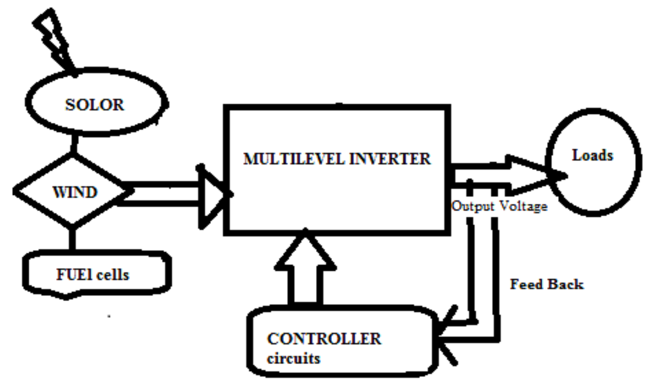


Figure 2 : Block diagram of the output voltage control system

From fig 2. It represent the combined generation systems of the solar energy, wind power and fuel cell systems are consider for the input source to the inverter circuit, these are generated power is not constant in always. In such cases output voltage suffers from its input. In this paper we developed a control circuit with PI, Fuzzy controller logic which absolves the output voltages, generates the equalant correction signal to the pwm circuits.

III. Space-Vector Pwm

One of the features of two parallel connected inverters is the ability to obtain three levels of voltage (phase to neutral) P = VDC, H = $\frac{1}{2}$VDC and O = 0. Describing system in the meaning of three voltage levels provides similarity to Three-Level Neutral Point Clamped Inverter. This similarity allows to approach Space Vector Modulation in the same way like for Neutral Point Clamped Inverter [1].

The large vectors divides the plane into six sectors. Each of these sectors can be split into four regions as it is depicted in Fig. 3. Combination of vectors which should be used to synthesize Vref is based on its position. For example, when Vref is in region four of sector I, V2, V7 and V14 are used.

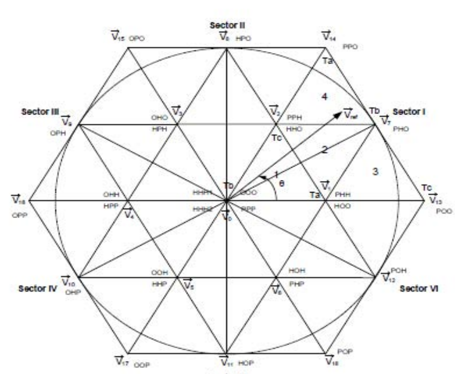


Figure 3 : 3-level space vector modulation sectors

a) Dwell Times

The following Figure presents reference vector transition from sector I to sector II:

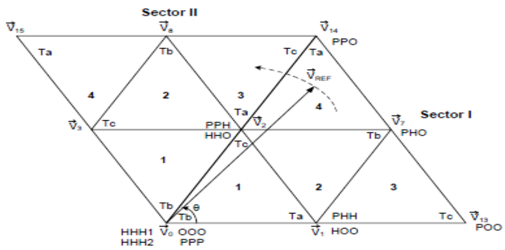


Figure 4 : Voltage reference transition between two sectors

where:

$$V14 = \frac{2}{3}VDCe^{j\frac{\Pi}{3}}e^{j\frac{\Pi}{3}};\ V7 = \frac{2}{3}VDCe^{j\frac{\Pi}{6}};\ V2 = \frac{1}{3}VDCe^{j\frac{\Pi}{3}};\quad \frac{2}{3}[\cos(\frac{\Pi}{3})+j\sin(\frac{\Pi}{3})]T_a + \frac{\sqrt{3}}{3}[\cos\left(\frac{\Pi}{6}\right) + j\sin(\frac{\Pi}{6})]T_b + \frac{1}{3}[\cos(\frac{\Pi}{6})+j\sin(\frac{\Pi}{6})]T_C = \frac{Vref}{VDC}[\cos(\Theta)+j\sin(\Theta)]T_s \quad (2)$$

And splitting into real and imaginary part:

b) Real

$$\frac{1}{3}T_a + \frac{1}{2}T_b + \frac{1}{6}T_c = \frac{Vref}{VDC}\cos(\Theta)T_s \quad (3)$$

c) Imaginary

$$\frac{\sqrt{3}}{3}T_a + \frac{\sqrt{3}}{6}T_b + \frac{\sqrt{3}}{6}T_c = \frac{Vref}{VDC}\sin(\Theta)T_s \quad (4)$$

d) Together with

$$T_a + T_b + T_c = T_s \quad (5)$$

a set of equations real and imaginary can be created to calculate dwell times: Ta, Tb, Tc. The dwell times for every region in sector I are presented in Table1.

Table 1 : Switching pattern for sector

SECTOR -1				
Segments	1	2	3	4
1	[OOO]	[HOO]	[HOO]	[HHO]
2	[HOO]	[HHO]	[POO]	[PHO]
3	[HHO]	[PHO]	[PHO]	[PPO]
4	[HHH]	[PHH]	[PHH]	[PPH]
5	[HHO]	[PHO]	[PHO]	[PPO]
6	[HOO]	[HHO]	[POO]	[PHO]
7	[OOO]	[HOO]	[HOO]	[HHO]

O-lower switching, H-upper switching, P-both upper and lower switching.

IV. Pi Controller

PI controller will eliminate forced oscillations and steady state error resulting in operation of on-off controller and P controller respectively. However, introducing integral mode has a negative effect on speed of the response and overall stability of the system. Thus, PI controller will not increase the speed of response [5]. It can be expected since PI controller does not have means to predict what will happen with the error in near future [1] [2]. This problem can be solved by introducing derivative mode which has ability to predict what will happen with the error in near future and thus to decrease a reaction time of the controller. PI controllers are very often used in industry, especially when speed of the response is not an issue. A control without D mode is used when

a) Fast response of the system is not required
b) large disturbances and noise are present during operation of the process
c) There is only one energy storage in process (capacitive or inductive)
d) There are large transport delays in the system

The pi controller basic mathematical equation is

$$U = Kpe_k + Ki\sum_{j=0}^{k} e_k + u_0 \quad (6)$$

$$u_k = \begin{Bmatrix} Umax(U \geq Umax) \\ Umin(U \leq Umin) \end{Bmatrix}$$

Kp=proportional coefficient

Ki=integral coefficient

e_k =K-th sampling time

u_0=initial value

V. Fuzzy Controller

The most commonly used fuzzy inference technique is the so-called Mamdani method, as the very first attempt to control a steam engine and boiler combination by synthesizing a set of linguistic control rules obtained from experienced human operators. Their work was inspired by an equally influential Interest in fuzzy control has continued ever since, and the literature on the subject has grown rapidly [2]. In this model the fuzzy implication is modeling by Mamdani's minimum operator, the conjunction operator is min, the t-norm

The dwell times calculation for three level SVM is similar to two level SVM. Vectors: V2, V7 and V14 are used when Vref is in region four of sector I:

$$V14Ta + V7Tb + V2Tc = Vref\ Ts \quad (1)$$

from compositional rule is min and for the aggregation of the rules the max operator is used. In order to explain the working with this model of FLC will be considered the example. Where a simple two-input one-output problem that includes three rules is examined

Rule 1 : IF x is A3 OR y is B1 THEN z is C1

Rule 2 : IF x is A2 AND y is B2 THEN z is C2

Rule 3 : IF x is A1 THEN z is C3.

Step 1: Fuzzification

The first step is to take the crisp inputs, x0 and y0, and determine the degree to which these inputs belong to each of the appropriate fuzzy sets. According to Fig 5 one obtains.

$$\mu A1(x0) = 0.5, \mu A2\ (x0) = 0.2, \mu B1\ (y0) = 0.1, \mu B2\ (y0) = 0.7 \quad (7)$$

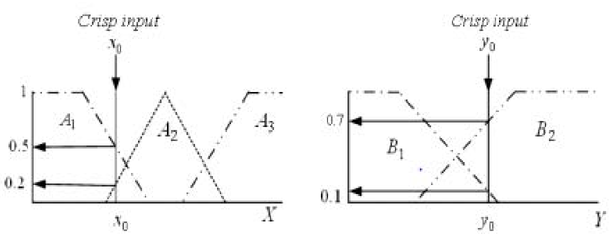


Figure 5 : Fuzzification

Step 2: Rules evaluation

The fuzzified inputs are applied to the antecedents of the fuzzy rules. If a given fuzzy rule has multiple antecedents, the fuzzy operator (AND or OR) is used to obtain a single number that represents the result of the antecedent evaluation. To evaluate the disjunction of the rule antecedents, one uses the OR fuzzy operation. Typically, the classical fuzzy operation unions used.

$$\mu A\cup B(x) = \max\{\mu A(x), \mu B(x)\} \quad (8)$$

Similarly, in order to evaluate the conjunction of the rule antecedents, the AND fuzzy operation intersection is applied.

$$\mu A\cap B(x) = \min\{\mu A(x), \mu B(x)\} \quad (9)$$

The result is given in this Figures

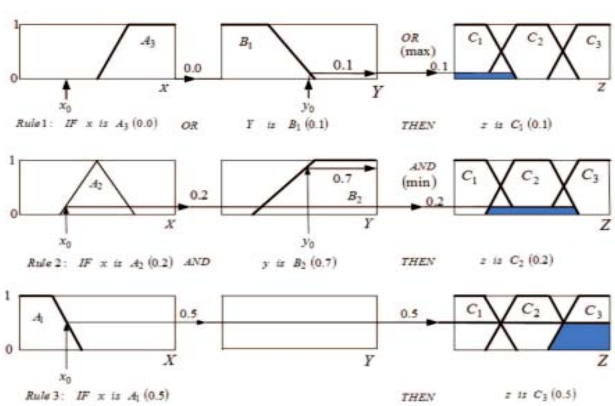


Figure 6 : Rules evaluation

Now the result of the antecedent evaluation can be applied to the membership function of the consequent. The most common method is to cut the consequent membership function at the level of the antecedent truth; this method is called clipping. Because top of the membership function is sliced, the clipped fuzzy set loses some information. However, clipping is preferred because it involves less complex and generates an aggregated output surface that is easier to defuzzify. Another method, named scaling, offers a better approach for preserving the original shape of the fuzzy set [3][9]. The original membership function of the rule consequent is adjusted by multiplying all its membership degrees by the truth value of the rule antecedent see in fig 7.

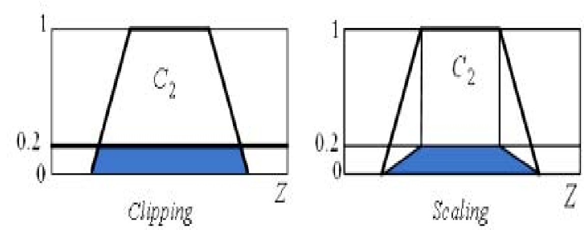


Figure 7 : Clipping and scaling

Step 3: Aggregation of the rule outputs

The membership functions of all rule consequents previously clipped or scaled are combined into a single fuzzy set. fig 8.

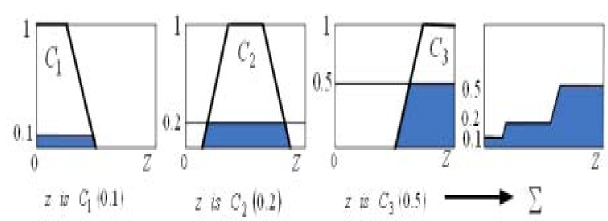


Figure 8 : Aggregation of the rule outputs

Step 4: Defuzzification

The most popular defuzzification method is the centroid technique used in this paper. It finds a point representing the center of gravity (COG) of the aggregated fuzzy set A, on the interval [a, b].

A reasonable estimate can be obtained by calculating it over a sample of points. This fuzzy logic controller is 3- level system so it has two inputs, n-level system has (n-1) inputs and $(n-1)^2$ rules are used so in this fuzzy logic controllers.

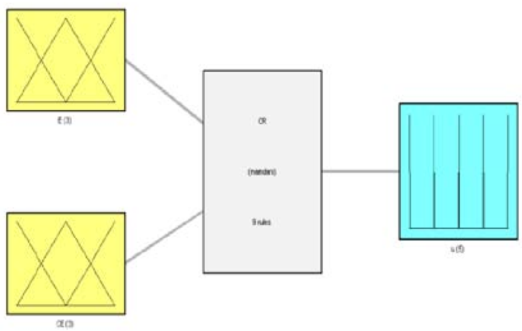


Figure 9 : Rules of the fuzzy logic controller

This fuzzy controller has two errors one is (E) error another one is (CE) counter error both are called input layer these are connected to hidden layer it means both inputs are compared as following rules

If (E is Negative) and (CE is Negative) then (u is Min)

If (E is Negative) and (CE is Positive) then (u is Zero)

If (E is Positive) and (CE is Negative) then (u is Zero)

If (E is Positive) and (CE is Positive) then (u is Max)

U id the output of fuzzy controller it is giving the pulses to pwm, this fuzzy controller is based on the input errors.

VI. Results

a) PI controller

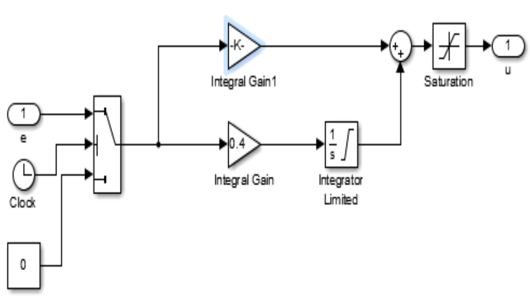


Figure 10 : Simulation diagram of PI controller

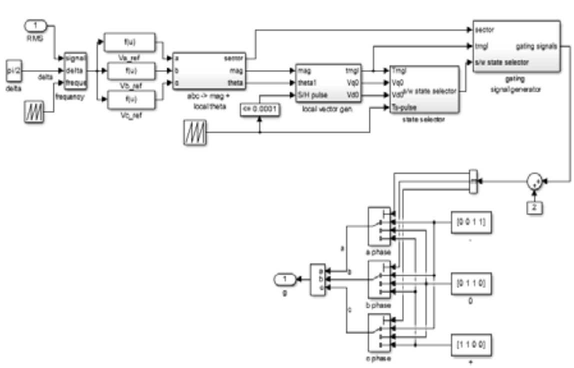


Figure 11 : Space vector pulse width modulation simulation diagram

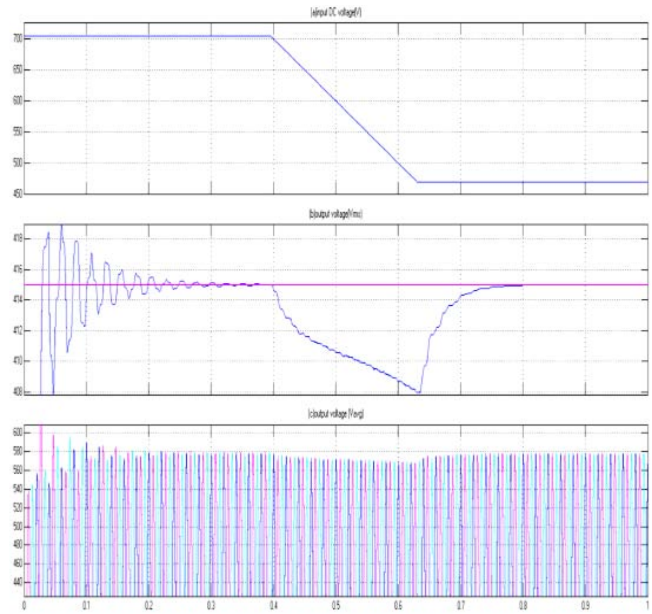


Figure 12 : Simulation results of Multilevel inverter using PI controller. (a) Input fluctuated DC voltage, (b) Inverter output voltage (Vrms) (c) The output voltage (Vavg)

From fig. no. 12. (a) The constant input DC voltage is applied from 0sec. to 0.4sec. then the time scale from 0.4sec. to 0.5sec.the input voltage is decreased from704.29V to 586v. then the time scale from 0.5sec. to 0.62sec. the DC voltage is gradually decreases from586v to 469.49V. Then after the input DC voltage magnitude is remains constant from 0.62sec. to 1sec.

From fig. no. 12. (b) it shows the output (Vrms) voltage from 0sec. to 0.4sec. the DC voltage magnitude is constant, voltage (Vrms) is oscillated nature settiled upto 0.3sec, then from 0.4sec.to 0.5sec.DC voltage is gradually decreases but output voltage (Vrms) fluctuated from 415v to 411v. Then after input DC voltage is decreased from 0.5sec. to 0.62sec. The voltage (Vrms) is also decresed upto 408V. Then from the time scale 0.62sec. to 1sec, input DC voltage is remains constant 469.49v and output (Vrms) voltage reaches the constant magnitude of 415v.

From fig.no.12(c) we can observe that 0sec. to 0.4sec. input DC is constant, output voltage is maintain constant magnitude. From 0.4sec. to 0.62sec. the input DC voltage is decreases. in this case the output voltage magnitude is small decreased. Than after time scale from 0.62sec. to 0.8sec.the output voltage has increased to meet the rated value of magnitude. after 0.62sec. to 1sec. DC voltage is 20% lesser than the applied voltage magnitude even through this period output voltage magnitude is reached the rated voltage and remains constant voltage magnitude. Using SVPWM method which is helps to improve the output voltage magnitude to maintain rated voltage with fast switching cycles.

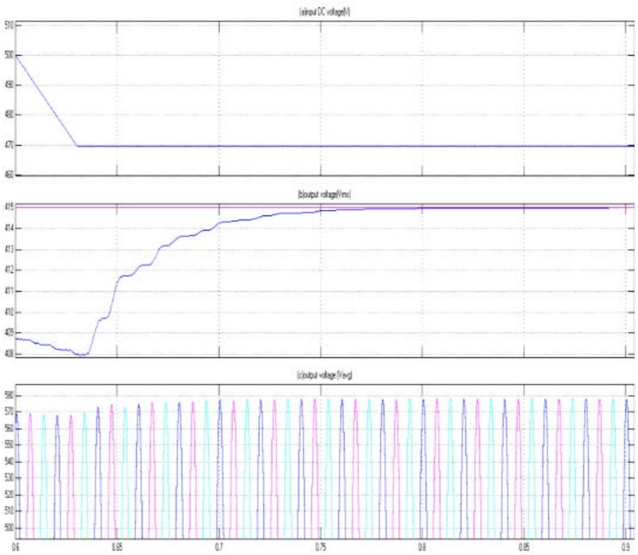


Figure 13 : Simulation results of Multilevel inverter using PI controller with zoom scale of fig12. (a) input DC voltage,(b) Inverter output voltage (Vms) (c) the output voltage (Vavg)

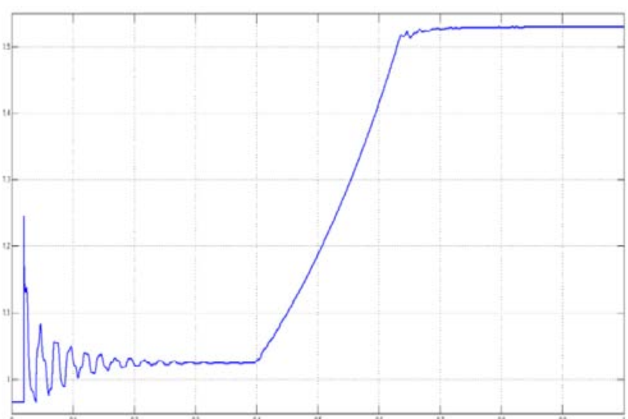


Figure 14 : PI controller error signal

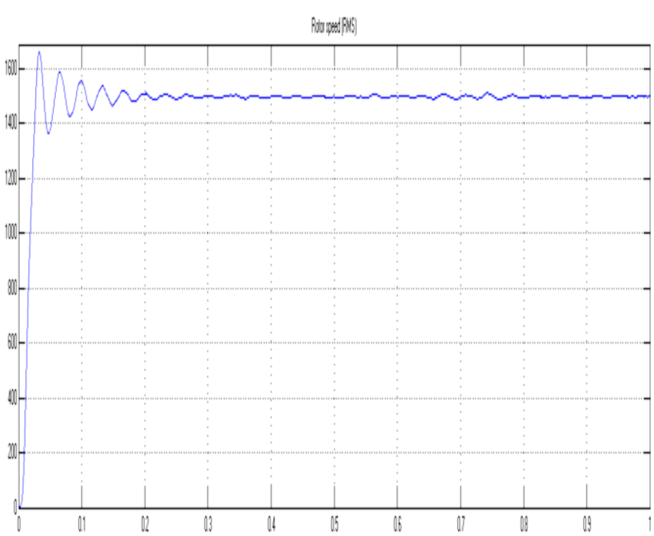


Figure 15 : Rotor speed of induction motor (rpm)

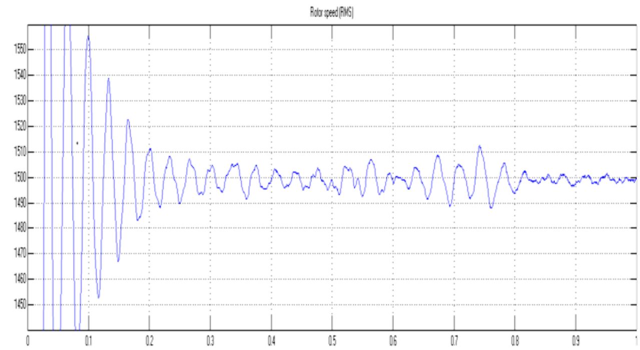


Figure 16 : Rotor speed of induction motor with zoom scale(rpm)

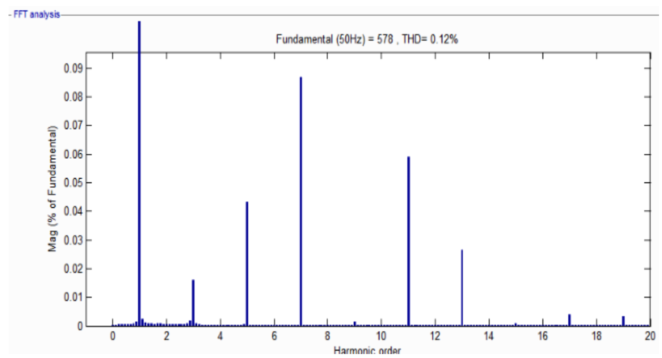


Figure 17 : THD with static load

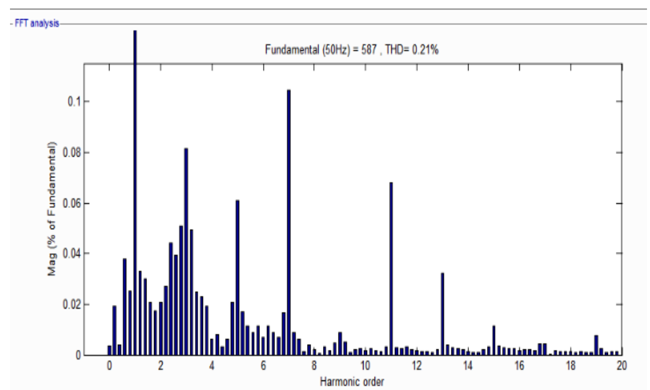


Figure 18 : THD with Induction motor load

From fig. no. 15, we conclude that using PI control method the 20% input DC voltage fluctuation was an effectively absorbed and improved the output rated voltage magnitude considering dc voltage fluctuation, induction motor load was running with constant rotor speed even though dc voltage fluctuation cases.

b) Fuzzy logic controller

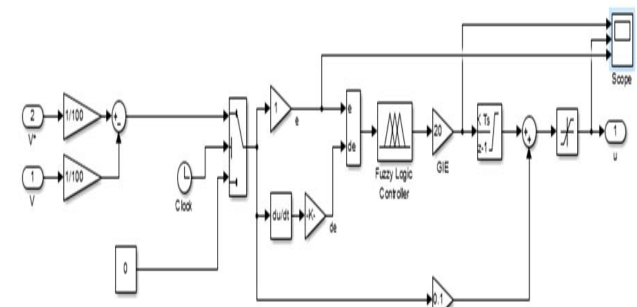


Figure 19 : Simulation diagram of Fuzzy- controller

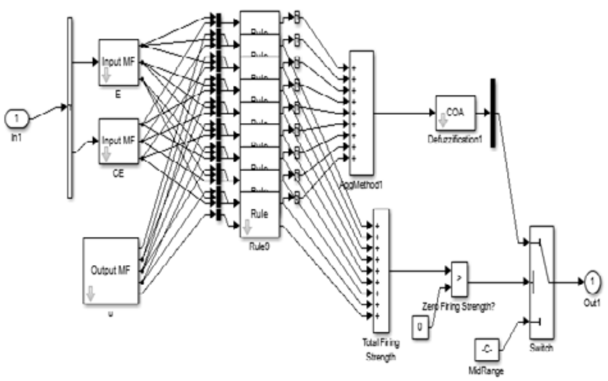


Figure 20 : Sub system diagram of Fuzzy logic simulation block

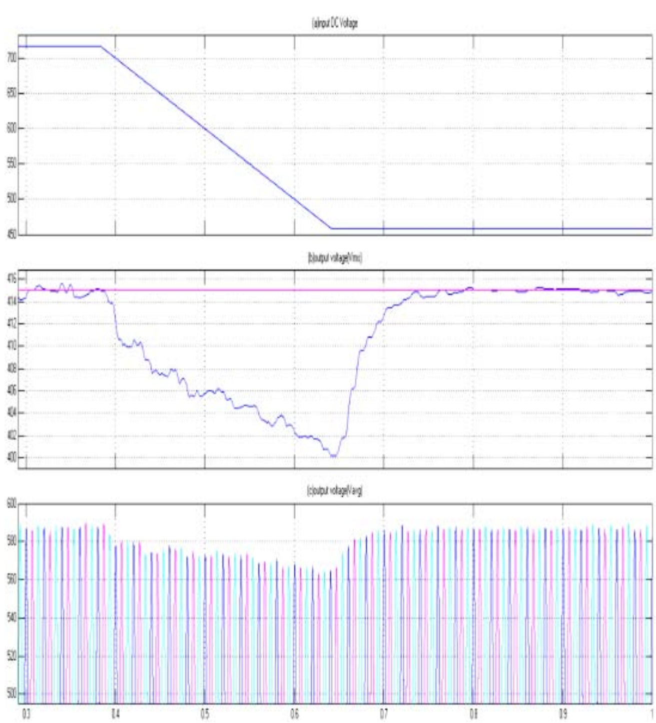


Figure 21 : Simulation results of Multilevel inverter using Fuzzy controller with 22% dc voltage fluctuation.(a) input DC voltage,(b) Inverter output voltage (Vrms) (c) the output voltage (Vavg)

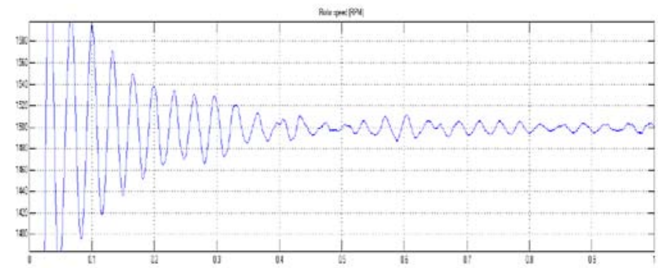


Figure 22 : Imulation results of dynamic load rotor speed using fuzzy-controller

From fig. no. 21. (b) it shows the output (Vrms) voltage from 0sec. to 0.4sec. the DC voltage magnitude is constant, voltage (Vrms) is less oscillated. Then from 0.4sec.to 0.62sec.DC voltage is gradually decreases but output voltage (Vrms) also decresed very smoothly. Then after input DC voltage is constant magnitude with 22% lesser value. From 0.62sec. to max time scale, the voltage (Vrms) is has an increased to reached the rated value magnitude of 417v within very less time comparativily PI control method.

From fig.no.21(c) we can observe that 0sec. to 0.4sec. input DC is constant, and the output voltage is maintain constant magnitude. From 0.4sec. to 0.62sec. the input DC voltage is decreases. In this case the output voltage magnitude is small decreased. Than after time scale from 0.62sec. to 0.8sec. the output voltage has increased to reach the rated value of magnitude. after 0.62sec. to 1sec. DC voltage is 22% lesser than the applied voltage magnitude even through this period output voltage magnitude is remains constant voltage magnitude.

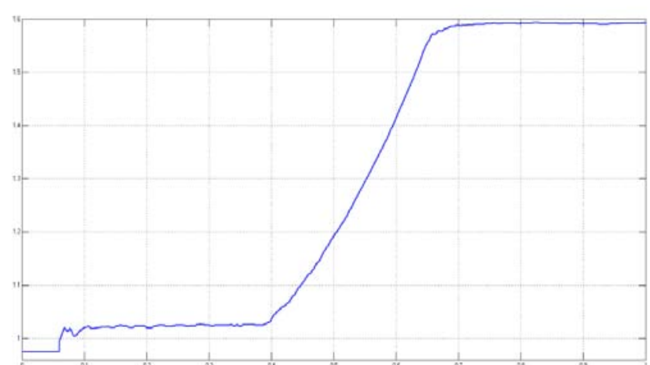


Figure 23 : Fuzy controller error signal

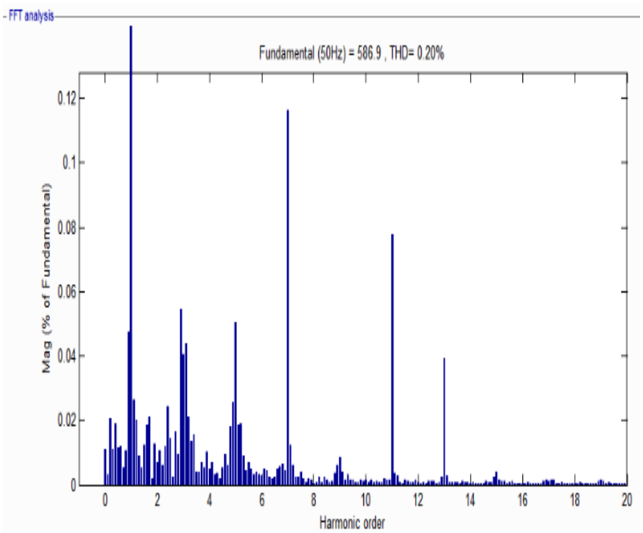


Figure 24 : THD of the dynamic load using Fuzzy controller

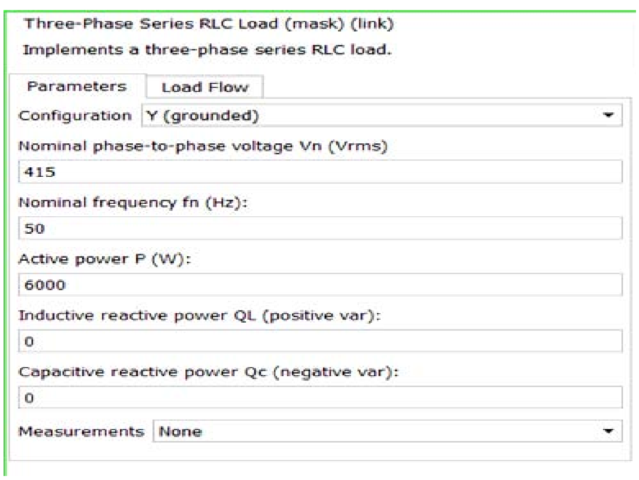


Figure 25 : Static load parameters(6Kw)

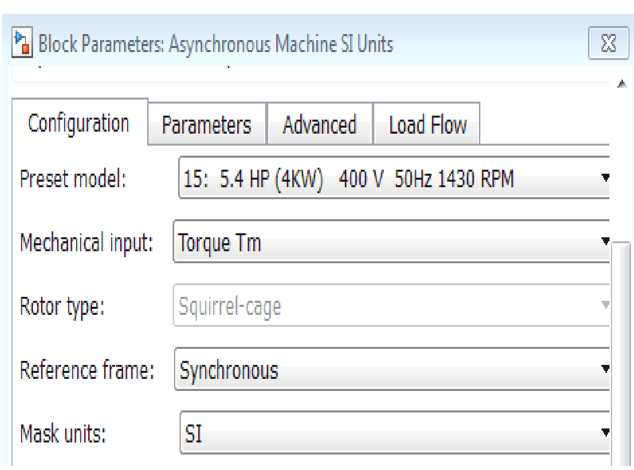


Figure 26 : Dynamic load parameters

Table 2 : Results comparison between PI and Fuzzy controller

Input DC voltage fluctuation (%)	Control methods with Load	Total Harmonic Distortion (%)	No. of cycles to reach rated voltage
20	PI with Resistive	0.12	12
20	PI with Induction motor	0.21	12
22	Fuzzy with Resistive	0.20	8
22	Fuzzy with Induction motor	0.20	8

VII. Conclusion

From table 2. Comparison of PI and FUZZY-controllers, The advantage of PI controller is less THD than fuzzy. The advantage of Fuzzy -controller is taking the less number of cycles to reach the rated output voltage magnitude considering input dc voltage flutuation. Fuzzy control is 22% of voltage fluctuation more DC voltage utilization and dynamic, static load response is very smooth manner than the PI control. So that fuzzy-control method is an effective one considering dc voltage fluctuation cases to improve the output voltages of converters with very fast response time, low THD value, and the supporting results are an examined in this paper with 6Kw resistive and 5HP induction motor loads.

VIII. Feature Scope

Future work will focus on the fast response time to reach the rated voltage magnitude considering input DC voltage fluctuation, low value of THD. Can be an implement the other hybrid techniques control algorithm. For improving the voltage utilization factor and power quality.

References Références Referencias

1. Biji Jacob, and M. R. Baiju, “A New Space Vector Modulation Scheme for Multilevel Inverters Which Directly Vector Quantize the Reference Space Vector” IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 62, NO. 1, page.no.88-95, JANUARY 2015.
2. Azuki Abdul Salam1, Nik Azran Ab Hadi “Fuzzy Logic Controller for Shunt Active Power Filter” 4th International Conference on Engineering Technology and Technopreneuship (ICE2T), pp. no. 256-259, 2014.

3. N. Madhanakkumar, T. S. Sivakumaran and D. Divya sri "Performance Analysis of PI and Fuzzy Control for Resonant Converter Incorporating Boost" International Conference on Science, Engineering and Management Research (ICSEMR 2014).
4. Ritu Sharma, Alka Singh, A.N. Jha "Performance Evaluation of Tuned PI Controller for Power Quality Enhancement for Linear and Non Linear Loads" IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE-2014), May 09-11, 2014, Jaipur, India.
5. Amei, K.; Tanizaki, Y.; Ohji, T.; Sakui, M. "A Control Method of Superposition Ratio in the Improvement of Voltage Utilization Factor in Three phase Multilevel Inverter considering the DC Voltage Fluctuation" Power Conversion Conference - Nagoya, 2007.7Publication Year: 2007, Page(s): 37 – 142.
6. High Performance Direct Power Control of Three-Phase PWM Boost Rectifier under Different Supply Voltage Conditions. 2014.
7. Jin-Woo Jung, Nga Thi-Thuy Vu, Dong Quang Dang, Ton Duc Do, Young-Sik Choi, and Han Ho Choi, "Three-Phase Inverter for a Standalone Distributed Generation System: Adaptive Voltage Control Design and Stability Analysis, Energy Conversion, IEEE Transactions Volume: 29, Issue: 1 Page(s): 46 – 56, 2014.
8. Bayat, Z.; Babaei, E.; Badamchizadeh, M. "Low Order Harmonics Elimination in Multilevel Inverters Using Fuzzy Logic Controller Considering the Variations of DC Voltage Sources" Electrical Machines and Systems (ICEMS), 2011 International Conference, Page(s): 1 – 6, 2011.
9. Lin Chengwu, Zhang Xiaomin, Jiang Qiguang "Research on SVPWM inverter output control technology" Fifth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), Page(s): 927 – 929, 2013.

This page is intentionally left blank

Global Journal of Researches in Engineering: F
Electrical and Electronics Engineering
Volume 15 Issue 3 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Power Factor Detection using Android Application via Bluetooth

By Md. Faysal Chowdhury, Sayeedul Mursalin, Mohammad Jubair Hossain & Omor Ahmed Dhali

American International University, Bangladesh

Abstract- In present days Technological advancement and its incorporation is becoming a significant role in human life. Now Electrical power is very precious but due to the addition of Inductive load the reactive power is increasing rapidly as a result the industrialization has been affecting the efficiency of the electric power system. To minimize the reactive power consumption the power factor detection system is became a serious issue. The developed module will be an ideal possibility in the upcoming future with minimal cost and flexibility. In this project we have used atmega16 microcontroller, LCD, current sensor, voltage sensor, Bluetooth Module and Android Application. The microcontroller is used to measure the phase voltage and current by using ADC as well as it detect the power factor by measuring the phase difference between voltage and current using delay. The current sensor is used to measure the current respectively voltage sensor for voltage. The LCD is used to show the measured data and the Bluetooth module is to send the data. The android application is used to show the data in smart phone which is specially developed for it. This is a part of smart grid. The ultimate objective of the project is to monitor the consumer end status continuously with minimum cost.

Keywords: microcontroller, transformer, LCD, bluetooth module, bridge rectifier, zero crossing detector, android application.

GJRE-F Classification : FOR Code: 290901

POWERFACTORDETECTIONUSINGANDROIDAPPLICATIONVIABLUETOOTH

Strictly as per the compliance and regulations of :

Power Factor Detection using Android Application via Bluetooth

Md. Faysal Chowdhury [α], Sayeedul Mursalin [σ], Mohammad Jubair Hossain [ρ] & Omor Ahmed Dhali [Ѡ]

Abstract- In present days Technological advancement and its incorporation is becoming a significant role in human life. Now Electrical power is very precious but due to the addition of Inductive load the reactive power is increasing rapidly as a result the industrialization has been affecting the efficiency of the electric power system. To minimize the reactive power consumption the power factor detection system is became a serious issue. The developed module will be an ideal possibility in the upcoming future with minimal cost and flexibility. In this project we have used atmega16 microcontroller, LCD, current sensor, voltage sensor, Bluetooth Module and Android Application. The microcontroller is used to measure the phase voltage and current by using ADC as well as it detect the power factor by measuring the phase difference between voltage and current using delay. The current sensor is used to measure the current respectively voltage sensor for voltage. The LCD is used to show the measured data and the Bluetooth module is to send the data. The android application is used to show the data in smart phone which is specially developed for it. This is a part of smart grid. The ultimate objective of the project is to monitor the consumer end status continuously with minimum cost.

Keywords: microcontroller, transformer, LCD, bluetooth module, bridge rectifier, zero crossing detector, android application.

I. Introduction

Power factor is the ratio between the kW and the kVA drawn by an electrical load where the kW is the actual load power and the kVA is the apparent load power. Simply, it is a measure of how efficiently the load current is being converted into useful work output and more particularly is a good indicator of the effect of the load current on the efficiency of the supply system. The value for the power factor can theoretically vary between 0/% and 100%, where a value of 100% also called unity power factor – delivers all of the power as active power. A value of 0% would mean all the power is supplied as reactive power; no motors would turn and no useful work could be accomplished. A high power factor is important. But if the power factor is low the Current will be increased, and this high current will cause to the following disadvantages.

Author α σ ρ Ѡ: Student, Electrical and Electronic Engineering Department, AIUB, Dhaka, Bangladesh.
e-mails: faysalchowdhury05@gmail.com, sayeedul.mursalin@gmail.com, jubair_aiub@hotmail.com, ador1207@gmail.com

- Large Line Losses (Copper Losses) will occurs.
- Large kVA rating and Size of Electrical Equipment's will be required.
- Greater Conductor Size and Cost will be needed
- Poor Voltage Regulation and Large Voltage Drop.
- Low Efficiency.
- Penalty from Electric Power Supply Company on Low Power factor.

This Project focuses on the design and implementation of power factor Detection using Atmega16 microcontroller chip, determine the power factor of the loaded power system, and generate proper action to calculate Capacitor. Also we would be using concepts of Bluetooth Module and Android Application.

II. Proposed System

Microcontroller base automatic Detection of power factor with load monitoring is shown in fig.1

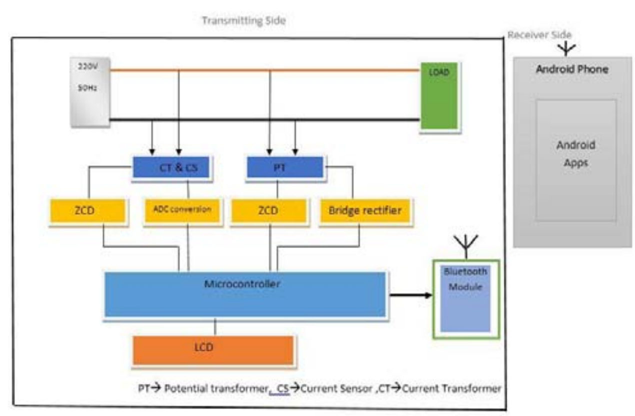


Figure 1 : Block diagram arrangement of the project

The principal element in the circuit is Atmega16 microcontroller. The current and voltage are measured from the main AC line (L) by using Hall Effect current sensor and Potential Transformer. The potential transformer and current transformer are used to measure the phase difference between voltage and current. The signals from potential transformer and current transformer are pass in to the zero crossing detector IC (ZCD I & ZCD V) individually that transposed square-wave of current and voltage and connect it to the Microcontroller to observe the zero crossing of current and voltage at the same time instant. Bridge Rectifier is used to convert the AC voltage to DC voltage. Voltage divider applied to convert the dc voltage to 5v. Hall

Effect current sensor gives the digital signal of current. Microcontroller read the value for both of voltage and current. The microcontroller internal timer read the time difference between voltage and current and convert it to phase angle and measures the power factor. The load monitoring status are shown in LCD and send it via Bluetooth module through UART for android application.

III. Circuit Design Arrangement

In figure 1, the basic arrangement of the implemented project can be found.

Among the major components required to establish the project, few of them are the power transformers (step down), microcontroller ATMEGA 16 and Bluetooth module, Bridge rectifier, Zero crossing detector.

a) Transformer

Transformer is an electrical device which transfer energy from one circuit to another circuit without change its frequency but in different voltage level. In this project we have 230v to 12v step down transformer. Step down transformers convert electrical voltage from one level usually down to a lower level. A step down transformer has less turns on the secondary coil that the primary coil. The induced voltage across the secondary coil is less the applied voltage across the primary coil or in other words the voltage is "stepped-down. Step down transformers are made from two or more coils of insulated wire wound around a core made of iron. When voltage is applied to one coil (frequently called the primary or input) it magnetizes the iron core, which induces a voltage in the other coil, (frequently called the secondary or output). The turn's ratio of the two sets of windings determines the amount of voltage transformation.

Figure 2 : 220v/12v transformer

b) Microcontroller ATMEGA 16

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals [3].

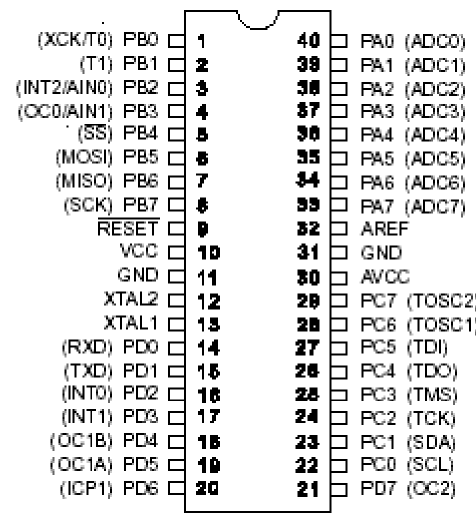


Figure 3 : Atmega16 microcontroller

c) Bluetooth module

HC-06 has been used as Bluetooth module. The Baud rate is 9600. Master and slave mode can't be switched in this Module. HC-06 module have paired memory to remember last slave device. The working voltage is 3.3V, but it can work at 3.00-4.2v.The Current pairing 20~30mA, connected 8mA [4][8].

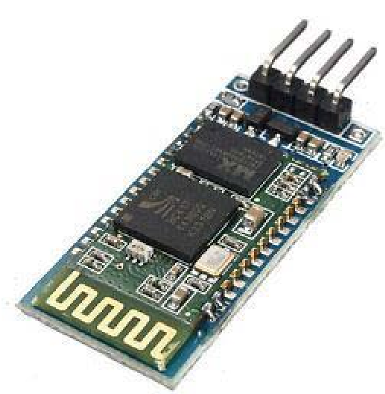


Figure 4 : Bluetooth module HC-06

d) Bridge rectifier

A bridge rectifier is an arrangement of four or more diodes in a bridge circuit configuration which provides the same output polarity for either input polarity. It is used for converting an alternating current (AC) input into a direct current (DC) output. A simple rectifier circuit described in this project converts the input from AC source to DC voltage. Firstly, the step down transformer converts the AC mains supply of 230V to 12V AC. This 12V AC is applied to the bridge rectifier arrangement such that the alternate diodes conduct for each half cycle producing a pulsating DC voltage consisting of AC ripples. A capacitor connected across the output allows the AC signal to pass through it and blocks the DC signal, thus acting as a high pass filter. The output across the capacitor is a smooth DC signal [8].

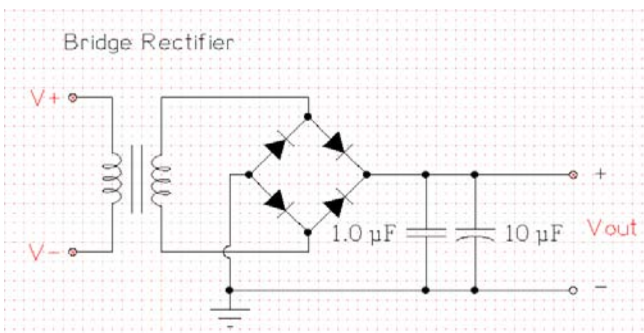


Figure 5 : Bridge rectifier

e) Zero crossing Detector

The zero crossing detector is a device that is used to detect the point where the voltage and current crosses zero in either direction. The reference voltage in this case is set to zero. The output voltage waveform shows when and in what direction an input signal crosses zero volt. If input voltage is a low frequency signal, then output voltage will be less quick to switch from one saturation point to another. And if there is noise in between the two input nodes, the output may fluctuate between positive and negative saturation voltage Vsat. Here IC LM358n is used as a zero crossing detector.

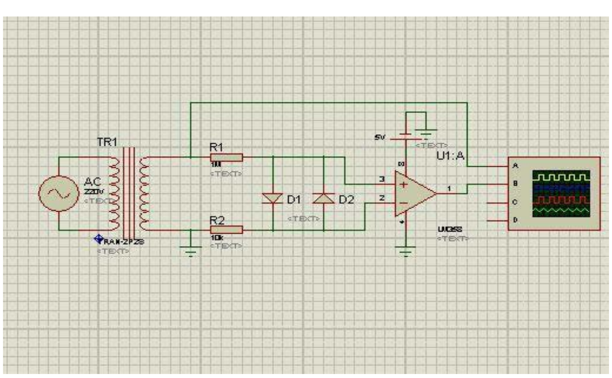


Figure 6 : zero crossing detector

The output of the zero crossing detector circuit is shown in Fig 7.

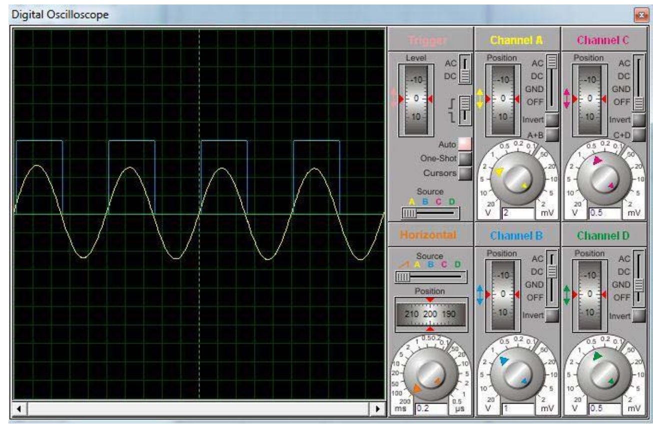


Figure 7 : Zero crossing detector circuit output

IV. Simulation & Flow Chart

The initial stage, the circuits have been designed and simulated in PROTEUS. The circuit have been utilized to detect the power factor using Android application via Bluetooth module. The circuit diagram can be found in figure 8.

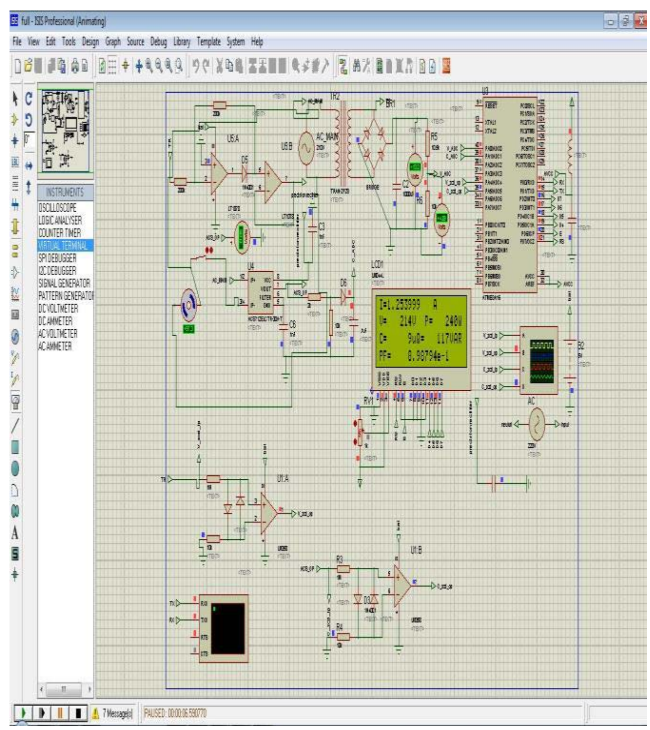


Figure 8 : Circuit Simulation

The output of the Bluetooth Module (Via UART) is shown in Fig 9.

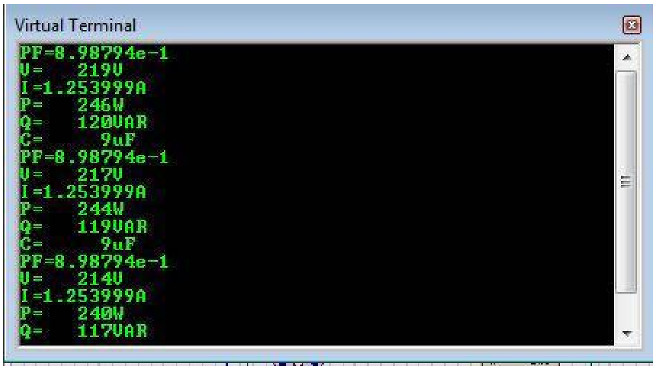


Figure 9 : Bluetooth Module output (Via UART)

The flow chart of the proposed automatic power factor Detection using Android application via Bluetooth module is shown in Fig 10.

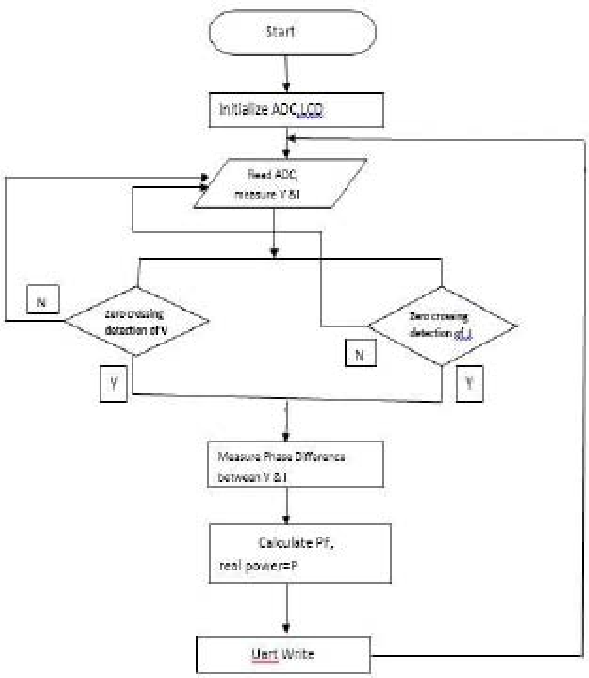


Figure 10 : Flow Chart of the Project

As can be seen from the flow chart, the sequence of operation depicted clearly. The process runs continuously in accordance with obtained logic. Vrms and Irms are read by the Microcontroller using ADC ports. After the zero crossing of voltage and current Signals, which are converted to square-waves, are provided to Microcontroller. Power Factor is measured by the Microcontroller from manipulating of capture module for V and I signals. After measuring the Power factor then microcontroller calculate the real power, reactive power, apparent power and value of capacitor. All the measured value are transmitted via UART.

V. Hardware Implementation

In reference to figure 1, the transmitting and receiving side can be described as follows:

a) Transmitting side

Heart of the project is the microcontroller ATMEGA 16.For measuring the line Voltage in this project we have used a step down transformer (220/12V) to converting the line voltage from 220V to 12V. Then, a bridge rectifier has been used to converting the 12 V ac to 12 V dc; after that, voltage divider have been applied to converts the 12 V to 5 V because the microcontroller works at maximum 5 V after that we connect it into a microcontroller pins. For current here we used a Hall Effect current sensor and connect the sensor output to another microcontroller pin. From this two pin the microcontroller measures the line voltage and current through ADC. For measuring zero crossing of voltage and current here we used a current transformer and potential transformer and the output ZCD are connected with microcontroller pins and microcontroller measures the phase angle between voltage and current .the Bluetooth module power is given from external power source (4V battery). Bluetooth module communicates with atmeg16 through UART. RXD of Bluetooth module is connected with TXD of atmega16 and TXD of Bluetooth module is connected to RXD of atmega16.

b) Receiving side

In receiver Side an Android Phone is available which is connected with transmitting side via Bluetooth Module CI Android Apps [6]. The apps can communicate with Bluetooth Module HC-06. The password of the module is 1234. The communication protocol is UART and baud rate is 9600[4].

In view of the descriptions above, the implemented hardware can be found in figure 10.

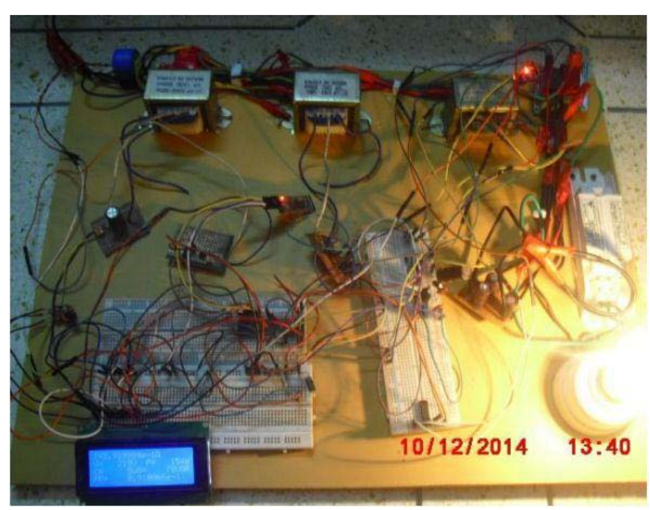


Figure 11 : Implemented Hardware model

As viewed from figure 11, Automatic Power factor detection system to be found. In figure 12, the corresponding representation appears in the LCD display with the Voltage, Current, Power factor, real power, reactive power and the value of Capacitor. The view from Android Phone is also shown in figure 12.

Figure 12 : Android Phone output

VI. Future Prospects

In The view of a wide and short range of possibilities on the basis of Bluetooth based power factor Detection system, a few has been depicted below:

- Improvements to human-machine interface.
- Load controlling.
- Load status checking and fault detection.
- Capacitor Switching etc.

Also this project work has not been tested on synchronous motor because of the requirement of considerable expense. It needs the further enhancement of the system. Finance is a critical issue for further enhancement.

VII. Conclusion

This Project has proposed the advanced method of the power factor Detection by using the Atmega16 and Android application via Bluetooth module which has the many advantages over the various conventional methods of the Power factor compensation. The microcontroller always monitor power factor, voltage and current and it always send the current status of the load via Bluetooth module. This project gives more reliable and user friendly power factor detection. Thus we have presented the Possible advanced method for the detection of the power factor.

References Références Referencias

1. Md Asaduzzaman Nur, Mehdi Hasan Sourov, M. S. Muhit & Md Khaled Hossain, ''Fault Analysis and Electrical Protection of Distribution Transformers" E-Journal_GJRE_(F)_Vol_14_Issue_3.
2. Thiyagarajan & T.G. Palanivel ''AN EFFICIENT MONITORING OF SUBSTATIONSUSING MICROCONTROLLER BASED MONITORING SYSTEM'' IJRRAS 4 (1).July 2010.
3. Datasheet of Atmega16" http://www.atmel.com/images/7766s.pdf"
4. Datasheet of Bluetooth module HC-06" http://www.micro4you.com/files/ElecFreaks/Bluetooth%20HC-06.pdf "
5. Wadhwa, C. L. (2005). ''Electrical Power Systems''. New Age International (P) Ltd., Publishers: New Delhi. Pp. 656-657.
6. Google play store "Bluetooth module CI".
7. Grainger, John J. (2003). Power System Analysis. Tata McGraw-Hill. p. 380. ISBN 978-0-07-058515-7.
8. MD Asaduzzaman Nur, Jahidul Islam, Md.Golam Mostofa, Moshiul Alam Chowdhury," Transmission Line Fault Detection Using Android Application via Bluetooth" E-Journal_GJRE_(F)_Volume 14 Issue 8 Version 1.0 Year 2014.
9. Alexander, C.K. And Sadiku, M.N.O. (2000). "Fundamentals of Electric Circuit" United States of America: McGraw-Hill Companies, Inc.
10. Pranjali Sonje, Anagha Soman'' Power Factor Correction Using PIC Microcontroller" IJEIT- Volume 3, Issue 4, October 2013.

This page is intentionally left blank

Global Journal of Researches in Engineering: F
Electrical and Electronics Engineering
Volume 15 Issue 3 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Four Ports Wideband Pattern Diversity MIMO Antenna

By Ramling P. Manurkar & Veeresh G. Kasabegoudar
MBES College of Engineering, India

Abstract- In this paper a broadband four ports MIMO antenna with pattern diversity is presented. To obtain pattern diversity, four microstrip feeding lines are printed on one side of the substrate where as the modified ground plane is printed on the other side. These microstrip lines generate orthogonal radiation patterns. In annular slot four shorts are placed between the microstrip lines to maintain isolation more than 25dB. The antenna operates in the range of frequencies from 2.3GHz to 12.6GHz (nearly 139%) which covers FCC defined wireless applications. Besides FCC, the proposed antenna covers WLAN and Wi-Max applications. A design and optimization of proposed geometry is done in Ansoft's HFSS 13. Simulated and measured reflection coefficients, coupling coefficients and radiation patterns are presented.

Keywords: *broadband antenna, pattern diversity antenna, slot antenna and ultra wide band (UWB) antenna.*

GJRE-F Classification : *FOR Code: 090699*

FOURPORTSWIDEBANDPATTERNDIVERSITYMIMOANTENNA

Strictly as per the compliance and regulations of :

Four Ports Wideband Pattern Diversity MIMO Antenna

Ramling P. Manurkar [α] & Veeresh G. Kasabegoudar [σ]

Abstract- In this paper a broadband four ports MIMO antenna with pattern diversity is presented. To obtain pattern diversity, four microstrip feeding lines are printed on one side of the substrate where as the modified ground plane is printed on the other side. These microstrip lines generate orthogonal radiation patterns. In annular slot four shorts are placed between the microstrip lines to maintain isolation more than 25dB. The antenna operates in the range of frequencies from 2.3GHz to 12.6GHz (nearly 139%) which covers FCC defined wireless applications. Besides FCC, the proposed antenna covers WLAN and Wi-Max applications. A design and optimization of proposed geometry is done in Ansoft's HFSS 13. Simulated and measured reflection coefficients, coupling coefficients and radiation patterns are presented.

Keywords: broadband antenna, pattern diversity antenna, slot antenna and ultra wide band (UWB) antenna.

I. Introduction

One important challenge to design a compact antenna for multiple applications is smaller and thinner terminals with increasing operating frequency bands and performance. Bandwidth enhancement is major requirement to design printed antenna for different applications, like WLAN, cellular and cordless phones. These applications are used in urban environments where multipath propagation and fading may occur.

To mitigate channel fading and improve transmission quality, antenna diversity technique is efficient. There are several types of diversity, such as pattern, polarization and space diversity has been used [1, 2]. The signals are combined in several ways to optimize the output signal power or signal to noise ration. In diversity method, selection includes combining of signals, where highest SNR is selected. The signals from all branches are compared with respective received signal [3].

The correlation between received signals shows the diversity performance [4]. If correlation is high then the combining efficiency is reduced. In spatial diversity method, decoupling between signals is achieved by maintaining separation between antennas. This scheme is difficult to implement in mobile handsets because of space restriction. To overcome this drawback pattern diversity and polarization diversity schemes are investigated [5, 6]. These techniques use two or more co-located antennas with different radiation patterns. To receive signal horizontally and vertically, dipole or microstrip antennas are used [7]. Microstrip antennas are widely used for diversity schemes due to their low cost. However, these suffer from narrow bandwidth. To extend bandwidth, many solutions are proposed including impedance matching networks, substrates with low dielectric constants or parasitic patches on the top of main patch [8] etc.

Slot antennas traditionally demonstrated a large bandwidth than microstrip antennas. For example in [9], slot with two feeding ports for pattern diversity applications is used. Pattern diversity antennas have been proposed in many literatures and carried out with different methods. In [10] two monopoles were used to provide pattern diversity. The T-shaped network was used to feed antenna with operating frequency range of 1790-2200 MHz, was achieved. In [11], a planar dual port diversity antenna was presented, which operates with broadside and conical radiation patterns in H-plane. In this geometry, operating bandwidth of 50% is achieved for diversity. In [12] pattern diversity is achieved by dual ports microstrip antenna with two shorts to maintain isolation above 15dB between these two ports. The annular slot is used for pattern diversity. The total bandwidth is increased up to 120%.

In this paper, we extended the work reported in [12]. Here, we designed annular ring slot with four ports. Furthermore, geometry of [12] uses air gap which makes the whole geometry as delicate and difficult to assemble. To overcome this FR4 material is used to fabricate the proposed prototype. Also, the substrate is easy to handle as compared to air dielectric material. The simulated and measured return loss, isolation between ports, and radiation patterns are presented. Antenna geometry is presented in Section 2. Section 3 presents geometry optimization procedure. Experimental results and discussions are covered in Section 4. Finally, the work is concluded in Section 5.

II. Antenna Design

In this section, the annular slot antenna which generates four orthogonal patterns is proposed for diversity applications in multipath fading environment. The proposed annular slot microstrip antenna, wideband behavior was achieved. To obtain wideband with pattern diversity, two more ports have been inserted

Author α σ: P. G. Dept., MBES College of Engineering, Ambajogai, India. e-mails: ramling.manurkar@gmail.com, veereshgk2002@rediffmail.com

in [12] geometry as shown in Figure 1. Four shorts are placed in antenna, in order each shorts between feed lines. These shorts are placed to obtain high isolation between ports. Good isolation between ports is achieved when single short is placed between ports.

The proposed antenna is printed on FR4 dielectric material with thickness of 0.8 mm. The annular slot is etched on square chassis of 100 x 100 mm^2. The antenna is fed with four microstrip lines printed on bottom side of substrate and shown in Figure 1. The microstrip feed lines terminated with sub-tuned patches to match the antenna to characteristics impedance of microstrip line.

Table 1 : Dimensions of the optimized geometry

Parameter	L	R_{in}	R_{out}	L_{feed}	L_1	W_{feed}	$W1$
Value (mm)	100	12	26	25.6	9.4	1.2	7.2

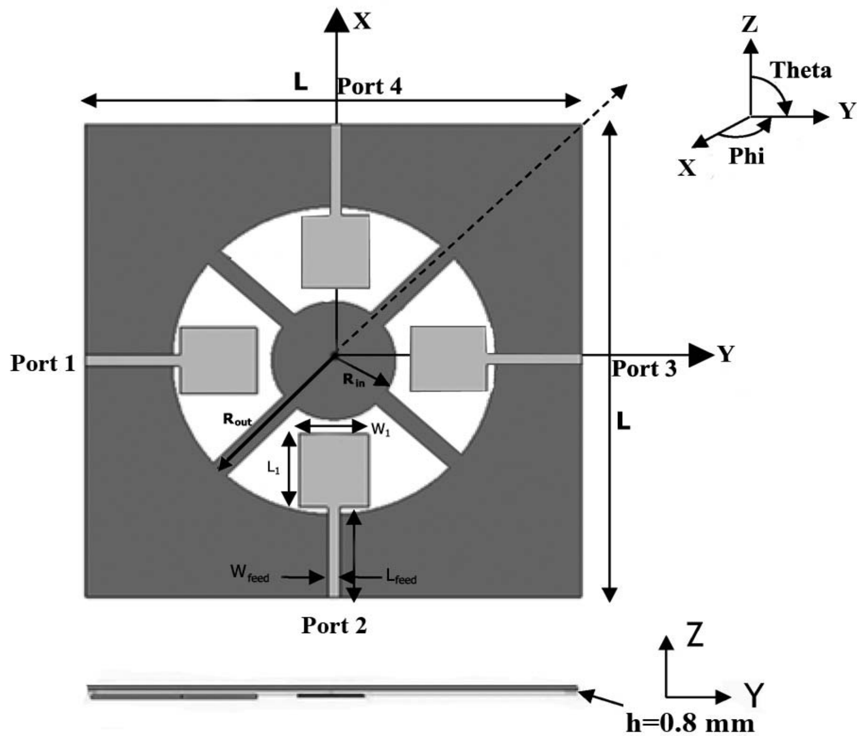


Figure 1 : The proposed geometry of annular slot antenna (light grey: bottom view; darker grey: top view)

III. Geometry Optimization and Discussions

In this section parametric study is conducted by optimizing the proposed geometry of antenna. The key design parameters used for optimization are inner radius R_{in}, patch length L_1, patch width W_1, and feed width W_{feed}. All simulations were carried out in HFSS 13 software. Here the parameters of R_{in}, L_1, W_1, W_{feed} are considered (one at a time keeping other parameters constant) to investigate the effect of each of these parameters on the antenna's performance.

a) Effect of Inner Radius

The inner radius (R_{in}) of the circle is varied in steps of 1 mm from 10 mm to 13 mm by keeping all other parameters constant. The simulated results of reflection coefficient of antenna with varying R_{in} are shown in Figure 2. From these characteristics it may be noticed that the good bandwidth of antenna is obtained for R_{in}= 12 mm.

b) Effect of Patch Length

In this study, keeping inner radius (R_{in}) constant, the patch length L_1 was varied (9mm to 9.8mm in step of 0.2mm) to investigate its effect on the antenna geometry. Results of this study are presented in Figure 3. These results indicate that the geometry offers good bandwidth for L_1=9.4 mm.

c) Effect of Patch Width

In another effort, the patch width W_1 is varied (6.8mm to 7.6mm) in steps of 0.2mm. The simulated reflection coefficient characteristics of this study are shown in Figure 4. From these simulated results, it may be noticed that optimum bandwidth can achieved for W_1 =7.2mm.

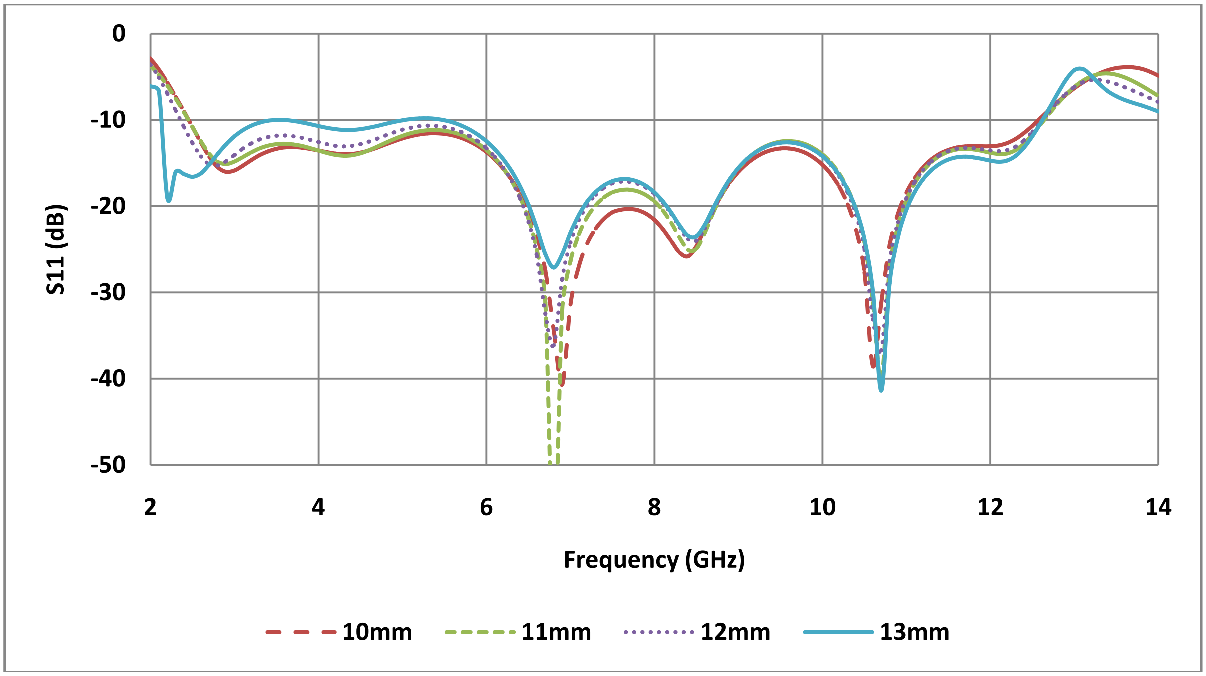


Figure 2 : The effect of inner radius R_{in} on reflection coefficient characteristics.

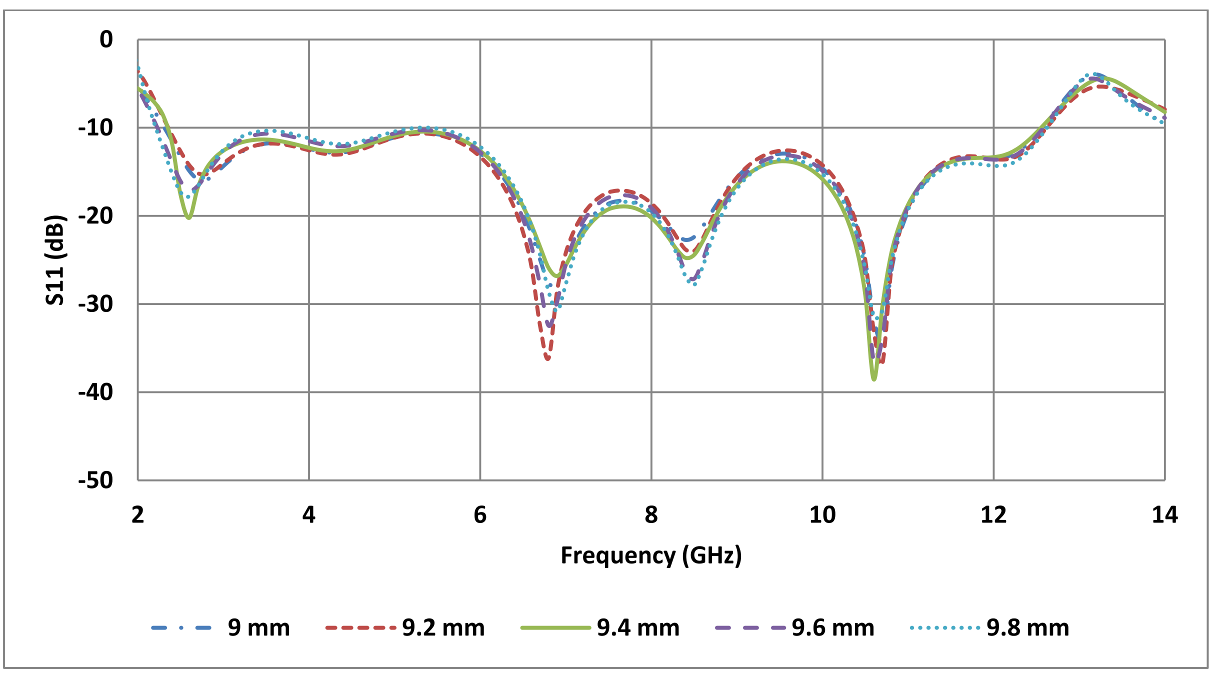


Figure 3 : The effect of patch length L_1 on reflection coefficient characteristics

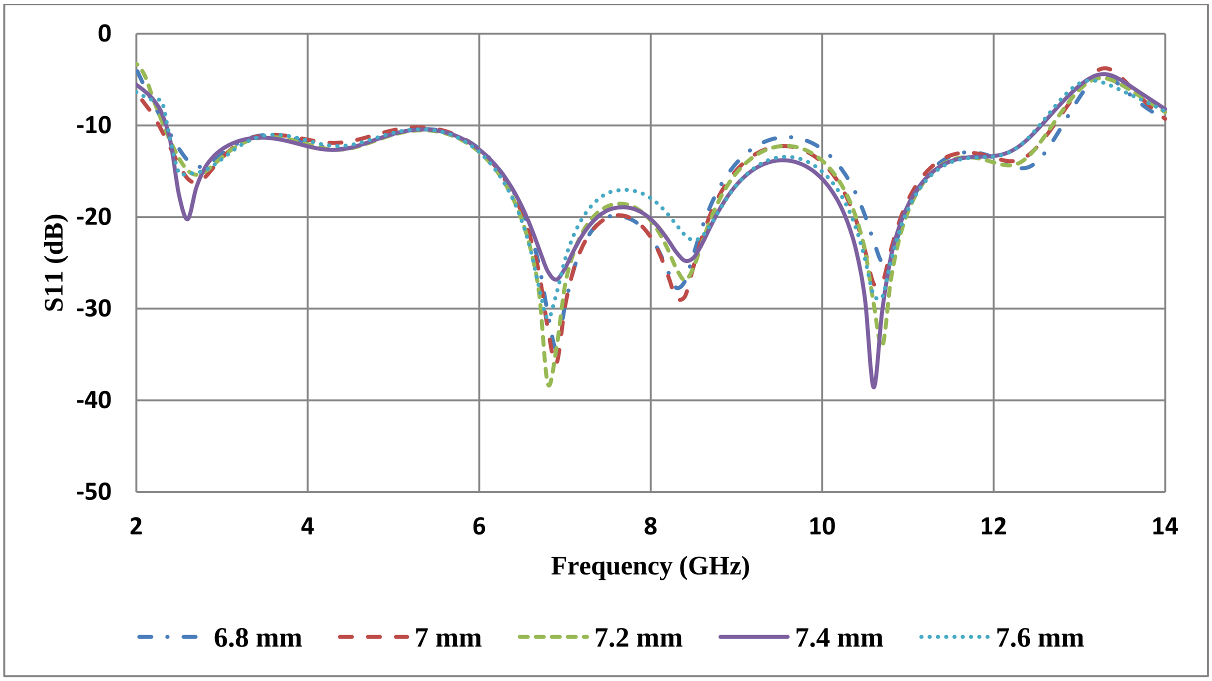


Figure 4 : The effect of patch width W_1 on reflection coefficient characteristics.

d) Effect of Feed Width

Finally, keeping all parameters discussed in earlier subsections constant, feed width (W_{feed}) of antenna was varied from 1mm to 1.4mm in steps of 0.2mm. The simulated characteristics for various feed widths are presented in Figure 5. By observing these characteristics it may be noted that the bandwidth of antenna is optimum for feed width equal to 1.2mm.

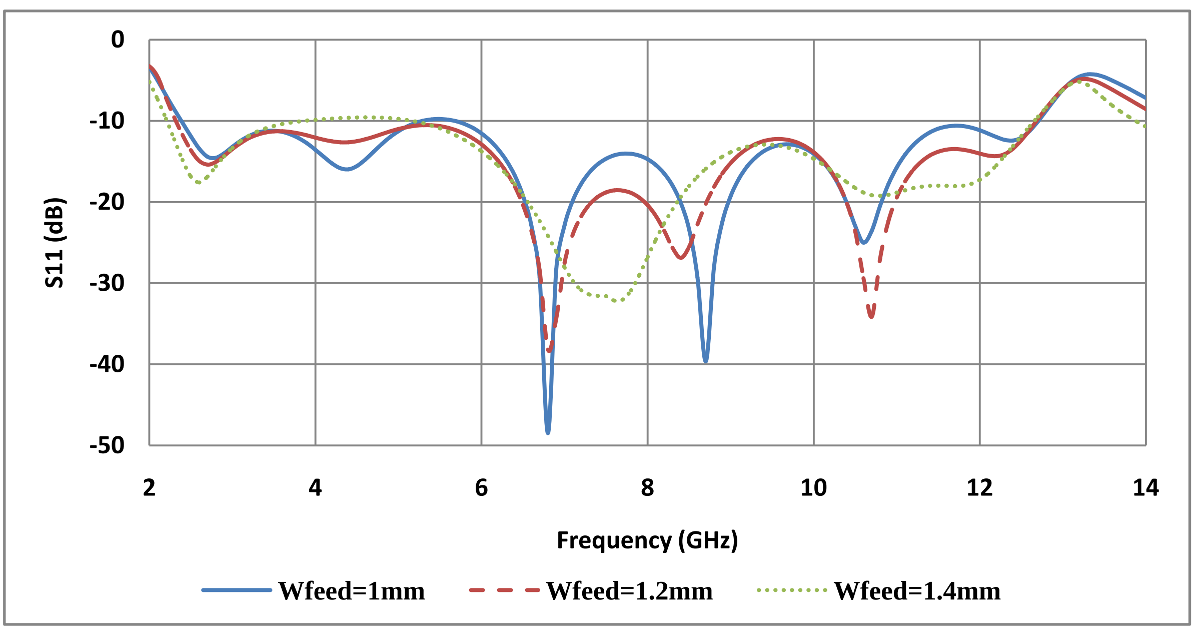
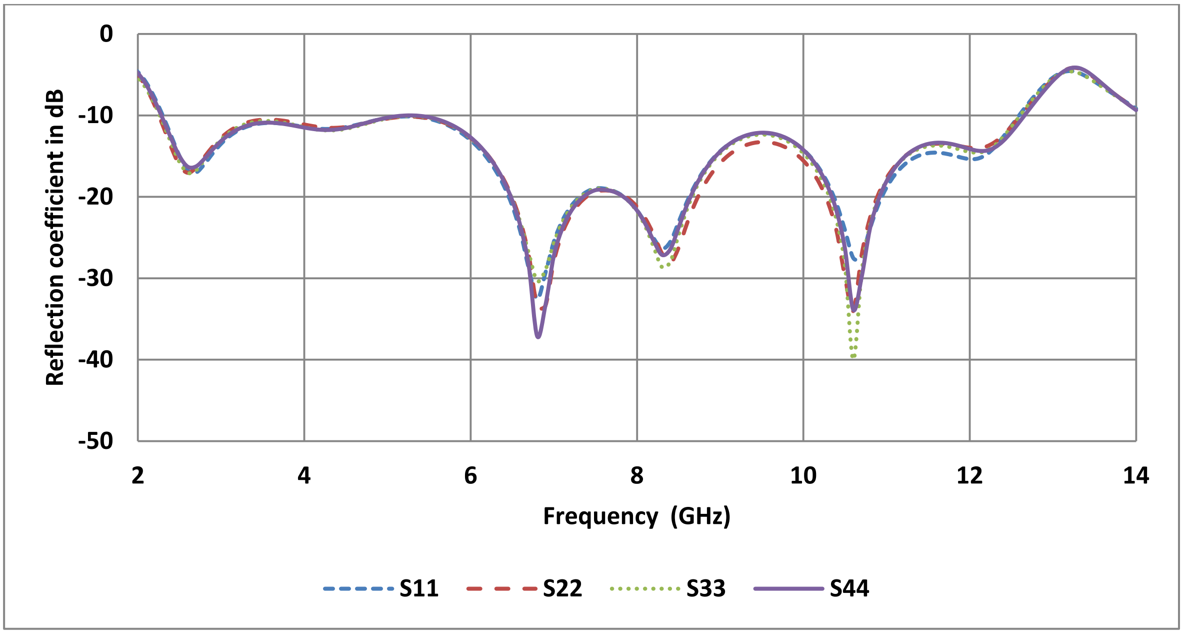
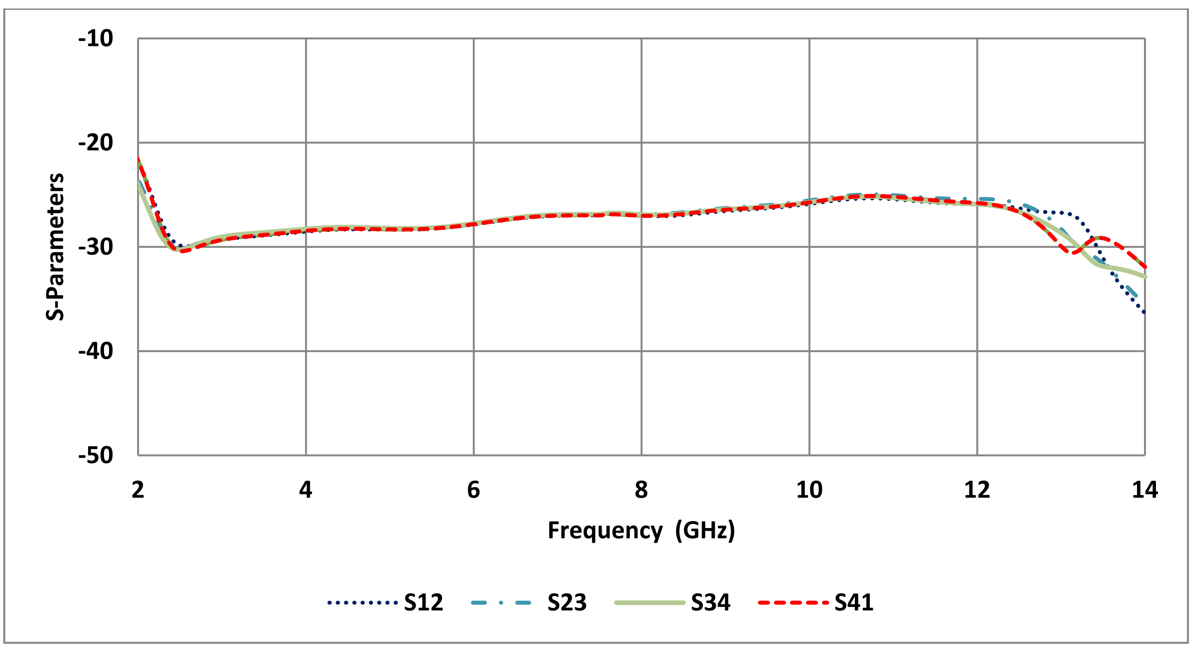


Figure 5 : The effect of feed width W_{feed} on reflection coefficient

From the parametric study conducted, it may be noted that the geometry with its dimensions listed in Table 1 offers optimum performance. The reflection coefficient characteristics and mutual coupling coefficients of the proposed optimum geometry are depicted in Figure 6. From these results it may be noted that the antenna offers 139% impedance bandwidth. Also, the mutual coupling is well below -20dB throughout the band of operation.



(a)

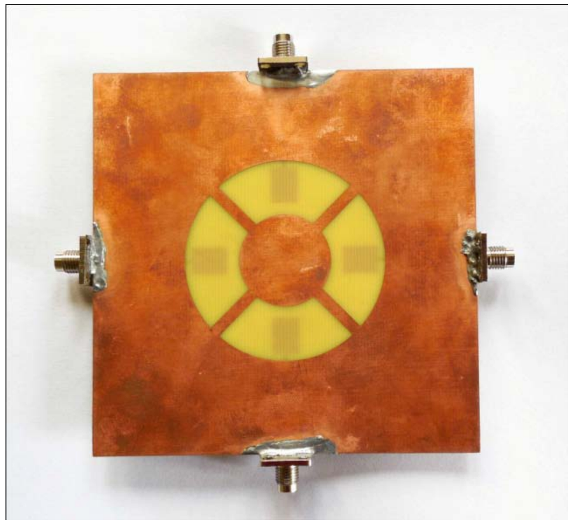


(b)

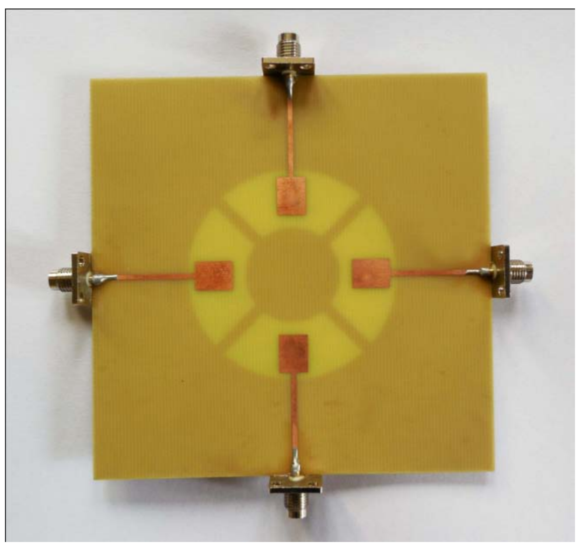
Figure 6 : Simulated results (a) Reflection coefficient (b) Coupling coefficient

IV. Experimental Validation of the Geometry and Discussions

The proposed geometry shown in Figure 1 with its optimized dimensions listed in Table 1 is fabricated on FR4 substrate having dielectric constant of 4.4 and thickness of 0.8mm. The photograph of fabricated prototype is shown in Figure 7. In Figure 8, the setup of measurement of reflection coefficient of antenna in real environment is shown. Reflection coefficient characteristics of measured results are compared with simulated values in Figure 9. In Figure 9 only S_{11} is presented as all ports are symmetrical. The measured results slightly mismatch with the simulated values which may be due to inaccuracies in the fabricated prototype. Simulated radiation patterns at different frequencies in the operating band are presented in Figure 10. From these patterns it may be noted that the patterns remain nearly stable across the band of operation. Also, omni-directional patterns are obtained in the H-plane suitable for broadcasting applications.



(a)



(b)

Figure 7 : Photograph of fabricated prototype (a) Front side (b) Back side

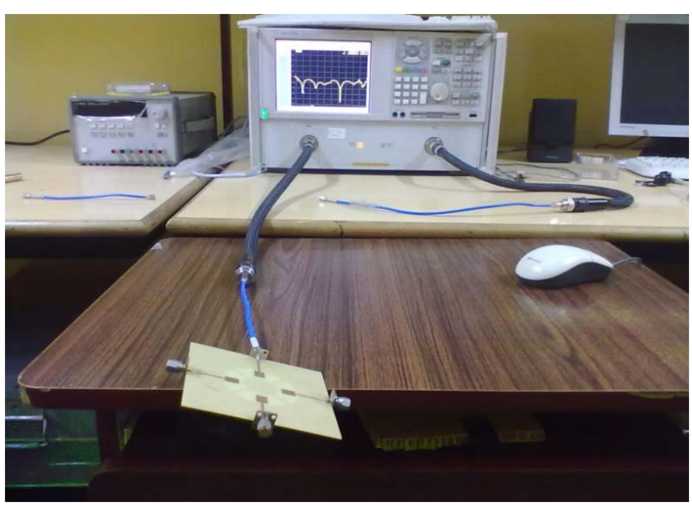


Figure 8 : Photograph of measurement setup

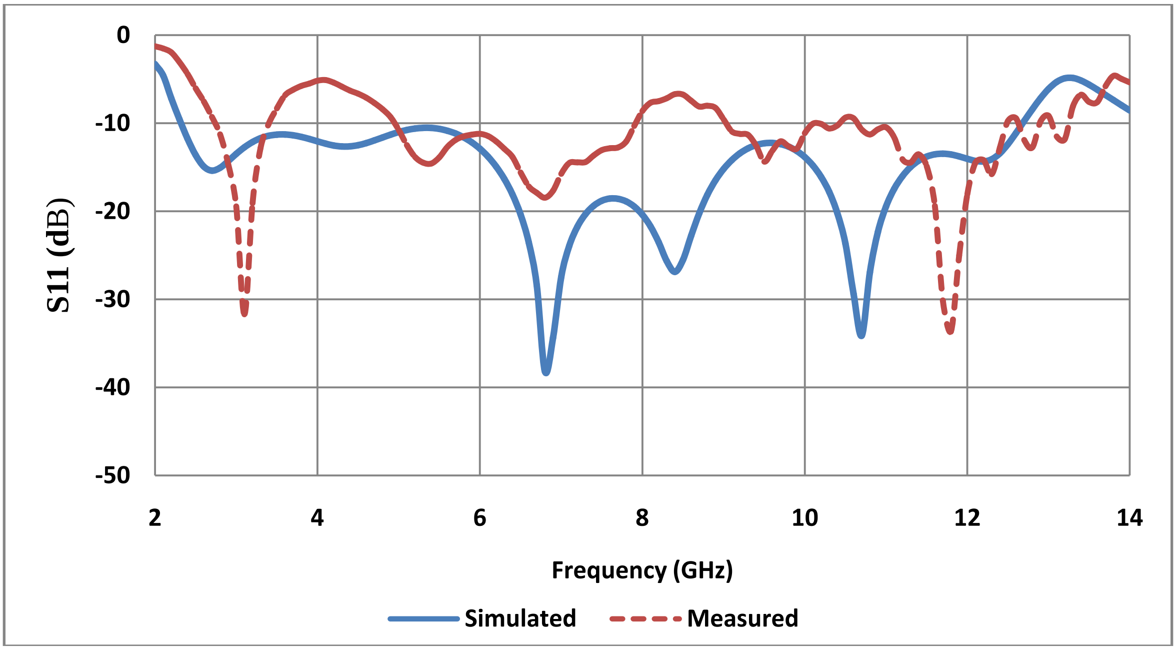
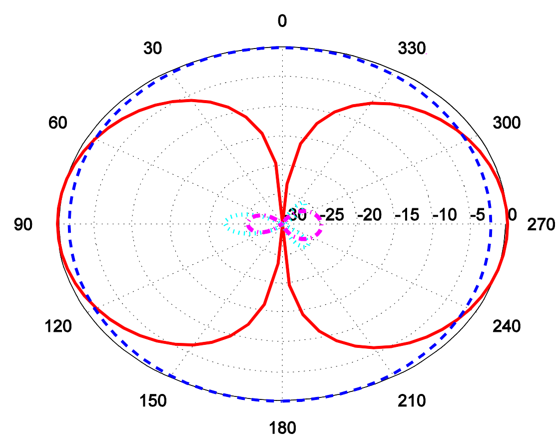
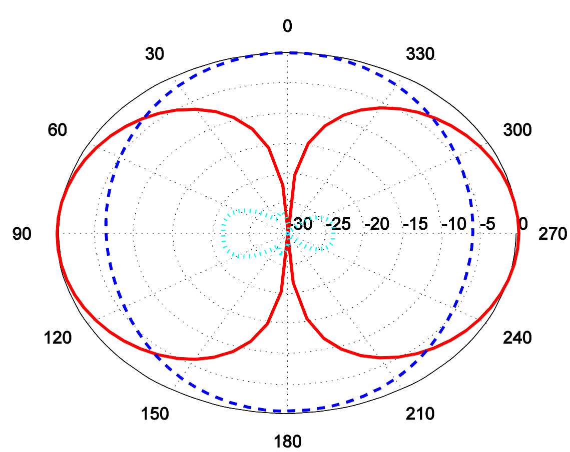


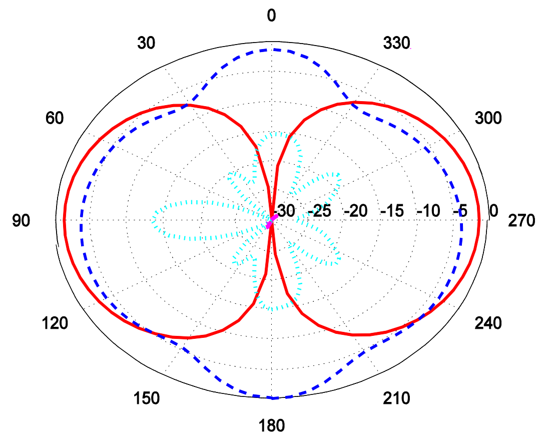
Figure 9 : Comparison of simulated and measured S_{11}



(a) Radiation patterns at 2.7GHz.



(b) Radiation patterns at 6.8GHz.



(c) Radiation patterns at 10.7GHz

Figure 10 : Radiation patterns at different frequencies in the operating band (Red (solid-line): E co-poln.; Blue (dashed-line): H_co-poln.; Cyan (dotted-line): E cross-poln.; Magenta (dash-dot-line): H cross-poln.)

V. Conclusions

Four ports wideband pattern diversity antenna has been presented. The antenna is etched on chassis of 100x100mm^2 fed with four microstrip lines printed on backside of the substrate. Four shorts are inserted to increase the isolation between the ports & to improve the performance of antenna. Various characteristics of the antenna are presented and satisfactory performance was achieved. The antenna covers the FCC defined UWB band of frequencies. The proposed antenna offers an impedance bandwidth of 139% in the frequency range of 2.3GHz to 12.6GHz. Also, the geometry produces stable and omni-directional patterns with good gain over the band of operation. Besides this the antenna exhibits good performance for all four ports, and hence the geometry is suitable for diversity applications.

References Références Referencias

1. X. Wang, Z. Feng, and K.-M. Luk, "Pattern and polarization diversity antenna with high isolation for portable wireless devices", *IEEE Antennas Wireless Propag. Lett.*, vol. 8, pp. 209–211, 2009.
2. A. Khaleghi and M. Kamyab, "Reconfigurable single port antenna with circular polarization diversity," *IEEE Trans. Antennas Propag.*, vol. 57, no. 2, pp. 555–559, Feb. 2009.
3. P. Gkonis, G. Tsoulos, and D. Kaklamani, "Dual code Tx diversity with antenna selection for spatial multiplexing in MIMO-WCDMA networks", *IEEE Comm. Lett.*, vol. 13, no. 8, pp. 570–572, Aug. 2009.
4. K. Boyle, "Radiation patterns and correlation of closely spaced linear antennas", *IEEE Trans. Antennas Propag.*, vol. 50, no. 8, pp. 1162–1165, Aug. 2002.
5. K. Wei, Z. Zhang, W. Chen, and Z. Feng, "A novel hybrid-fed patch antenna with pattern diversity", *IEEE Antennas Wireless Propag. Lett.,* vol. 9, pp. 562–565, 2010.
6. S.-L. S. Yang, K.-M. Luk, H.-W. Lai, A.-A. Kishk, and K.-F. Lee, "A dual-polarized antenna with pattern diversity", *IEEE Antennas Propag. Mag.*, vol. 50, no. 6, pp. 71–79, Dec. 2008.
7. Y. Huang, A. Nehorai, and G. Friedman, "Mutual coupling of two collocated orthogonally oriented circular thin-wire loops", *IEEE Trans. Antennas Propag.*, vol. 51, no. 6, pp. 1307–1314, 2003.
8. K. Ghorbani and R. B. Waterhouse, "Dual polarized wide-band aperture stacked patch antennas", *IEEE Trans. Antennas Propag.*, vol. 52, no. 8, pp. 2171–2175, Aug. 2004.
9. J.-Y. Jan and L.-C. Wang, "Printed wideband rhombus slot antenna with a pair of parasitic strips for multiband applications", *IEEE Trans. Antennas Propag.*, vol. 57, no. 4, pt. 2, pp. 1267–1270, Apr. 2009.
10. Y. Ding, Z. Du, K. Gong, and Z. Feng, "A novel dual-band printed diversity antenna for mobile terminals", *IEEE Trans. Antennas Propag.*, vol. 55, no. 7, pp. 2088–2096, Jul. 2007.
11. W. Toh, Z. Chen and T. Ping, "A planar UWB diversity antenna," *IEEE Trans. Antennas Propag.,* Vol. 57, no. 11, pp. 3467-3473, Nov. 2009.
12. M. Gallo, E. Davin, M. Bataller, M. Bozzetti, J. Maria and L. Llacer, "A broadband pattern diversity annular slot antenna", *IEEE Trans. Antennas Propag.,* vol. 60, no. 3, pp. 1596-1600, Mar. 2012.

Global Journals Inc. (US) Guidelines Handbook 2015

www.GlobalJournals.org

Fellows

FELLOW OF ASSOCIATION OF RESEARCH SOCIETY IN ENGINEERING (FARSE)

Global Journals Incorporate (USA) is accredited by Open Association of Research Society (OARS), U.S.A and in turn, awards "FARSE " title to individuals. The 'FARSE' title is accorded to a selected professional after the approval of the Editor-in-Chief /Editorial Board Members/Dean.

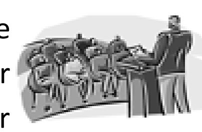
- The "FARSE" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSE or William Walldroff, M.S., FARSE.

FARSE accrediting is an honor. It authenticates your research activities. After recognition as FARSE, you can add 'FARSE' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, and Visiting Card etc.

The following benefits can be availed by you only for next three years from the date of certification:

FARSE designated members are entitled to avail a 40% discount while publishing their research papers (of a single author) with Global Journals Incorporation (USA), if the same is accepted by Editorial Board/Peer Reviewers. If you are a main author or co-author in case of multiple authors, you will be entitled to avail discount of 10%.

Once FARSE title is accorded, the Fellow is authorized to organize a symposium/seminar/conference on behalf of Global Journal Incorporation (USA).The Fellow can also participate in conference/seminar/symposium organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent.

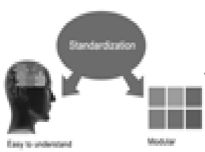


You may join as member of the Editorial Board of Global Journals Incorporation (USA) after successful completion of three years as Fellow and as Peer Reviewer. In addition, it is also desirable that you should organize seminar/symposium/conference at least once.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The FARSE can go through standards of OARS. You can also play vital role if you have any suggestions so that proper amendment can take place to improve the same for the benefit of entire research community.

As FARSE, you will be given a renowned, secure and free professional email address with 100 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.



The FARSE will be eligible for a free application of standardization of their researches. Standardization of research will be subject to acceptability within stipulated norms as the next step after publishing in a journal. We shall depute a team of specialized research professionals who will render their services for elevating your researches to next higher level, which is worldwide open standardization.

The FARSE member can apply for grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A. Once you are designated as FARSE, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria. After certification of all your credentials by OARS, they will be published on your Fellow Profile link on website https://associationofresearch.org which will be helpful to upgrade the dignity.

The FARSE members can avail the benefits of free research podcasting in Global Research Radio with their research documents. After publishing the work, (including published elsewhere worldwide with proper authorization) you can upload your research paper with your recorded voice or you can utilize chargeable services of our professional RJs to record your paper in their voice on request.

The FARSE member also entitled to get the benefits of free research podcasting of their research documents through video clips. We can also streamline your conference videos and display your slides/ online slides and online research video clips at reasonable charges, on request.

The FARSE is eligible to earn from sales proceeds of his/her researches/reference/review Books or literature, while publishing with Global Journals. The FARSE can decide whether he/she would like to publish his/her research in a closed manner. In this case, whenever readers purchase that individual research paper for reading, maximum 60% of its profit earned as royalty by Global Journals, will be credited to his/her bank account. The entire entitled amount will be credited to his/her bank account exceeding limit of minimum fixed balance. There is no minimum time limit for collection. The FARSE member can decide its price and we can help in making the right decision.

The FARSE member is eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get remuneration of 15% of author fees, taken from the author of a respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account.

MEMBER OF ASSOCIATION OF RESEARCH SOCIETY IN ENGINEERING (MARSE)

The ' MARSE ' title is accorded to a selected professional after the approval of the Editor-in-Chief / Editorial Board Members/Dean.

The "MARSE" is a dignified ornament which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., MARSE or William Walldroff, M.S., MARSE.

MARSE accrediting is an honor. It authenticates your research activities. After becoming MARSE, you can add 'MARSE' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, Visiting Card and Name Plate etc.

The following benefitscan be availed by you only for next three years from the date of certification.

MARSE designated members are entitled to avail a 25% discount while publishing their research papers (of a single author) in Global Journals Inc., if the same is accepted by our Editorial Board and Peer Reviewers. If you are a main author or co-author of a group of authors, you will get discount of 10%.

As MARSE, you will be given a renowned, secure and free professional email address with 30 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders,Auto-Responders, Email Delivery Route tracing, etc.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time.This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The MARSE member can apply for approval, grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.

Once you are designated as MARSE, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria.

It is mandatory to read all terms and conditions carefully.

Auxiliary Memberships

Institutional Fellow of Open Association of Research Society (USA)-OARS (USA)

Global Journals Incorporation (USA) is accredited by Open Association of Research Society, U.S.A (OARS) and in turn, affiliates research institutions as "Institutional Fellow of Open Association of Research Society" (IFOARS).

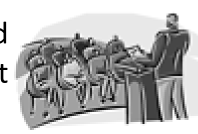
The "FARSC" is a dignified title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as "Institutional Board of Open Association of Research Society"-(IBOARS).

The Institute will be entitled to following benefits:

The IBOARS can initially review research papers of their institute and recommend them to publish with respective journal of Global Journals. It can also review the papers of other institutions after obtaining our consent. The second review will be done by peer reviewer of Global Journals Incorporation (USA) The Board is at liberty to appoint a peer reviewer with the approval of chairperson after consulting us.
The author fees of such paper may be waived off up to 40%.

The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.

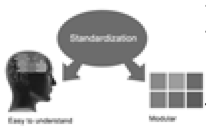


The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.

The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of "Open Association of Research Society, U.S.A (OARS)" so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.

The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.



After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
The board can also take up the additional allied activities for betterment after our consultation.

The following entitlements are applicable to individual Fellows:

Open Association of Research Society, U.S.A (OARS) By-laws states that an individual Fellow may use the designations as applicable, or the corresponding initials. The Credentials of individual Fellow and Associate designations signify that the individual has gained knowledge of the fundamental concepts. One is magnanimous and proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice.

Open Association of Research Society (US)/ Global Journals Incorporation (USA), as described in Corporate Statements, are educational, research publishing and professional membership organizations. Achieving our individual Fellow or Associate status is based mainly on meeting stated educational research requirements.

Disbursement of 40% Royalty earned through Global Journals : Researcher = 50%, Peer Reviewer = 37.50%, Institution = 12.50% E.g. Out of 40%, the 20% benefit should be passed on to researcher, 15 % benefit towards remuneration should be given to a reviewer and remaining 5% is to be retained by the institution.

We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth $ 2376 USD.

Other:

The individual Fellow and Associate designations accredited by Open Association of Research Society (US) credentials signify guarantees following achievements:

- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.

- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10%discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
- The Fellow can become member of Editorial Board Member after completing 3yrs.
- The Fellow can earn 60% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.
- Fellow can also join as paid peer reviewer and earn 15% remuneration of author charges and can also get an opportunity to join as member of the Editorial Board of Global Journals Incorporation (USA)
- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

"

- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

"

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.

(II) Choose corresponding Journal.

(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

(B) If you are using Internet Explorer, then Direct Submission through Homepage is also available.

(C) If these two are not conveninet , and then email the paper directly to dean@globaljournals.org.

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.

Preferred Author Guidelines

MANUSCRIPT STYLE INSTRUCTION (Must be strictly followed)

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, “Abstract” word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

You can use your own standard format also.
Author Guidelines:

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript’s Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

1. GENERAL

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

Scope

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

Journals Inc. (US) are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

2. ETHICAL GUIDELINES

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.

Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals Inc. (US) and Editorial Board, will become the copyright of the Global Journals Inc. (US).

Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission

The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.

2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.

Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5.STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

Structure

All manuscripts submitted to Global Journals Inc. (US), ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .

You must strictly follow above Author Guidelines before submitting your paper or else we will not at all be responsible for any corrections in future in any of the way.

Before start writing a good quality Computer Science Research Paper, let us first understand what is Computer Science Research Paper? So, Computer Science Research Paper is the paper which is written by professionals or scientists who are associated to Computer Science and Information Technology, or doing research study in these areas. If you are novel to this field then you can consult about this field from your supervisor or guide.

TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. Pick a good study spot: To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

Index

save our planet

Global Journal of Researches in Engineering

Visit us on the Web at www.GlobalJournals.org | www.EngineeringResearch.org
or email us at helpdesk@globaljournals.org

9 70116 58698 2 61427>
ISSN 9755861