ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA:3.21) NIRF-2020 Rank Band: 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE

Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.

काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत

కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము

(An Autonomous Institute under Kakatiya University, Warangal)

(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

Estd-1980 KITSW

website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in ✆ : +91 9392055211, +91 7382564888

TECHNICAL MAGAZINE

A.Y. 2020-21

DEPARTMENT OF

ELECTRICAL & ELECTRONICS ENGINEERING

Technical Magazine Committee:

Editor	:	**Prof. C. Venkatesh**	**HoD, EEE Dept.**
Members	:	**Dr. M. Santhosh**	**Asst. Prof., EEE Dept.**
		Sri K. Srinivas	**Asst. Prof., EEE Dept.**

CONTENTS

Technical Magazine Committee:

Editor	:	Prof. C. Venkatesh	HoD, EEE Dept.
Members	:	Dr. M. Santhosh	Asst. Prof., EEE Dept.
		Sri K. Srinivas	Asst. Prof., EEE Dept.

Message by HoD

With great pleasure and honour I write this foreword. Indeed, this **Technical Magazine** has a lot to look forward. **I am happy that our department started in the year 1994 with B.Tech-EEE programme has completed 25 years during 2019-20. During these 25 years EEE department has crossed several milestones and contributed to society in the form of education to engineering students**.

Started with B.Tech – EEE in 1994 with an intake of 60 later enhanced to an intake of 120 in the year 2012. PG programme of M.Tech-Power Electronics was started in the year 2013. B.Tech-EEE program has been accredited by NBA three times under Tier-II from 2011-14 and 2016-19. **I am glad to inform that now B.Tech-EEE program has been *accredited by NBA under Tier-I* for three years from 1st July 2019.**

Faculty have contributed whole heartedly for the growth of the Department. The Department has also witnessed the strong force of faculty. At present the Department has faculty strength 34 with diversity of specialization, out of which 18 of them have Doctorates, 10 are pursuing PhD and 06 are with M.Tech. There are four research groups in the department – **Power Electronics, Power systems, Electrical Machines & Drives, Control Systems and Instrumentation.**

The objective of Technical Magazine is to display the research culture in the department and publications made by the department faculty in terms of Journals / Transactions / Conference Papers during the academic year. Also, it provides an opportunity to students to publish technical articles.

I would like to offer a word of thanks to our readers, our contributors, and our editorial board for their support of the technical magazine and its mission: to improve the quality of research contribution and awareness on recent trends & life-long learning among students. This technical magazine will provide a glimpse of faculty and student contributions made during academic year 2020-2021.

Prof. C. Venkatesh
HOD, EEE Dept.

Faculty publications - Journals

List of Journals published by Faculty during A.Y. 2020-21:

S.No.	Name of the Faculty	Title of the Paper	Name of the Journal	Details of Paper
1	Prof. V. Ramaiah	Overview of Restructured Power System	Springer - Innovations in Electrical and Electronics Engineering. Lecture Notes in Electrical Engineering, vol 626., Singapore.	https://doi.org/10.1007/978-981-15-2256-7_29
2	Dr.V.Rajagopal	Optimization of controller gains to enhance power quality of standalone wind energy conversion system	Int. J. Emerg. Electr. Power Syst. 2021; (IJEEPS)	https://doi.org/10.1515/ijeeps-2021-0024
3	Sri. M. Narasimha Rao	Single-Phase PV System with Continuous H-Bridge Inverter	Springer - Innovations in Electrical and Electronics Engineering. Lecture Notes in Electrical Engineering, vol 626., Singapore.	https://doi.org/10.1007/978-981-15-2256-7_30
4	Dr. B. Jagadish Kumar	Investigations on recharge boost converter	Journal of Informational and Computational Science	ISSN: 1548-7741
5	Dr. B. Jagadish Kumar	Transparent Solar Cells	Journal of Information and Computational Science	ISSN: 1548-7741
6	Dr. B. Jagadish Kumar	Certain investigations on two input integrated buck and buck-boost converter	International Journal of Science Technology and Management	ISSN: 2394-1537
7	Dr. B. Jagadish Kumar	Investigations on performance of Flyback and Buck-Boost converters in PV energy conversion system	Kala Sarovar (UGC Care Group-1 Journal)	ISSN:0975-4520
8	Dr. B. Jagadish Kumar	Investigations On Multi Input Integrated Buck-Sepic Converter	International Journal of Science Technology and Management	ISSN: 2394-1537

9	Dr. B. Jagadish Kumar	Investigations On Changing The Electrical Safety Culture	Journal of Information and Computational Science	ISSN: 1548-7741
10	Sri. C. Pavan Kumar	Single-Phase PV System with Continuous H-Bridge Inverter	Springer - Innovations in Electrical and Electronics Engineering. Lecture Notes in Electrical Engineering, vol 626., Singapore.	https://doi.org/10.1007/978-981-15-2256-7_30
11	Dr. D. Rakesh Chandra	Short-term electric power load forecasting using factor analysis and long short-term memory for smart cities	Intl. J Circ Theor Appl., John Wiley & Sons, Ltd.	2021;49:1678–1703.
12	Dr. V. Prakash	Single-Phase PV System with Continuous H-Bridge Inverter	Springer - Innovations in Electrical and Electronics Engineering. Lecture Notes in Electrical Engineering, vol 626., Singapore.	https://doi.org/10.1007/978-981-15-2256-7_30
13	Dr. V. Prakash	Overview of Restructured Power System	Springer - Innovations in Electrical and Electronics Engineering. Lecture Notes in Electrical Engineering, vol 626., Singapore.	https://doi.org/10.1007/978-981-15-2256-7
14	Dr. V. Ashok	Fault Diagnosis Scheme for Cross-Country Faults in Dual-Circuit Line With Emphasis on High-Impedance Fault Syndrome	IEEE SYSTEMS JOURNAL, VOL. 15, NO. 2, JUNE 2021	Digital Object Identifier 10.1109/JSYST.2020.2991770
15	Dr. V. Ashok	Optimized ensemble of regression tree-based location of evolving faults in dual-circuit line	Springer Neural Computing and Applications	https://doi.org/10.1007/s00521-020-05628-6(0123456789
16	Dr. V. Ashok	Fault Location Scheme for Cross-Country Faults in Dual-Circuit Line Using Optimized Regression Tree	Electric Power Components and Systems, 0(0): 1–33, 2021 # 2021 Taylor & Francis Group, LLC	ISSN: print / online DOI: 10.1080/15325008.2020.1856232
17	Dr. V. Srikanth	Stability Analysis on Torsional Interactions of Turbine-Generator connected with DFIG-WECS using Admittance Model'	IEEE Transactions on Power Systems.	https://doi.org/10.1109/TPWRS.2020.2992111.

18	Dr. B. Pradeep Kumar	Identification and Localization of Array Faults with Optimized Placement of Voltage Sensors in a PV System	IEEE Transactions on Industrial Electronics	DOI:10.1109/TIE.2020.2998750
19	Dr. B. Pradeep Kumar	Identification of Pre-existing/Undetected Line-to-Line Faults in PV Array Based on Pre-turn ON/OFF Condition of the PV Inverter	IEEE Transactions on Power Electronics, vol. 35, no. 11, pp. 11865-11878, Nov. 2020,	doi: 10.1109/TPEL.2020.2987856
20	Dr. B. Pradeep Kumar	Estimation of PV Module Degradation Through Extraction of I-V Curve at Inverter Pre-Startup Condition	IET Renewable Power Generation	*IET Renew. Power Gener.*, 2020, Vol. 14 Issue. 17, pp. 3479-3486

Overview of Restructured Power System

Prakash Vodapalli and Ramaiah Veerlapati

Abstract Power restructuring, a systematic running of modifying the rules and instructions that control the power market to impart consumers for the option of power producing, those are may be traders and allowing rivalry within the traders. Deregulation improves the stock rate and usage. Due to gain in the electric market, the power rates are likely to come down which welfare the consumers.

Keywords Deregulation · Competition · Market · Efficiency · Cost

1 Introduction

It is happening throughout the world, there which is a worry concerning about re-modelling and re-regulation of the property market over the aftermost decade. The rivalry in the wholesale generation market and the retail market combined with the open entry to the delivered circuit can tie many benefits to the extreme consumers, such as lower electricity rates and better favour. However, this rivalry also escorts different productive issues and oppositions to the operation of re-modelled power circuit.

The re-modelling of the electricity branches is bracing by the economic opportunities to society resulting from the re-regulation of other communities such as communication, textiles, cement and airports. Presently, electrical utilities around the world are withstanding an extensive transformation from an essentially regulated and monopolistic industry to a new model distinguished by competition in generation/distribution [1, 2] with promised access to open transmission. Rivalries among the traders increases creation, thoughts and implementation efficiency. The target of re-regulation is to enable competitiveness based upon tropical efficiencies, and to erase the monopoly handling and market [3] imperfections that lie under the vertically integrated utility circuit.

P. Vodapalli (✉) · R. Veerlapati
Kakatiya Institute of Technology and Science, Warangal, India

H. S. Saini et al. (eds.), *Innovations in Electrical and Electronics Engineering*,
Lecture Notes in Electrical Engineering 626,
https://doi.org/10.1007/978-981-15-2256-7_29

Bochu Subhash, Veeramalla Rajagopal* and Surender Reddy Salkuti

Optimization of controller gains to enhance power quality of standalone wind energy conversion system

https://doi.org/10.1515/ijeeps-2021-0024
Received January 30, 2021; accepted April 25, 2021;
published online May 10, 2021

Abstract: This article presents optimized gains for regulation of frequency and terminal voltage irrespective of the varying wind speeds in an autonomous wind power generation feeding linear and non-linear loads. Icosφ control algorithm is used to calculate and estimate reference source currents in a remote area wind energy conversion system (WECS) using an Induction Generator (IG). The Icosφ control algorithm do not have any phase locked loop or any conversions from one reference frame to other, which improves the dynamics and power system quality issues. The heart of the control algorithm is how quickly it estimates the reference source currents; this in turn depends on values of proportional and integral controller gains in the control algorithm. Here we are applying three optimization techniques to find the optimal proportional-integral (PI) controller output gains, the best convergence values are taken from optimization technique and applied for WECS. Battery energy storage system (BESS) connected to the direct current (DC) link of voltage source converter (VSC) manages the power of WECS. When load useful power level is less than the generated power level, the excess will be diverted and stored in the battery. But when generated power level is less than the load applied on WECS then the excess power requirement of the load is met by the battery, thus regulating the frequency under varying wind speeds. An isolated zigzag transformer is connected between point of common coupling and controller for neutral line current compensation. The controller is used for load balancing, current harmonic suppression, voltage and frequency regulation.

Keywords: ant lion optimization (ALO); battery energy storage system (BESS); dragonfly optimization algorithm (DOA); particle swarm optimization (PSO); voltage and frequency controller (VFC); wind energy conversion system (WECS).

***Corresponding author: Veeramalla Rajagopal**, Department of Electrical and Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telangana, India, E-mail: vrg.eee@kitsw.ac.in. https://orcid.org/0000-0002-6947-3047
Bochu Subhash, Department of Electrical and Electronics Engineering, JNTU Hyderabad, Hyderabad, India, E-mail: subashbochu@gmail.com
Surender Reddy Salkuti, Department of Railroad Electrical Systems Engineering, Woosong University, Daejeon, South Korea, E-mail: salkuti.surenderreddy@gmail.com. https://orcid.org/0000-0002-3849-6051

1 Introduction

Nowadays, as per the Industrial and Technological world scenario the whole world is operating based on the electrical energy and it needs more electrical energy for consumers from hill areas to urban areas consumer as well as from small domestic equipments to industrial element and there is a greater power demand by the consumers across world and there is a maximum gap between consumer demand and the power generation due to decaying fossil fuels like coal and oil with high price fluctuations, releasing more harmful emissions and also impacting the climate change [1, 2]. In order to meet the Consumers demand which is increasing day by day, at this present scenario, many countries are looking forward for feasible, environment-friendly Non-Conventional power generation and placed a greater concentration due to non-polluting and it's numerous advantages [3, 4]. Power system engineers, planners are carefully examining many issues of technical feasibility of synchronizing the Non-Conventional power to the main transmission grid and furthermore, wind energy conversion system is a good method of supplying power to remote areas, hill areas consumers, those consumers are away and unable to connect to the main grid [1]. However, F. A. Ferret [5] given the wide views about the wind energy system and its potential in remote, hill areas and explained in literature about tapping technologies even it is in vast availability of large amount of wind energy potential across the world, the majority of wind potential is still untapped.

In order to tap the major amount of wind potential, the various technologies are developed, wind turbines are

Single-Phase PV System with Continuous H-Bridge Inverter

Vodapalli Prakash, Mucherla Narasimha Rao and Chillappagiri Pavan Kumar

Abstract Continuous piercing of photovoltaic grid systems are increasing gradually in all most all applications. It enhances the efficiency and successful application of solar system. In this paper, an inverter was drafted and run only solar PV system. The given system utilises sinusoidal pulse width modulation (SPWM) control scheme in the inverter to modify steady-state voltage from the battery, given to alternating loads and MPPT. Thus lessening the problems of the system, these MPPT methods which required to employing disturbance and observe methods have been initiated with the PV panel by indicating economic handling current to get desired power. Here presented to demonstrate the given system of competent behaviour.

Keywords Photovoltaic · Inverter · MPPT · SPWM

1 Introduction

The demand of effective and continuous power is required in the electricity operation. Present power systems are highly condemnatory and require proper and effective control. Everyone's moral duty is to the environmental kind of problems relating to the fossil resources and economic magnification. Among available natural sources, sunlight and wind energy have become very famous and demanding more due to the latest technology world. PV resources are used frequently nowadays with benefits such as free from pollution. Solar-electric source requirement slowly increases day-by-day. Because they are available at lower rates [1, 2]. Solar inverter is used to transform steady-state power which is used to get from PV modules, alternating power which is injecting to the load.

Power electronic change is a pointer component to improve the total efficiency and generation levels of PV grid-connected system. In the existing work, a vast diversity of PV system models which are entered depends on various types of

V. Prakash (✉) · M. Narasimha Rao · C. Pavan Kumar
Kakatiya Institute of Technology and Science, Warangal, India

H. S. Saini et al. (eds.), *Innovations in Electrical and Electronics Engineering*,
Lecture Notes in Electrical Engineering 626,
https://doi.org/10.1007/978-981-15-2256-7_30

INVESTIGATIONS ON RECHARGE BOOST CONVERTER

[1]Dr. B. Jagadish Kumar , [2]N.Ganesh

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science,Warangal,India,
bjk.eee@kitsw.ac.in
[2]M. Tech Student (PE),Kakatiya Institute of Technolgy and Science,Warangal,India,nknganesh09@gmail.com

ABSTRACT:

In this paper,A Boost converter with a coupled-inductor is explored.In the proposed,method a coupled inductor and a switch with low voltage rating is used for improving voltage gain.A passive regenerative snubber circuit is used for reviting energy of the stray inductance,makes the switch to operate in a wide range of duty cycle which relatively increase,the voltage gain,compared to coupled inductor-based converters.These scheme have voltage clamped properties,low voltage stress than output voltage made to choose low-voltage low conduction devices,with no reverse-recovery currents within diodes used in the circuit.Moreover,the closed loop control technique used to reduce the voltage drift problems.The proposed converter topology boost the voltage gain of a conventional Boost converter using single inductor, and mitigate the demagnetization of transformer and leakage inductor of coupled-inductor based converter.

Keywords: *Battery, Passive Regenerative snubber circuit,coupled-inductor, reverse recovery,fuel cells,proton exchange membrane.*

INTRODUCTION:

In present days,many industrial application require steep voltage ratio.For example,boost converters are used in hybrid electric vehicles (HEV) and lighting systems,telecommunication industry.By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic interference problem is more.Several converter topologies are proposed in past decades.

By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic Interference problem.Eventhough Voltage clamped techniques are used to decrease the reverse-recovery problem,The switch voltage stress is more and voltage gain is limited by turn-on time of the switch,a boost soft-single converter topology in pulse width modulation manner is used.The high-step up ratio is achieved by using coupled inductor and switch voltage accordingly,also improves the reverse-recovery problem of output diode.

TRANSPARENT SOLAR CELLS

Govulakonda Harshavardhan[1] , Dr.B.Jagadish Kumar[2]

[1]*B.Tech (UG) Student, Electrical & Electronics Engineering, Kakatiya Institute of Technology and science,(India), govulakondaharshavardhan19@gmail.com*

[2]*Associate professor, Electrical and Electronics Engineering Department, Kakatiya Institute of Technology and Science, (India),jagadeesh908@gmail.com*

ABSTRACT

There are places where people still live without basic needs such as electricity. They are the places which are isolated and as difficult environmental conditions to build power plant and transport electricity. So, by producing their energy source in their areas solemnly depending on natural resources would be the ultimate salvation for those who are in abysmal. This will become possible if we implement using transparent solar cells. Unlike conventional solar cells, transparent solar cells trap photons of invisible light, such as ultraviolet rays. The stripes of the photovoltaic cells convert these photons into electricity. Moreover, these cells can be used as windows in their house, mobile phone screens and can replace any glass used for commercial purpose. Since the title suggests "transparent", these cells allow visible light to pass through them. Therefore, transparent solar cells allow the useful light to echo and on the other hand, it converts the useless light into energy, where a conventional solar cell cannot.

Keywords:*Antireflection coating, Absorptive Spectrum, Photovoltaic cell, Transparent Substrate, Transparent electrode, Ultraviolet light.*

I. INTRODUCTION

Intense changes in energy conversions system are foreseen because of deficiency of conventional fuels. Fuel deposit on the planet will soon exhaust and fossil fuel scarcity will be maximum. The fundamental explanations behind the above are due to increasing demand for energy, rising population, fast development in innovation. Indiscriminate utilization of commercial energy has lead to genuine climate issues like air and water contaminations. People who are harnessing the utilization of alternate source of energy should please and accept the environmental conditions, low cost electrical energy as a replacement for energy from quickly draining resources of fossil fuels is the basic requirement for the endurance of humanity.

Solar energy is the biggest source of energy when compared to all the forms of renewable energy and it is the prominent source of energy. Since all other sources of renewable energy have vulnerable limitations. Solar energy is the boon for future generations because of its opulence and never-ending characteristics. This unicity of solar energy regards the non-renewable energy as unpromising. Solar energy can enlighten the world since it is the major source of energy. The potential of solar energy is baffling; which is 178 billion MW and this myriad value of energy will promise a whole new world. Statistically, 178 billion MW is about 20000 times the total energy consumption of the world. Moreover, the energy radiated by the sun on a sunny day is almost 1km/m2.

But the problem associated with the utilization of this legion of potential is its availability. We cannot promise the same radiation of the sun throughout the year because the radiation of the sun changes with time. Sadly, the variations appear even in

International Journal of Science Technology and Management
Volume No.09, Issue No. 06, June 2020
www.ijstm.com
ISSN 2394 - 1537

CERTAIN INVESTIGATIONS ON TWO INPUT INTEGRATED BUCK AND BUCK-BOOST CONVERTER

B. Jagadish Kumar[1], A. Anusha[2]

[1] Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

[2] Student,Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

ABSTRACT

The Multi Input Integrated Buck and Buck-boost converter is essentially a combination of buck and buck-boost converters. However, on account of integration only one inductor is sufficient enough for performing the power conversion. In order to have simple control strategy as well as simpler compensator design a single loop control scheme, voltage-mode and current-limit control, are proposed here for the power distribution. The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter.

Keywords: DC–DC converter, Multi input integrated converter, Multi input power converter, PI controller.

I. INTRODUCTION

The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter. A laboratory prototype is developed for experimental realization of the converter. The analysis, design, simulation, and experimental results of the converter prove that it is suitable in hybrid electric or renewable energy systems application.

ISSN:0975-4520
Vol-23 No.02(IV) July-September 2020

Investigations on performance of Flyback and Buck-Boost converters in PV energy conversion system

Dr. B. Jagadish Kumar
Associate Professor
Department of Electrical Engineering,
Kakatiya Institute of Technology & Science,
Warangal, Telangana State, India

Dr. B. Basavaraja Banakara
Registrar & Professor
Department of Electrical Engineering,
UBDTE College of Engineering (Autonomous),
Davangere University, Karnataka, India.

ABSTRACT— ***In this paper presents a three level & five-level inverters fed from photovoltaic (PV) and wind energy topology for grid-connected PV system with a pulse-width-modulated (PWM) control scheme. Some of the distributed power generation sources that are used to increase the total power produced in the world include renewable energy sources such as photovoltaic, wind, and geothermal. Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. Multilevel inverter structures have been developed to overcome shortcomings in solid-state switching device ratings so that they can be applied to high voltage electrical systems. The multilevel voltage source inverters unique structure allows them to reach high voltages with low harmonics. This makes unique power electronics topologies suitable for Flexible AC Transmission Systems and custom power applications. The use of a multilevel converter to control the frequency, voltage output including phase angle, real and reactive power flow at a dc/ac interface provides significant opportunities in the control of distributed power systems. In this work, new system architecture for hybrid Photovoltaic and Wind energy system is connected to the grid. This method allows the renewable energy sources to deliver the load together or independently depending upon their availability. The proposed inverter uses less number of switches when compared with the conventional Multilevel Inverter. The simulations results are obtained using MATLAB/SIMULINK software.***

Index Terms-- Photovoltaic (PV), Wind energy system, hybrid system and Multilevel Inverter

I. INTRODUCTION

The dc-dc converters are widely used in regulated switch mode dc power supplies and in dc motor drive applications. Often the input to these converters is an unregulated dc voltage ,which is obtained by rectifying the line voltage or by sources of renewable energy such as pv system , and therefore it will fluctuate due to changes in the line voltage magnitude . Switch mode dc-dc converter are used to convert the unregulated dc input into controlled dc output at a desired voltage level. DC-DC converter can be classified into two types, first one is non isolated converter and the second is isolated converter , Most power supplies and power electronics circuits are designed to meet some or all of the following requirements :

- It provides dc isolation.
- It stores the magnetic energy.
- It changes the voltage levels.
- The output voltages can be either positive or negative.
- Additional secondary transformer windings and rectifiers may be added to provide more.

Interleaved power converters can be very beneficial for high performance electrical equipment applications. Reductions in size and electromagnetic emission along with an increase in efficiency, transient response, and reliability. An interleaved design involving parallel operation, was evaluated as a means to reduce the burden on the output capacitor as well as the form factor and weight of the inductor. Additional benefits of interleaving include high power capability, modularity, and improved reliability of the converter. An interleaved topology, however, improves converter performance at the cost of additional inductors, power switching devices, and output rectifiers. Since the inductor is the largest and heaviest component in a power boost converter, the use of a coupled inductor, where a core is shared by multiple converters instead of using multiple discrete inductors, offers a potential approach to reducing parts count, volume, and weight. Coupled inductor topologies can also provide additional advantages such as reduced core and winding loss as well as improved input and inductor current ripple characteristics. Properly implemented, the coupled inductor can also yield a decrease in electromagnetic emission, an increase in

International Journal of Science Technology and Management
Volume No.09, Issue No. 06, June 2020
www.ijstm.com
ISSN 2394 - 1537

INVESTIGATIONS ON MULTI INPUT INTEGRATED BUCK- SEPIC CONVERTER

[1]B. Jagadish Kumar, [2]K. Sahithi,

[1]Associate Professor, Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology & Science, Warangal 506015, India

[2]UG Student, Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology & Science, Warangal 506015 ,India

ABSTRACT— The application of high-frequency switching converters and their controls in dc power distribution has been increasing in recent years . The major concern with recent dc distribution systems, such as in automotive and telecom power supply systems, is to meet the increased power demand and to reduce the burden on the primary energy source, i.e.,built-in battery. This is possible by adding additional power sources in parallel with the existing battery source. The additional power source can be a renewable energy source such as photovoltaic (PV) or fuel cell (FC) storage power . In this paper analysis and control of two-input buck integrated SEPIC converter, suitable for photovoltaic (PV) applications, is presented. This converter is essentially combination of individual buck and SEPIC converters

Keywords: DC–DC converter, Multi input integrated converter, power management, trailing-edge modulation.

I. INTRODUCTION

High frequency switching converters application in the dc power distribution is increasing in the recent years. . One of the main orientations in power electronics in the last decade has been the development of switching-mode converters with higher power density and low electromagnetic interference(EMI). As the power conversion system is becoming miniaturized, increasing the power density is one of the challenging issues for the power supply designers. Furthermore, light weight, small size and high power density are also some of the key design parameters. In the recent dc distribution systems the prominent issue, in automotive and telecom powersupply systems, is to meet the increasing power demand and reduce the burden on the primary energy source, i.e. built-inbattery. This is implemented by using additional power sources in parallel to the existing primary source. The additional power sources are (i) renewable energy sources like solar or wind, (ii) fuel cell storage power. **The** dc sources are connected in parallel to meet the common load demand. This parallel connection is preferred when: 1) the existing dc source is unable to meet the full load demand and 2) the power available from a cost-effective source is used in combination with the another source which supplies deficit demand. In any case,a power electronic converter is required for efficient handlingof power transfer. Converters can be paralleled in two differentways: 1) paralleling different power electronic converters at the load port and 2) connecting multiple sources through an integrated converter The various dc sources must be connected in parallel through an intermediate power electronic converter at the load port or through a single integrated converter. For two dc sources, the two-input integrated converter is preferred for power control as it results in a smaller number of components and simplicity in controller design. . A systematic approach for analyzing two-input integrated converters based on six basic topologies has been studied extensively . This reveals that the input sources can supply power to a load either individually or simultaneously without disturbing. One of such is, integrating buck and buck–boost converters,where power is drawn from low voltage and high-voltage dc sources and supplied to a common dc load. Eventhough, buck–boost converter integration in a double-input dc –dc converter works well for power transfer from a low-voltage source (LVS), the source current has more ripple content and requires an additional input filter. By using the SEPIC converter in place of the buck–boost converter gives an additional flexibility of voltage gain matching, low to high or vice versa, together with lesser source ripple current. One such double-input converter is studied, which is a combination of the buck and SEPIC topologies

II. MODELING AND ANALYSIS OF BUCKINTEGRATED SEPIC CONVERTER

The proposed BI-SEPIC is essentially a parallel combination of buck and SEPIC converter. However,to reduce the number of energy storage elements, the switching devices of the two converters are arranged so that o one inductor "L" on the load side is sufficient for processing the power in both of these converters.Having single inductor in the integrated topology shows order of the power

INVESTIGATIONS ON CHANGING THE ELECTRICAL SAFETY CULTURE

[1]Dr. B. Jagadish Kumar , [2]Pandilla Shivani

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science,Warangal,India,

jagadeesh908@gmail.com

[2]B. Tech III year Student (UG,)Kakatiya Institute of Technolgy and Science,Warangal,India,

b18ee026@kitsw.ac.in

Abstract: ***This paper analyses the ways to improve the electric safety culture in an organization .This analyses about the safety measures that was being taken and should be taken by the managements of any organization. Following few key issues are included in this paper. (i) The basic requirements of the electric safety culture are analyzed. (ii) By taking the past and present work practices in electrical safety culture into consideration, few suggestions are given to improve electric safety cultures in organization in future. The main argument of this paper is that representation of culture is the sum of what is commonly acceptable without analyzation and the most important thing included in this paper is that the training must be given to the non electrical personnel in order to avoid electric hazards and addressed the more difficult aspects of human performance in fair manner.***

Keywords: ***Beliefs, Electrical safety, Safety culture, non electrical personnel.***

I. INTRODUCTION

Electrical safety culture is nothing but it is the set of values, attitudes, goals of an organization. Responsibility of keeping workplace safe will be in the hands of every single individual working at an organization. When we compare working conditions of past and present there are a lot of developmental changes have taken place. The future developments will be done on the basis of past and present working conditions in the electrical organization.

A.Electrical Safety:

Protecting electrical workers of electrical organization from the dangerous effects of electric currents, electrical arc, etc.. is known as electrical safety. Every worker working at electrical organization including electrical and non electrical workers should be educated and should have knowledge on every single equipment that is being used.In order to create awareness among workers, A workshop was conducted by IEEE IAS. Fig 1.1 shows the logo of the workshop.

Figure 1.1:Electrical Workshop logo

Figure 1.2:Working with Energized and de energized equipment

Single-Phase PV System with Continuous H-Bridge Inverter

Vodapalli Prakash, Mucherla Narasimha Rao and Chillappagiri Pavan Kumar

Abstract Continuous piercing of photovoltaic grid systems are increasing gradually in all most all applications. It enhances the efficiency and successful application of solar system. In this paper, an inverter was drafted and run only solar PV system. The given system utilises sinusoidal pulse width modulation (SPWM) control scheme in the inverter to modify steady-state voltage from the battery, given to alternating loads and MPPT. Thus lessening the problems of the system, these MPPT methods which required to employing disturbance and observe methods have been initiated with the PV panel by indicating economic handling current to get desired power. Here presented to demonstrate the given system of competent behaviour.

Keywords Photovoltaic · Inverter · MPPT · SPWM

1 Introduction

The demand of effective and continuous power is required in the electricity operation. Present power systems are highly condemnatory and require proper and effective control. Everyone's moral duty is to the environmental kind of problems relating to the fossil resources and economic magnification. Among available natural sources, sunlight and wind energy have become very famous and demanding more due to the latest technology world. PV resources are used frequently nowadays with benefits such as free from pollution. Solar-electric source requirement slowly increases day-by-day. Because they are available at lower rates [1, 2]. Solar inverter is used to transform steady-state power which is used to get from PV modules, alternating power which is injecting to the load.

Power electronic change is a pointer component to improve the total efficiency and generation levels of PV grid-connected system. In the existing work, a vast diversity of PV system models which are entered depends on various types of

V. Prakash (✉) · M. Narasimha Rao · C. Pavan Kumar
Kakatiya Institute of Technology and Science, Warangal, India

H. S. Saini et al. (eds.), *Innovations in Electrical and Electronics Engineering*,
Lecture Notes in Electrical Engineering 626,
https://doi.org/10.1007/978-981-15-2256-7_30

Received: 12 October 2020 | Revised: 15 November 2020 | Accepted: 4 December 2020
DOI: 10.1002/cta.2928

ORIGINAL PAPER

WILEY

Short-term electric power load forecasting using factor analysis and long short-term memory for smart cities

Venkataramana Veeramsetty[1] | D. Rakesh Chandra[2] | Surender Reddy Salkuti[3]

[1]Center for AI and Deep Learning, Department of Electrical and Electronics Engineering, S R Engineering College, Warangal, India
[2]Department of Electrical and Electronics Engineering, KITS, Warangal, India
[3]Department of Railroad and Electrical Engineering, Woosong University, Daejeon, Republic of Korea

Correspondence
Surender Reddy Salkuti, Department of Railroad and Electrical Engineering, Woosong University, Daejeon, Republic of Korea.
Email: surender@wsu.ac.kr

Funding information
S R Engineering College Warangal, India and Woosong University, South Korea, Grant/Award Number: Academic Research Funding (2020-2021)

Summary
Electric load estimation is an important activity for electrical power system operators to operate the system stably and optimally. This paper develops a machine learning model with a long short-term memory and a factor analysis to predict the load at a specific hour of the day on an electrical power substation. Historical load data from the 33-/11-kV substation near Kakatiya University in Warangal are taken at each hour of the day for the period from September 2018 to November 2018. A new long short-term memory architecture with factor analysis is being designed based on the approach used to predict substation loads by simulation in Microsoft Azure Notebooks. Based on the study, it was found that the proposed design predicts loads with good accuracy.

KEYWORDS
day ahead market, load forecasting, long short-term memory, mean absolute error, self-adaptive Adam optimizer

1 | INTRODUCTION

Smart city is a well-established field with innovative development, strong connectivity, and increased integration. While innovations intended to enhance people's quality of life, there is an immediate need to create new cities because of the vast number of citizens who have chosen to live in the cities. This is one of the reasons why there is a growing curiosity in the trend of smart cities.[1]

Smart cities are faced with numerous obstacles, such as proposing new approaches to satisfy the need for load demand, though not raise generation capacity. Consumers have a chance to manage their energy in smart cities. Economic consumption is based on variation in consumption with the price. Different important steps in the area of sustainable energy markets should be treated based on outcomes obtained from demand management, including power plant preparation, buying petrol, and creating a maintenance schedule.[2] Economic consumption of power by consumers in the smart cities can be achieved by an effective load forecasting mechanism.

Electrical load forecasting helps electricity companies provide their end-users with safe and stable electricity. Power companies have some advantages with accurate load forecasting, such as reduced operating and maintenance costs, increased reliability, and can also make sound decisions for future development.[3,4] Electrical load forecasting is categorized into four categories based on forecasting time, such as very short-term, short-term, medium-term, and long-term load forecasting[5] as presented in Table 1.

Short-term electricity load forecasting is an important task for any electrical company to successfully trade energy on the energy markets. Power markets are divided into two categories based on trading time, such as hourly ahead

Single-Phase PV System with Continuous H-Bridge Inverter

Vodapalli Prakash, Mucherla Narasimha Rao and Chillappagiri Pavan Kumar

Abstract Continuous piercing of photovoltaic grid systems are increasing gradually in all most all applications. It enhances the efficiency and successful application of solar system. In this paper, an inverter was drafted and run only solar PV system. The given system utilises sinusoidal pulse width modulation (SPWM) control scheme in the inverter to modify steady-state voltage from the battery, given to alternating loads and MPPT. Thus lessening the problems of the system, these MPPT methods which required to employing disturbance and observe methods have been initiated with the PV panel by indicating economic handling current to get desired power. Here presented to demonstrate the given system of competent behaviour.

Keywords Photovoltaic · Inverter · MPPT · SPWM

1 Introduction

The demand of effective and continuous power is required in the electricity operation. Present power systems are highly condemnatory and require proper and effective control. Everyone's moral duty is to the environmental kind of problems relating to the fossil resources and economic magnification. Among available natural sources, sunlight and wind energy have become very famous and demanding more due to the latest technology world. PV resources are used frequently nowadays with benefits such as free from pollution. Solar-electric source requirement slowly increases day-by-day. Because they are available at lower rates [1, 2]. Solar inverter is used to transform steady-state power which is used to get from PV modules, alternating power which is injecting to the load.

Power electronic change is a pointer component to improve the total efficiency and generation levels of PV grid-connected system. In the existing work, a vast diversity of PV system models which are entered depends on various types of

V. Prakash (✉) · M. Narasimha Rao · C. Pavan Kumar
Kakatiya Institute of Technology and Science, Warangal, India

H. S. Saini et al. (eds.), *Innovations in Electrical and Electronics Engineering*,
Lecture Notes in Electrical Engineering 626,
https://doi.org/10.1007/978-981-15-2256-7_30

Overview of Restructured Power System

Prakash Vodapalli and Ramaiah Veerlapati

Abstract Power restructuring, a systematic running of modifying the rules and instructions that control the power market to impart consumers for the option of power producing, those are may be traders and allowing rivalry within the traders. Deregulation improves the stock rate and usage. Due to gain in the electric market, the power rates are likely to come down which welfare the consumers.

Keywords Deregulation · Competition · Market · Efficiency · Cost

1 Introduction

It is happening throughout the world, there which is a worry concerning about re-modelling and re-regulation of the property market over the aftermost decade. The rivalry in the wholesale generation market and the retail market combined with the open entry to the delivered circuit can tie many benefits to the extreme consumers, such as lower electricity rates and better favour. However, this rivalry also escorts different productive issues and oppositions to the operation of re-modelled power circuit.

The re-modelling of the electricity branches is bracing by the economic opportunities to society resulting from the re-regulation of other communities such as communication, textiles, cement and airports. Presently, electrical utilities around the world are withstanding an extensive transformation from an essentially regulated and monopolistic industry to a new model distinguished by competition in generation/distribution [1, 2] with promised access to open transmission. Rivalries among the traders increases creation, thoughts and implementation efficiency. The target of re-regulation is to enable competitiveness based upon tropical efficiencies, and to erase the monopoly handling and market [3] imperfections that lie under the vertically integrated utility circuit.

P. Vodapalli (✉) · R. Veerlapati
Kakatiya Institute of Technology and Science, Warangal, India

H. S. Saini et al. (eds.), *Innovations in Electrical and Electronics Engineering*,
Lecture Notes in Electrical Engineering 626,
https://doi.org/10.1007/978-981-15-2256-7_29

Fault Diagnosis Scheme for Cross-Country Faults in Dual-Circuit Line With Emphasis on High-Impedance Fault Syndrome

V. Ashok, *Member, IEEE*, and Anamika Yadav, *Senior Member, IEEE*

***Abstract*—In a power system network, transmission lines are exposed to atypical fault scenarios. The transmission line is the longest component in a power system and sometimes it passes through forest areas where the occurrence of cross-country faults (CCFs) associated with high-impedance fault (HIF) syndrome is more due to thunderstorms, cyclones, and poor vegetation management/tree trimming. Detection and classification of CCFs which are associated with HIF syndrome is the most challenging task. In this article, maximal overlap discrete wavelet packet transform (MODWPT) has been employed to extract the characteristics of the signals during CCF with HIF syndrome which are more complex and aperiodic/asymmetric/nonlinear. Thereafter, maximum change in wavelet packet energy of MODWPT coefficients of currents/voltages have been deliberated as unique features to design proposed fault diagnosis scheme for a dual-circuit transmission line. The efficacy of the proposed scheme has been investigated on the Chhattisgarh State Power Transmission Network. The proposed scheme is appraised with exclusive case studies such as switching of capacitor bank, switching of reactor string, switching of load/feeder, effect of power swing, nonlinear loads, lightly loading conditions, and measurement noise. The proposed scheme has been also validated on standard IEEE 13 bus distribution system with nonlinear loads to confirm its adaptability.**

***Index Terms*—Cross-country faults (CCFs), dual-circuit transmission line (DCTL), high-impedance faults (HIFs), maximal overlap discrete wavelet packet transform (MODWPT).**

I. Introduction

THE protection of dual-circuit transmission line (DCTL) is multifaceted owing to the influence of mutual coupling; likelihood of occurrence of intercircuit faults (ICFs), cross-country faults (CCFs), and evolving faults (EVFs) is more predominant because of the physical geometry of the conductors. The detection and classification of ICFs and CCFs by artificial neural network (ANN) is demonstrated in [1] and investigation of differential relaying schemes for CCFs is described in [2]. The effect of CCFs on distance relaying scheme is reported on a 132-kV transmission network in [3]. The zone-I distance relaying scheme for nonearthed CCFs and grounded CCFs is exemplified in [4] and [5], respectively. The multilocation faults (MLFs) and EVFs have atypical characteristics and unenviably disturb the efficacy of the distance relaying scheme. This is because of the fact that the CCF comprises faults at two different locations in dissimilar phases and EVF includes primary fault and secondary fault at different fault initiation times [6]. An algorithm using DWT (discrete wavelet transform) and ANN has been elucidated for shunt fault location including CCFs and EVFs in a single-circuit transmission line (SCTL) in [7]. An adaptive differential relaying scheme for CCFs and CT saturation using continuous wavelet transform approach is described in [8]. A novel relaying scheme for detecting MLFs in series-compensated DCTL is explained in [9]. The location of MLFs in series-compensated DCTL lines using ANN is elucidated in [10]. A case study on 400 kV DCTL of Chhattisgarh state transmission utility for CCFs and transforming faults using real-time digital simulator based on ANN has been reported in [11] and detection and classification of CCFs based on maximal-overlap discrete wavelet transform (MODWT) have been reported in [12]. These schemes do not consider the high-impedance fault (HIF) detection and classification.

High-impedance arcing fault identification method using DWT is discussed in [13] for a 154-kV Korean transmission line. The electromagnetic interference around the power line corridors using empirical mode decomposition with combination of quantile regression techniques has been reported for tree-based HIFs in [14]. An analytical model for HIF analysis has been reported by modeling an electric arc reflection coefficient in [15]. Detection of HIFs in power transmission networks with nonlinear loads using ANN is illustrated in [16] on a 110-kV transmission line. Models from field experiments have been developed for location of HIFs in [17]. Distributed constraints model for detection and classification of HIFs in transmission lines has been exemplified in [18]. An unsynchronized fault location scheme for HIFs in a 345-kV double-fed transmission system is demonstrated in [19]. A real-time evaluation of HIF detection using DWT in EHV transmission system is reported in [20] and a cumulative standard deviation sum-based approach for detection and classification of high resistance faults is illustrated in [21]. HIFs classification in a unified power flow controller (UPFC) compensated DCTL using differential power has been reported in [22]. Further alienation-based analysis of voltage signals for fault detection and classification is demonstrated in [23]. An HIF fault locator for series-compensated

Manuscript received December 17, 2019; revised March 21, 2020; accepted April 28, 2020. Date of publication May 25, 2020; date of current version June 16, 2021. This work was supported by the Central Power Research Institute, Bengaluru, under Project RSOP/2016/TR/1/22032016. (*Corresponding author: Anamika Yadav.*)

The authors are with the Department of Electrical Engineering, National Institute of Technology Raipur, Raipur 492010, India (e-mail: ashokjntuk@gmail.com; ayadav.ele@nitrr.ac.in).

Digital Object Identifier 10.1109/JSYST.2020.2991770

Neural Computing and Applications
https://doi.org/10.1007/s00521-020-05628-6

ORIGINAL ARTICLE

Optimized ensemble of regression tree-based location of evolving faults in dual-circuit line

Ashok Valabhoju[1] · Anamika Yadav[1] · Mohammad Pazoki[2] · Ragab A. El-Sehiemy[3]

Received: 11 February 2020 / Accepted: 11 December 2020

Abstract
In a dual-circuit transmission line, the location of evolving faults (EVFs) is more tiresome due to its multifaceted nature. In this paper, a novel data-mining-based scheme is proposed for location of EVFs by using an ensemble of regression trees, that is, bagged regression trees and boosted regression trees. This ensemble of regression tree modules is trained with optimized hyperparameters such as minimum leaf size, leaning cycles, and learning rate by using Bayesian optimization. A practical power transmission network of Chhattisgarh state is modeled/simulated in MATLAB software to employ the proposed fault location scheme. Exclusive datasets are provided by performing extensive simulation studies at a wide range of fault scenarios, thereby applying discrete wavelet transform as an explanatory signal processing technique. Further performance assessment is carried out by comparing different error metrics such as mean absolute error, mean absolute relative error, mean square error, and root mean square error. The simulation results confirm the applicability of the proposed scheme for fault location estimation, and it makes a research insight while designing relaying schemes to practical power transmission networks.

Keywords Fault location · Evolving faults (EVFs) · Discrete wavelet transform (DWT) · Dual-circuit transmission line (DCTL) · Data-mining model · Bagged regression tree (BGRT) · Boosted regression tree (BSRT)

1 Introduction

The power transmission line is the furthermost vulnerable component owing to its large physical dimension in power system networks. The thermal, electrical, mechanical, and environmental eccentricities are the foremost reasons for faults on transmission lines, which can be demarcated as common shunt faults (CSF), cross-country faults (CCF), and evolving faults (EVF). The EVFs can be categorized as ground faults that occur on diverse phases of the same circuit at the same locations at different fault inception times. For example, EVF (A1G-B1G) occurs on phase 'A1' at 15 km, and it is evolved to phase 'B1' after ½-cycle delay at the same location of circuit-I as shown in Fig. 1. Whereas Fig. 1a shows an EVF incepted on the dual-circuit transmission line (DCTL), and Fig. 1b–d shows three-phase currents of circuit-I of DCTL. A suitable protective system should be designed to recognize the fault, which, if undetected, could lead to damage of equipment or extended loss of service.

At present, in this unified power system network, the detection/location of EVFs is wearisome; none of the recent numerical distance relays are efficient enough. Generally, these transmission lines lying through the forest area, after thunderstorms/cyclones, occurrences of EVFs are most severe, and the location of EVFs by digital fault locators is not precise, and it misinforms the line patrolling

✉ Mohammad Pazoki
pazoki.m@du.ac.ir

Ashok Valabhoju
vashok.phd2016.ee@nitrr.ac.in

Anamika Yadav
ayadav.ele@nitrr.ac.in

Ragab A. El-Sehiemy
elsehiemy@eng.kfs.edu.eg

[1] Department of Electrical Engineering, National Institute of Technology Raipur, Raipur, India

[2] School of Engineering, Damghan University, Damghan, Iran

[3] Electrical Engineering Department, Faculty of Engineering, Kafrelsheikh University, Kafr El-Shaikh, Egypt

Published online: 06 January 2021

Electric Power Components and Systems, 0(0): 1–33, 2021

ISSN: print / online
DOI: 10.1080/15325008.2020.1856232

Fault Location Scheme for Cross-Country Faults in Dual-Circuit Line Using Optimized Regression Tree

Valabhoju Ashok,[1] Anamika Yadav ,[1] Mohammad Pazoki ,[2] and Almoataz Y. Abdelaziz [3]

[1]Department of Electrical Engineering, National Institute of Technology Raipur, Raipur, India
[2]School of Engineering, Damghan University, Damghan, Iran
[3]Faculty of Engineering and Technology, Future University in Egypt, Cairo, Egypt

CONTENTS

Abstract—In the double-circuit transmission line (DCTL), location of cross-country faults (CCFs) is more wearisome due to its intricate nature. The CCFs can occur at miscellaneous locations on dissimilar phases at the same fault inception time. Furthermore, the CCFs encompasses different fault locations which can mislead the line patrolling team and not only takes long hours to attend the fault location. Therefore, this may also cause electrical stress on the various power system components owing to tripping of circuit breaker repeatedly because of inappropriate fault clearance. In this context, an ensemble of regression tree (ERT) model-based fault location scheme is proposed using different regression trees such as Bagged Regression Trees (BGRT) and Boosted Regression Trees (BSRT). These regression tree modules have been trained with optimized hyper-parameters such as minimum leaf size, leaning cycles, and learning rate by using Bayesian optimization. A 400 kV, 50 Hz Chhattisgarh state power system (CSPS) network has been designed and simulated in MATLAB/Simulink to implement the proposed fault location scheme. Exclusive datasets have been designed at atypical fault scenarios thereby applying an exploratory signal processing technique such as Discrete Wavelet Transform (DWT). Additionally, the performance assessment has been done by comparing different error metrics. The simulation results reveal the applicability of the proposed ensemble regression tree (ERT) model for location of CCFs and it gives a research insight to adapt the same in the real power system network.

Keywords: fault location, DWT, ERT-ensemble of regression tree, BGRT-bagged regression tree, BSRT-boosted regression tree and double-circuit transmission line

Received 29 February 2020; accepted 23 October 2020

Address correspondence to Almoataz Y. Abdelaziz, Faculty of Engineering and Technology, Future University in Egypt, Cairo, Egypt. E-mail: almoatazabdelaziz@hotmail.com

1. INTRODUCTION

Among all the components in the power system network, a transmission line is the longest one and it is utmost susceptible to disturbances (faults). These transmission lines are frequently exposed to various type of faults such as common shunt faults (CSFs) and cross-country faults (CCFs). The CCFs are characterized as ground-faults which incept simultaneously on dissimilar phases of the same circuit at different locations. An appropriate relaying scheme should be designed to identify/spot the fault otherwise it causes

Stability Analysis on Torsional Interactions of Turbine-Generator Connected With DFIG-WECS Using Admittance Model

Srikanth Velpula, *Student Member, IEEE*, R. Thirumalaivasan, *Senior Member, IEEE*, and M. Janaki, *Senior Member, IEEE*

***Abstract*—To evaluate the stability of Subsynchronous Torsional Interactions (SSTI), we propose a simple and effective approach using admittance model. The proposed approach gives the subsynchronous conductance based criterion to find the stability of torsional interactions. The subsynchronous conductance based approach is utilized to evaluate the impact of Doubly-Fed Induction Generator based Wind Energy Conversion System (DFIG-WECS) on the torsional vibrations of nearby turbine-generator. The damping of Induction Generator Effect (IGE) and SSTI is analyzed through admittance model at different wind speed with various compensation level. The results of admittance analysis are validated through eigenvalue analysis and transient simulation. The results show that, the DFIG-WECS reduces the damping of torsional modes in the low frequency region of subsynchronous network mode. The damping of SSTI reduces with increase in wind speed. Hence, the DFIG-WECS significantly destabilizes the low frequency torsional modes at high wind speed with high compensation level. Further, it is found that, the network conductance at all critical torsional modes marginally reduces with Subsynchronous Damping Controller (SSDC) at the inner loop of Grid Side Converter (GSC) controller compared to other locations in DFIG converter controllers.**

***Index Terms*—Subsynchronous resonance (SSR), subsynchronous torsional interactions (SSTI), DFIG based wind energy conversion system (DFIG-WECS), admittance analysis, critical conductance, subsynchronous damping controller (SSDC).**

I. Introduction

THE integration of power converter based HVDC, solar system and Wind Energy Conversion System (WECS) into the power system may arise the SubSynchronous Interactions/SubSynchronous Oscillations (SSI/SSO) [1]–[15]. Depending upon the participation of different subsystems, the SSI is categorized into Subsynchronous Control Interactions (SSCI) and Subsynchronous Torsional Interactions (SSTI). The SSCI is the interaction between the power converter and the series compensated transmission line, whereas SSTI is the interaction between the power converter and torsional vibrations [2]–[4], [12]–[14]. The damping of SSTI depends on the operating modes of converter controllers and their parameters. It is notable that the power electronic converter may provide negative resistance in the subsynchronous frequency region, thereby destabilizes the torsional vibrations [1].

The high penetration of WECS into the power system led researchers to analyze the impact of full-scale converter and Doubly-Fed Induction Generator based WECS (DFIG-WECS) on Subsynchronous Resonance (SSR) characteristics [2]–[4], [8]–[19]. In [17], [18], the investigations on subsynchronous interactions of DFIG report that, in the absence of controller dynamics the damping of subsynchronous network mode (NM^{sub}) improves at high wind speeds, whereas the damping reduces with increase in compensation level. However, the controller dynamics have significant impact on the damping of NM^{sub} [15]–[18]. The converters of the DFIG-WECS with supplementary control signal can be used to mitigate SSR [8]–[13]. Also, the nonlinear control method is used to mitigate SSCI [20]–[22]. References [23], [24] report the SSR in DFIG based wind farms connected to series compensated line. The impedance model based stability criterion is proposed to evaluate the stability of subsynchronous network mode. The frequency response of impedance model depicts the SSR frequency; thereby the stability of SSR mode is evaluated. References [25], [26] investigate the impact of DFIG on the torsional interactions of turbine-generator connected to series compensated line at various operating conditions.

The Nyquist-criterion based methods, eigenvalue analysis, immittance model analysis and damping torque method are widely used to determine the small signal stability of SSR [1], [2], [5], [18], [19], [27]–[36]. Among aforementioned methods, the Nyquist-criterion based method using impedance model is tedious to apply on a meshed power system having multiple wind farms. Also, the Nyquist-criterion based method is a qualitative method, and may not provide the accurate findings about the damping and frequency of SSR [23], [24]. The computation of eigenvalues requires the detailed state space representation of the entire system including electrical and mechanical subsystems [5], [27], [32]. The damping torque method gives the damping provided by the electrical system, which uses the

Manuscript received December 7, 2019; revised February 22, 2020 and April 22, 2020; accepted April 26, 2020. Date of publication May 4, 2020; date of current version November 4, 2020. Paper no. TPWRS-01836-2019. *(Corresponding author: Thirumalaivasan Rajaram.)*

The authors are with the School of Electrical Engineering, Vellore Institute of Technology, Vellore 632014, India (e-mail: srikvelpula@gmail.com; thirumalai22@gmail.com; mjanaki74@gmail.com).

Color versions of one or more of the figures in this article are available online at https://ieeexplore.ieee.org.

Digital Object Identifier 10.1109/TPWRS.2020.2992111

Identification and Localization of Array Faults With Optimized Placement of Voltage Sensors in a PV System

B. Pradeep Kumar, *Graduate Student Member, IEEE*, Dhanup S. Pillai, *Member, IEEE*, N. Rajasekar, *Senior Member, IEEE*, Manickam Chakkarapani, and G. Saravana Ilango, *Senior Member, IEEE*

***Abstract*—The traditional protection devices installed in photovoltaic (PV) arrays generally detect line–line (LL) and line–ground (LG) faults when the fault current magnitude exceeds its threshold value defined by various international standards. However, the magnitude of fault current is greatly reduced, due to low irradiance levels, active maximum power point tracker, location of fault, minimal fault mismatch, and presence of blocking diodes. Consequently, majority of such faults remain obscured even when the irradiance reaches to a higher level and thereby constitute to reliability issues and severe fire risks. Therefore, both timely fault detection and localization become highly obligatory for sustainable power generation and safety. Thus, this article proposes a new, robust, and efficient fault localization method based on the principle of differential voltage measurement between PV modules of adjacent strings. For accomplishing this task, a new optimized voltage sensor arrangement with minimal number of sensors is followed. Moreover, the proposed convention 1) is proficient to detect any LL/LG faults independent of its detection challenges, 2) suits both grounded and floating PV systems, and 3) is compatible for systems with/without blocking diodes. For a realistic validation, testing has been performed on a small-scale grid-connected PV system and the efficacy in detecting various array faults is demonstrated via extensive investigations.**

***Index Terms*—Differential voltage measurement, LL faults, open-circuit fault, partial shading conditions, photovoltaic array.**

Manuscript received December 12, 2019; revised April 24, 2020; accepted May 8, 2020. Date of publication June 4, 2020; date of current version March 22, 2021. This work was supported by the Technology Mission division, Department of Science and Technology (DST), Government of India, under Grant Mission Innovation challenge IC#2 sanction order DST/TMD/MI/OGMI/2018/11(G). *(B. Pradeep Kumar and Dhanup S. Pillai are co-first authors.) (Corresponding authors: G. Saravana Ilango; N. Rajasekar.)*

B. Pradeep Kumar and G. Saravana Ilango are with the Department of Electrical and Electronics Engineering, National Institute of Technology, Tiruchirappalli 620015, India (e-mail: pradeep301327@gmail.com; gsilango@nitt.edu).

Dhanup S. Pillai is with the Solar Energy Research Institute of Singapore (SERIS), National University of Singapore, Singapore 11574 (e-mail: dhanup.pillai@nus.edu.sg).

N. Rajasekar is with the Solar Energy Research Cell, Department of Energy and Power Electronics, School of Electrical Engineering, Vellore Institute of Technology, Vellore 632014, India (e-mail: nrajasekar@vit.ac.in).

Manickam Chakkarapani is with the Department of Electrical and Electronics Engineering, Madanapalle Institute of Technology and Science, Madanapalle 517325, India (e-mail: chakra_nit@yahoo.com).

Color versions of one or more of the figures in this article are available online at https://ieeexplore.ieee.org.

Digital Object Identifier 10.1109/TIE.2020.2998750

I. Introduction

FAULT diagnosis in a photovoltaic array is crucial to enhance the system safety, reliability, and efficiency. Pertinent to international standards, array faults such as line–line (LL) and line–ground (LG) faults are conventionally detected using over current protection device (OCPD) and ground fault protection device (GFPD), respectively. However, certain faults are not cleared by these protection devices, particularly due to nonlinear PV operating characteristics, active maximum power point trackers (MPPTs), presence of blocking diodes, low fault mismatch levels, and low irradiance conditions [1]–[3]. More importantly, undetected array faults induce huge power loss and, even, it may create fire hazards [2]. In addition, PV output characteristics during most partial shading conditions (PSCs) are analogous to electrical faults [4]. As a result, there ascends an exigent demand to develop effective fault detection techniques to ascertain and differentiate the electrical array faults and partial shade conditions.

Among advanced fault detection techniques, multiresolution analysis and artificial intelligence (AI)-based techniques such as wavelets and fuzzy inference system in [5], artificial neural networks [6], support vector machine [7], random forest-based approach [8], and k-nearest neighbors (kNN) with nonparametric thresholds [9] are used to identify the faults. However, these methods require voluminous training data sets for efficient operation. However, detection approaches presented in [10] and [11] are based on the wavelets and necessitate advanced controllers and additional sensors in [11] (pyranometer and temperature sensors) for its implementation, making protection system expensive. Distinctive techniques based on time response analysis of externally injected signals such as time domain reflectometry [12] and spread spectrum time domain reflectometry (SSTDR) [13] are used for fault localization. However, hardware integration and distance between fault location and external device drastically affect the detection accuracy.

Besides, some techniques apply statistical difference measurement between simulated and field electrical quantities of PV

Identification of Pre-existing/Undetected Line-to-Line Faults in PV Array Based on Preturn ON/OFF Condition of the PV Inverter

Pradeep Kumar Boggarapu, *Student Member, IEEE*, Chakkarapani Manickam, Brad Lehman, *Fellow, IEEE*, Saravana Ilango Ganesan, *Senior Member, IEEE*, and Nagamani Chilakapati, *Senior Member, IEEE*

***Abstract*—A major challenge in a photovoltaic (PV) system is to identify the line-to-line faults that occurred under low irradiance conditions, during day-to-night/night-to-day transitions in the presence of blocking diodes. Due to active maximum power point tracker, these faults may not be identified and continue to be hidden even if the system returns to a high irradiance condition, since the magnitude of fault current may be less than the rating of the protection device (fuse). Those uncleared faults may subsequently lead to reduced peak output power, reliability issues, and may even cause fire risks. To address these issues, a method is proposed to identify the pre-existing/undetected faults using the transitory conditions that occur during the preturn ON/OFF condition of the PV inverter (checking mode). From these transitory conditions, the *I–V* curve of the PV array is exploited without the need for additional components or sensors. Additionally, there is no need to disconnect the PV array from the setup. Moreover, the local minima is tracked, to discriminate the faults and partial shading conditions. The proposed algorithm is tested on a small-scale grid-connected PV system and implemented in LabVIEW. The results demonstrate the efficacy of proposed algorithm in detecting the pre-existing/undetected faults.**

***Index Terms*—Existing/undetected faults, inverter preturn ON/OFF condition, *I–V* curve, local minima (LM), photovoltaic (PV) array.**

I. Introduction

AMONG the various renewable energy sources, solar photovoltaic (PV) energy has become increasingly implemented and predicted to reach the global PV generating capacity as 402 GW by the end of 2017 [1]. Nevertheless, the PV output power depends mainly on local weather condition, maximum power point tracking (MPPT) operation, aging of the PV panels, shading, and failures/faults in various components of the PV system. In fact, typical surveys of large PV systems have begun to document the significant energy losses due to PV faults and shading over the lifespan of an array, typically of the order of 4%–18% within a few years of operation [2]. This has led to increasing research on fault identification and detection for PV systems ([3]–[27], summarized below) with the goals to both increase energy yield of a PV system, as well as to improve safety and reliability.

The most prevalent PV array faults include such as line-to-line (LL) faults, line-to-ground (LG) faults, open-circuit (OC) faults, arc faults, and mismatch faults. Of these, LL and LG often involve massive fault currents and, therefore, lead to possible dangers, even fire hazards [3]. However, Zhao *et al.* [4] has recently narrated difficulties faced by the conventional protection devices in detecting LL and some LG faults under typical operating conditions. For example, when an LL fault occurs under high irradiance conditions, large fault currents are induced and, further, these faults are cleared by the installed overcurrent protection device (OCPD) (fuse). However, when the same fault occurs under low irradiance condition, the magnitude of fault current will be less than the rating of the fuse, so that it might not be cleared and continue to be obscure, even when the irradiance increases to a higher value. The reason is that the MPPT moves the operating point to a lower power faster than the operating time of fuse and might not be able to clear it. Similarly, faults occurring through high LL impedance or low percentage mismatch LL faults may also be undetectable. They will result in continuous decline in PV output power and may even pose fire risks. The fact that the PV array *I–V* characteristics under fault conditions are analogous to that under certain partial shading conditions (PSCs) makes it more difficult to detect the fault [5]. In summary, there is an urgent need to design a cost effective fault detection algorithm (FDA) which is capable of detecting the LL faults under low irradiance conditions and also able to discriminate the faults and PSC to avoid nuisance tripping. These are the objectives for this article.

In recent years, many fault detection methods have been proposed. Some approaches rely on time-domain responses of the PV system. Schirone *et al.* [6] investigated the faults, insulation failures, and broken cells using an offline scheme

Manuscript received December 6, 2019; revised February 20, 2020; accepted March 30, 2020. Date of publication April 15, 2020; date of current version July 20, 2020. This work was supported by the Ministry of Electronics and Information Technology, Government of India. Recommended for publication by Associate Editor V. Agarwal. *(Corresponding author: Saravana Ilango Ganesan.)*

Pradeep Kumar Boggarapu, Saravana Ilango Ganesan, and Nagamani Chilakapati are with the Department of Electrical and Electronics Engineering, National Institute of Technology, Tiruchirappalli 620015, India (e-mail: pradeep301327@gmail.com; gsilango@nitt.edu; cnmani@nitt.edu).

Chakkarapani Manickam is with the Department of Electrical and Electronics Engineering, Madanapalle Institute of Technology and Science, Madanapalle 517325, India (e-mail: chakra_nit@yahoo.com).

Brad Lehman is with the Department of Electrical and Computer Engineering, Northeastern University, Boston, MA 02115 USA (e-mail: lehman@ece.neu.edu).

Color versions of one or more of the figures in this article are available online at https://ieeexplore.ieee.org.

Digital Object Identifier 10.1109/TPEL.2020.2987856

IET Renewable Power Generation

Research Article

IET Journals
The Institution of Engineering and Technology

Estimation of PV module degradation through extraction of *I–V* curve at inverter pre-startup condition

ISSN 1752-1416
Received on 13th March 2020
Revised 31st October 2020
Accepted on 1st December 2020
E-First on 16th February 2021
doi: 10.1049/iet-rpg.2020.0316
www.ietdl.org

Boggarapu Pradeep Kumar[1] ✉, *Rajendran Nitheesh*[2], *Manickam Chakkarapani*[3], *Ganesan Saravana Ilango*[4], *Chilakapati Nagamani*[4]

[1]*Department of Electrical and Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, India*
[2]*Department of Electrical Engineering, Indian Institute of Technology, Madras, India*
[3]*Department of Electrical and Electronics Engineering, Madanapalle Institute of Technology and Science, Madanapalle, India*
[4]*Department of Electrical and Electronics Engineering, National Institute of Technology Tiruchirappalli, Tiruchirappalli 15, India*
✉ *E-mail: pradeep301327@gmail.com*

Abstract: Decline in photovoltaic (PV) output power is observed due to aging factors such as solder bond failure, corrosion of busbars, formation of cracks in solar cell, failures of bypass diode etc. Furthermore, these happenings reflect changes in PV module parameters such as increment in series resistance/reduction in open-circuit voltage and/or decrease in fill factor etc. However, these parameter variations can be easily examined with the module level *I–V* curve. This study proposes a new approach of exploring the *I–V* curve of the PV module using an inverter pre-startup condition, i.e. just before sending the PV power to the grid. From this pre-startup *I–V* curve, one of the important parameters, i.e. module series resistance is estimated. The proposed method is investigated through simulations in MATLAB/Simulink and is experimentally tested on a PV output coupled to a grid-connected micro-inverter. The key advantage of the proposed method is that it does not require any additional circuitry/sensors to extract the *I–V* curve. Furthermore, there is no need to disconnect the PV from its normal operation.

1 Introduction

The need for alternatives to fossil fuel-based electricity generation, electrification of far-flung areas by distributed energy sources, free from environmental pollution, less maintenance, and reduced costs of systems led to the exponential growth in the photovoltaic (PV) generated power. The PV module, which is an integral part of the PV system, is considered to be the most reliable component. Usually, all the manufacturers mention that PV panels have a performance warranty of 25 years [1]. However, due to harsh environmental conditions, the PV modules experience early degradation, which in turn affects the reliability, lifetime, and return on investment of the PV system. Thus, to enhance the reliability and lifetime of the PV system, many degradation detection methods and procedures were developed to identify and for analysing the cause and effect of various degradation mechanisms.

In [2–4], the authors discussed the various degradation modes (discolouration/delamination of ethylene vinyl acetate (EVA), corrosion of bus bars, interconnects, hot spot formation, formation of cracks in solar cell, junction box damage, degradation of packaging material etc.) that are observed in the field-installed PV modules and explicated the cause–effect links. Furthermore, the degradation effects are correlated with the electrical specifications and parameters of the PV module (current at peak power (I_{mpp}), the voltage at peak power (V_{mpp}), open-circuit voltage, short circuit current, fill factor, diode ideality factor, shunt and series resistance). Moreover, the degradation mode and its rate of degradation (the rate at which the PV output power declines) predominantly depends upon the installed site climatic conditions. For example, the degradation modes such as corrosion of busbars, solder bond failure, junction box damages, and broken interconnectors are more pronounced in hot climatic zones [5, 6] which in turn increases the series resistance and in another case study in Oman [7] revealed that under hot and dry climatic conditions, crystalline module output is degraded at a faster rate (2.54%) when compared with other PV technologies and multi-crystalline panels have a less performance ratio at higher temperatures [8]. Pieril *et al.* [9] developed a time series model based on the robust principal component analysis to predict the degradation of the PV system. Furthermore, a few degradation detection methods are reviewed as follows.

Bastidas-Rodriguez *et al.* [10] determined the module degradation through estimation of series resistance from the input data namely: V_{mpp}, I_{mpp}, module temperature and irradiance measurement through short circuit current of the reference module. Another study [11] discussed the assessment of series resistance by computing the time constant from the steady-state oscillations that occurred in the PV output voltage (due to the operation of perturb and observe-based maximum power point tracking (MPPT)) while in [12], module performance is analysed with an external device known as Jubomer fitted in the junction box. Shrestha and TamizhMani [13] explicated four methods (metered raw kWh, *I–V* measurement, performance index, and performance ratio) to measure the degradation rate in PV modules. Among these methods, *I–V* measurement is stated as the best method for analysing the various degradation modes. In addition to this, the *I–V* curve provides valuable information regarding the abnormalities present in the module such as broken cells, corrosion, mismatch in short circuit current, bypass diode failure etc.

Furthermore, various *I–V* curve extraction methods using a variable resistive load, bipolar regulated power supply, dc–dc converters, and capacitive load are reviewed in [14–16]. These methods are offline, time-consuming and requires additional circuitry/components, which are expensive. An alternate method for characterising the PV in outdoors is known as the Suns-V_{oc} method. The Suns-V_{oc} curve is a series resistance-free *I–V* curve (constructed using open-circuit voltage recorded at discrete irradiance values) used to evaluate the losses due to the mismatch, shunt, and series resistance by comparing with the conventional *I–V* characteristics [17, 18] whereas in [19], it is used for monitoring the recovery of potential-induced-degradation affected PV modules. Deciglie *et al.* [20] monitored the series resistance of the PV module without constructing the full *V –I* curve/Suns-V_{oc} curve. In this, series resistance can be computed at any PV operating point, provided the open circuit voltages at discrete

Faculty publications – Conference Papers

List of Conference Papers published by Faculty during A.Y. 2020-21:

S.No.	Name of the Faculty	Title of the Paper	Name of the Conference	Details of Paper
1	Dr. C. Venkatesh	NLC and SFO Control Technique Based Multilevel Inverter fed 3-phase Induction Motor Drive	IEEE -International Conference on Sustainable Energy and Future Electric transportation (SEFET) 2021	ISBN:978-1-7281-5681-1/21
2	Dr. V. Rajagopal	NLC and SFO Control Technique Based Multilevel Inverter fed 3-phase Induction Motor Drive	IEEE -International Conference on Sustainable Energy and Future Electric transportation (SEFET) 2021	ISBN:978-1-7281-5681-1/21
2	Dr. B. Jagadish Kumar	Transparent Solar Cells	International Conference on Recent Innovations in Science, Engineering, Humanities and Management, IEI Chandigarh	ISBN: 978-81-948668-6-2
3	Dr. B. Jagadish Kumar	Investigations On Recharge Boost Converter	International Conference on Recent Innovations in Science, Engineering, Humanities and Management, IEI Chandigarh	ISBN: 978-81-948668-6-2
4	Dr. B. Jagadish Kumar	Investigations On Changing The Electrical Safety Culture	International Conference on Recent Innovations in Science, Engineering, Humanities and Management, IEI Chandigarh	ISBN: 978-81-948668-6-2
5	Dr. B. Jagadish Kumar	Investigations on performance of Flyback and Buck-Boost converter in PV Energy Conversion System	Smart modernistic in electronics and Communication, St. Martin's Engg.College,Hyd.	ISBN:978-93-80831-43-5
6	Dr. B. Jagadish Kumar	Investigations on Multi input Integrated Buck-Sepic Converter,	Second International online and Multidisciplinary Conference , International Association Research and Developed organization, Gaziabad	ISBN:978-93-90103-04-1
7	Dr. B. Jagadish Kumar	Certain Investigations on two input integrated Buck and Buck-Boost Converter	Second International online and Multidisciplinary Conference , International Association Research and Developed	ISBN:978-93-90103-04-1

			organization, Gaziabad	
8	Dr. P. Nagarjuna Reddy	Hacking wireless network credentials by performing phishing attack using Python Scripting	Proceedings of the Fifth International Conference on Intelligent Computing and Control Systems (ICICCS 2021) IEEE Xplore Part Number: CFP21K74-ART;	ISBN: 978-0-7381-1327-2
9	Dr. P. Nagarjuna Reddy	Comparitive Study of Conventional Inverter Topologies for Stand-Alone PV System	2021 2nd International Conference for Emerging Technology (INCET) Belgaum, India. May 21-23, 2021	ISBN:978-1-7281-7029-9/21
10	Sri. T. Praveen Kumar	Power management system of a particle swarm optimization controlled grid integrated hybrid PV/WIND/FC/Battery Distributed Generation System	Distributed Generation & Alternative Energy Journal	doi: 10.13052/dgaej2156-3306.3624
11	Dr. Y. Manjusree	An Intelligent ANFIS controller based PV Custom device to enhance power quality	Springer	https://doi.org/10.1007/978-981-16-0081-4_11
12	Dr. Y. Manjusree	Fuzzy based controller for a hybrid electric vehicle with MMC and SRM drive	IOP Conf.Series: Materials Science and Engineering	doi:10.1088/1757-899X/981/4/042052
13	Sri. G. Rakesh Yadav	Wind speed prediction using hybrid long short-term memory neural network based approach	IEEE-International Conference on Sustainable Energy and Future Electric transportation (SEFET) 2021	ISBN:978-1-7281-5681-1/20
14	Dr. M. Santhosh	Wind speed prediction using hybrid long short-term memory neural network based approach	IEEE -International Conference on Sustainable Energy and Future Electric transportation (SEFET) 2021	ISBN:978-1-7281-5681-1/20
15	Dr. M. Santhosh	Ensemble deep learning model for wind speed prediction	In 2020 21st National Power Systems Conference (NPSC), pp 1-5. IEEE 2020.	ISBN:978-1-7281-8552-1/20
16	P. Mahesh	NLC and SFO Control Technique Based Multilevel Inverter fed 3-phase Induction Motor Drive	IEEE	ISBN:978-1-7281-5681-1/21

NLC and SFO Control Technique Based Multilevel Inverter fed 3-φ Induction Motor Drive

P. Mahesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
pm.eee@kitsw.ac.in

C. Venkatesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
cv.eee@kitsw.ac.in

V. Rajagopal
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
vrg.eee@kitsw.ac.in

***Abstract*—In this work, hybrid control technique based 3-φ induction motor drive fed from a cascaded multilevel inverter is presented. In the past decades regular two level inverters are, however these are having output voltage with harmonic content. To improve the solar photovoltaic system power quality and voltage rating, the multilevel inverters are employed along with several lower voltage dc sources is employed. In multilevel inverters power conversion is by synthesizing a staircase voltage waveform. The presented inverter configuration is derived from a module of addition and subtraction of sources. It helps to reduce the number of components - number of sources, switching drive, capacitors, diodes and majorly power switches. In this work, performance analysis and operating modes of 3-φ cascaded hybrid control technique based multilevel inverter for both symmetrical and asymmetrical topologies are explained. Further, the nearest level control (NLC) and switching frequency optimal (SFO) control techniques are employed in this work. To operate the power switches in this topology the switching signals are generated by using hybrid SFO-NLC technique. The enhanced features of this topology with the perspectives of power quality and optimized switching count are presented. The inverter fed drive system with proposed control technique is simulated by MATLAB/Simulink for the verification of the performance of the technique under both steady state and dynamic conditions.**

Keywords*— *Module of Addition and Subtraction of Sources (MASS), Modular Multilevel Inverter, Nearest Level Control (NLC), Switching Frequency Optimal (SFO), Induction Motor Drive (IMD)

I. INTRODUCTION

In many industrial applications, conventional DC motors were the best suitable for the variable speed drives because of excellent performance in torque and speed characteristics. These motors comprise of commutator and mechanical brushes, which undergo wear and tear with the progression of time. Because of these inherent disadvantages, nowadays the DC machines are replaced by AC machines [1]. Nowadays almost in all industrial drives, AC induction motors are preferred **as** compared to DC motors because of more advantages [2]. These motors are low cost, rugged, reliable, and relatively inexpensive with high efficiency. So that the induction motors are more preferable in many areas of industrial applications. But in past years, because of constant supply voltage and constant frequency the Induction motors are mainly suitable for only constant speed applications. In many industrial applications variable speed operation is required. For that, conventional mechanical gear systems were used. Due to the advancement in power electronic technology the mechanical gear systems are replaced. This technology is utilized for variable speed drives and also it can improve the response and performance of speed and torque characteristics of a motor under dynamic and steady state conditions [3]. For adjustable speed applications in the AC drive system, the variable frequency operation is required. So that AC drive system is fed from the power electronic converters [4]. The power electronic converters are suitable to conversion of fixed voltage & frequency to variable voltage & frequency, and then control the speed of AC motor. Generally, induction motor drive fed from the three-phase power electronic converters (inverter), but which is having poor voltage and current qualities that means it consisting of high THD. To improve the power quality and for reduction of THD, the power electronic converter must be operated with high switching frequency, but which causes an additional switching losses.

The multi level inverter [5] concept introduced to improve the power quality with reduced THD [6] and switching losses [7], so it can improves the dynamic performance of the converter and control the speed of induction motor with excellent speed and torque characteristics. Several conventional multilevel inverter (MLI) topologies are developed, such as flying capacitor clamped inverter, diode clamped inverter, cascaded H-bridge MLI, Neutral point clamped [8] and hybrid MLI [9]. The cascaded MLIs are popular due to its modularity in design of topology and possibility to extend the capacity as well as the number of the voltage levels in near future. However, the conventional inverters are consisting of high power conduction losses, as more number of power switches is used for increase the number of levels in inverter operation and normally which operate at higher switching frequency [10]. And also the novel multilevel inverter topologies are presented in [11]-[12] with reduced number of switches. Modular MLI are introduced to enhance the voltage rating with reduced number of switches. But which are having voltage equalizing problems across the source side capacitors [13]-[14].

To improve the multi level inverter performance compared to conventional multi level inverters in this research work a 3-φ hybrid cascaded modular multi level inverter is presented. In this work a three-phase cascaded structure with optimum component count is presented, viz., power switches count, gate drive count, capacitor count, diode count, and source count. The fundamental frequency hybrid control technique is used to generate the switching signals for power semiconductor switches, which is derived from nearest level control (NLC) and switching frequency optimal (SFO) switching control technique, is presented.

978-1-7281-5681-1/21/$31.00 ©2021 IEEE

NLC and SFO Control Technique Based Multilevel Inverter fed 3-φ Induction Motor Drive

P. Mahesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
pm.eee@kitsw.ac.in

C. Venkatesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
cv.eee@kitsw.ac.in

V. Rajagopal
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
vrg.eee@kitsw.ac.in

***Abstract*—In this work, hybrid control technique based 3-φ induction motor drive fed from a cascaded multilevel inverter is presented. In the past decades regular two level inverters are, however these are having output voltage with harmonic content. To improve the solar photovoltaic system power quality and voltage rating, the multilevel inverters are employed along with several lower voltage dc sources is employed. In multilevel inverters power conversion is by synthesizing a staircase voltage waveform. The presented inverter configuration is derived from a module of addition and subtraction of sources. It helps to reduce the number of components - number of sources, switching drive, capacitors, diodes and majorly power switches. In this work, performance analysis and operating modes of 3-φ cascaded hybrid control technique based multilevel inverter for both symmetrical and asymmetrical topologies are explained. Further, the nearest level control (NLC) and switching frequency optimal (SFO) control techniques are employed in this work. To operate the power switches in this topology the switching signals are generated by using hybrid SFO-NLC technique. The enhanced features of this topology with the perspectives of power quality and optimized switching count are presented. The inverter fed drive system with proposed control technique is simulated by MATLAB/Simulink for the verification of the performance of the technique under both steady state and dynamic conditions.**

Keywords*— *Module of Addition and Subtraction of Sources (MASS), Modular Multilevel Inverter, Nearest Level Control (NLC), Switching Frequency Optimal (SFO), Induction Motor Drive (IMD)

I. INTRODUCTION

In many industrial applications, conventional DC motors were the best suitable for the variable speed drives because of excellent performance in torque and speed characteristics. These motors comprise of commutator and mechanical brushes, which undergo wear and tear with the progression of time. Because of these inherent disadvantages, nowadays the DC machines are replaced by AC machines [1]. Nowadays almost in all industrial drives, AC induction motors are preferred **as** compared to DC motors because of more advantages [2]. These motors are low cost, rugged, reliable, and relatively inexpensive with high efficiency. So that the induction motors are more preferable in many areas of industrial applications. But in past years, because of constant supply voltage and constant frequency the Induction motors are mainly suitable for only constant speed applications. In many industrial applications variable speed operation is required. For that, conventional mechanical gear systems were used. Due to the advancement in power electronic technology the mechanical gear systems are replaced. This technology is utilized for variable speed drives and also it can improve the response and performance of speed and torque characteristics of a motor under dynamic and steady state conditions [3]. For adjustable speed applications in the AC drive system, the variable frequency operation is required. So that AC drive system is fed from the power electronic converters [4]. The power electronic converters are suitable to conversion of fixed voltage & frequency to variable voltage & frequency, and then control the speed of AC motor. Generally, induction motor drive fed from the three-phase power electronic converters (inverter), but which is having poor voltage and current qualities that means it consisting of high THD. To improve the power quality and for reduction of THD, the power electronic converter must be operated with high switching frequency, but which causes an additional switching losses.

The multi level inverter [5] concept introduced to improve the power quality with reduced THD [6] and switching losses [7], so it can improves the dynamic performance of the converter and control the speed of induction motor with excellent speed and torque characteristics. Several conventional multilevel inverter (MLI) topologies are developed, such as flying capacitor clamped inverter, diode clamped inverter, cascaded H-bridge MLI, Neutral point clamped [8] and hybrid MLI [9]. The cascaded MLIs are popular due to its modularity in design of topology and possibility to extend the capacity as well as the number of the voltage levels in near future. However, the conventional inverters are consisting of high power conduction losses, as more number of power switches is used for increase the number of levels in inverter operation and normally which operate at higher switching frequency [10]. And also the novel multilevel inverter topologies are presented in [11]-[12] with reduced number of switches. Modular MLI are introduced to enhance the voltage rating with reduced number of switches. But which are having voltage equalizing problems across the source side capacitors [13]-[14].

To improve the multi level inverter performance compared to conventional multi level inverters in this research work a 3-φ hybrid cascaded modular multi level inverter is presented. In this work a three-phase cascaded structure with optimum component count is presented, viz., power switches count, gate drive count, capacitor count, diode count, and source count. The fundamental frequency hybrid control technique is used to generate the switching signals for power semiconductor switches, which is derived from nearest level control (NLC) and switching frequency optimal (SFO) switching control technique, is presented.

978-1-7281-5681-1/21/$31.00 ©2021 IEEE

2 Days International Conference on Recent Innovations in Science, Engineering, Humanities and Management
(IEI, Chandigarh) Institution of Engineers, India , Chandigarh
16th - 17th January 2021 www.conferenceworld.in
ISBN : 978-81-948668-6-2

TRANSPARENT SOLAR CELLS

Govulakonda Harshavardhan[1] Dr.B.Jagadish Kumar[2]

[1]B.Tech (UG) Student, Electrical & Electronics Engineering,
Kakatiya Institute of Technology and science,(India),
govulakondaharshavardhan19@gmail.com

[2]Associate professor, Electrical and Electronics Engineering Department,
Kakatiya Institute of Technology and
Science, (India),jagadeesh908@gmail.com

ABSTRACT

There are places where people still live without basic needs such as electricity. They are the places which are isolated and as difficult environmental conditions to build power plant and transport electricity. So, by producing their energy source in their areas solemnly depending on natural resources would be the ultimate salvation for those who are in abysmal. This will become possible if we implement using transparent solar cells. Unlike conventional solar cells, transparent solar cells trap photons of invisible light, such as ultraviolet rays. The stripes of the photovoltaic cells convert these photons into electricity. Moreover, these cells can be used as windows in their house, mobile phone screens and can replace any glass used for commercial purpose. Since the title suggests "transparent", these cells allow visible light to pass through them. Therefore, transparent solar cells allow the useful light to echo and on the other hand, it converts the useless light into energy, where a conventional solar cell cannot.

Keywords:*Antireflection coating, Absorptive Spectrum, Photovoltaic cell, Transparent Substrate, Transparent electrode, Ultraviolet light.*

I. INTRODUCTION

Intense changes in energy conversions system are foreseen because of deficiency of conventional fuels. Fuel deposit on the planet will soon exhaust and fossil fuel scarcity will be maximum. The fundamental explanations behind the above are due to increasing demand for energy, rising population, fast development in innovation. Indiscriminate utilization of commercial energy has lead to genuine climate issues like air and water contaminations. People who are harnessing the utilization of alternate source of energy should please and accept the environmental conditions, low cost electrical energy as a replacement for energy from quickly draining resources of fossil fuels is the basic requirement for the endurance of humanity.

Solar energy is the biggest source of energy when compared to all the forms of renewable energy and it is the prominent source of energy. Since all other sources of renewable energy have vulnerable limitations. Solar energy is the boon for future generations because of its opulence and never-ending characteristics. This unicity of solar energy regards the non-renewable energy as unpromising. Solar energy can enlighten the world since it is the major source of energy. The potential of solar energy is baffling; which is 178 billion MW and this myriad value of energy will promise a whole new world. Statistically, 178 billion MW is about 20000 times the total energy consumption of the world. Moreover, the energy radiated by the sun on a sunny day is almost 1km/m2.

But the problem associated with the utilization of this legion of potential is its availability. We cannot promise the same radiation of the sun throughout the year because the radiation of the sun changes with time. Sadly, the variations appear even in a single day because of the day and night cycle of the earth.

2 Days International Conference on Recent Innovations in Science, Engineering, Humanities and Management
(IEI, Chandigarh) Institution of Engineers, India , Chandigarh
16th - 17th January 2021 www.conferenceworld.in
ISBN : 978-81-948668-6-2

INVESTIGATIONS ON RECHARGE BOOST CONVERTER

[1]Dr.B.Jagadish Kumar , [2]N.Ganesh

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science,Warangal,India,
bjk.eee@kitsw.ac.in
[2]M. Tech Student (PE),Kakatiya Institute of Technolgy and Science,Warangal,India,nknganesh09@gmail.com

ABSTRACT:

In this paper,A Boost converter with a coupled-inductor is explored.In the proposed,method a coupled inductor and a switch with low voltage rating is used for improving voltage gain.A passive regenerative snubber circuit is used for reviting energy of the stray inductance,makes the switch to operate in a wide range of duty cycle which relatively increase,the voltage gain,compared to coupled inductor-based converters.These scheme have voltage clamped properties,low voltage stress than output voltage made to choose low-voltage low conduction devices,with no reverse-recovery currents within diodes used in the circuit.Moreover,the closed loop control technique used to reduce the voltage drift problems.The proposed converter topology boost the voltage gain of a conventional Boost converter using single inductor, and mitigate the demagnetization of transformer and leakage inductor of coupled-inductor based converter.

***Keywords**: Battery, Passive Regenerative snubber circuit,coupled-inductor, reverse recovery,fuel cells,proton exchange membrane.*

INTRODUCTION:

In present days,many industrial application require steep voltage ratio.For example,boost converters are used in hybrid electric vehicles (HEV) and lighting systems,telecommunication industry.By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic interference problem is more.Several converter topologies are proposed in past decades.

By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic Interference problem.Eventhough Voltage clamped techniques are used to decrease the reverse-recovery problem,The switch voltage stress is more

2 Days International Conference on Recent Innovations in Science, Engineering, Humanities and Management
(IEI, Chandigarh) Institution of Engineers, India , Chandigarh
16th - 17th January 2021 www.conferenceworld.in
ISBN : 978-81-948668-6-2

INVESTIGATIONS ON CHANGING THE ELECTRICAL SAFETY CULTURE

[1]Dr.B.Jagadish Kumar , [2]Pandilla Shivani

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science,Warangal,India,
jagadeesh908@gmail.com

[2]B. Tech III year Student (UG,)Kakatiya Institute of Technolgy and Science,Warangal,India,
b18ee026@kitsw.ac.in

Abstract: *This paper analyses the ways to improve the electric safety culture in an organization .This analyses about the safety measures that was being taken and should be taken by the managements of any organization. Following few key issues are included in this paper. (i) The basic requirements of the electric safety culture are analyzed. (ii) By taking the past and present work practices in electrical safety culture into consideration, few suggestions are given to improve electric safety cultures in organization in future. The main argument of this paper is that representation of culture is the sum of what is commonly acceptable without analyzation and the most important thing included in this paper is that the training must be given to the non electrical personnel in order to avoid electric hazards and addressed the more difficult aspects of human performance in fair manner.*

Keywords: *Beliefs, Electrical safety, Safety culture, non electrical personnel.*

I. INTRODUCTION

Electrical safety culture is nothing but it is the set of values, attitudes, goals of an organization. Responsibility of keeping workplace safe will be in the hands of every single individual working at an organization. When we compare working conditions of past and present there are a lot of developmental changes have taken place. The future developments will be done on the basis of past and present working conditions in the electrical organization.

A.Electrical Safety:

Protecting electrical workers of electrical organization from the dangerous effects of electric currents, electrical arc, etc.. is known as electrical safety. Every worker working at electrical organization including electrical and non electrical workers should be educated and should have knowledge on every single equipment that is being used.In order to create awareness among workers, A workshop was conducted by IEEE IAS. Fig 1.1 shows the logo of the workshop.

ISBN No. 978-93-80831-43-5

PAPER ID: ICSMEC-2020/0309

Investigations on Performance of Flyback and Buck-Boost Converters in PV Energy Conversion System

[1]Dr.B.Jagadish Kumar
Associate Professor
Department of Electrical Engineering,
Kakatiya Institute of Technology & Science,
Warangal, Telangana State, India

[2]Dr.B. Basavaraja Banakara
Registrar & Professor
Department of Electrical Engineering,
UBDTE College of Engineering(Autonomous);
Davangere University, Karnataka, India

Abstract

In this paper presents a three level & five- level inverters fed from photovoltaic (PV) and wind energy topology for grid-connected PV system with a pulse-width-modulated (PWM) control scheme. Some of the distributed power generation sources that are used to increase the total power produced in the world include renewable energy sources such as photovoltaic, wind, and geothermal. Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. Multilevel inverter structures have been developed to overcome shortcomings in solid-state switching device ratings so that they can be applied to high voltage electrical systems. The multilevel voltage source inverters unique structure allows them to reach high voltages with low harmonics. This makes unique power electronics topologies suitable for Flexible AC Transmission Systems and custom power applications. The use of a multilevel converter to control the frequency, voltage output including phase angle, real and reactive power flow at a dc/ac interface provides significant opportunities in the control of distributed power systems. In this work, new system architecture for hybrid Photovoltaic and Wind energy system is connected to the grid. This method allows the renewable energy sources to deliver the load together or independently depending upon their availability. The proposed inverter uses less number of switches when compared with the conventional Multilevel Inverter. The simulations results are obtained using MATLAB/SIMULINK software.

Index Terms--*Photovoltaic (PV), Wind energy system, hybrid system and Multilevel Inverter.*

*corresponding author
E-mail Address: jagadeesh908@gmail.com

Second International Online and Multidisciplinary Conference
Organised by International Association of Research and Developed Organization
www.iardo.com
Date: 15th - 16th June 2020
ISBN : 978-93-90103-04-1
Conference World
www.conferenceworld.in

INVESTIGATIONS ON MULTI INPUT INTEGRATED BUCK- SEPIC CONVERTER

[1]B. Jagadish Kumar, [2]K. Sahithi,

[1]*Associate Professor, Department of Electrical and Electronics Engineering*
Kakatiya Institute of Technology & Science, Warangal 506015, India

[2]*UG Student, Department of Electrical and Electronics Engineering*
Kakatiya Institute of Technology & Science, Warangal 506015 ,India

ABSTRACT— The application of high-frequency switching converters and their controls in dc power distribution has been increasing in recent years . The major concern with recent dc distribution systems, such as in automotive and telecom power supply systems, is to meet the increased power demand and to reduce the burden on the primary energy source, i.e.,built-in battery. This is possible by adding additional power sources in parallel with the existing battery source. The additional power source can be a renewable energy source such as photovoltaic (PV) or fuel cell (FC) storage power . In this paper analysis and control of two-input buck integrated SEPIC converter, suitable for photovoltaic (PV) applications, is presented. This converter is essentially combination of individual buck and SEPIC converters

Keywords: DC–DC converter, Multi input integrated converter, power management, trailing-edge modulation.

I. INTRODUCTION

High frequency switching converters application in the dc power distribution is increasing in the recent years. . One of the main orientations in power electronics in the last decade has been the development of switching-mode converters with higher power density and low electromagnetic interference(EMI). As the power conversion system is becoming miniaturized, increasing the power density is one of the challenging issues for the power supply designers. Furthermore, light weight, small size and high power density are also some of the key design parameters. In the recent dc distribution systems the prominent issue, in automotive and telecom powersupply systems, is to meet the increasing power demand and reduce the burden on the primary energy source, i.e. built-inbattery. This is implemented by using additional power sources in parallel to the existing primary source. The additional power sources are (i) renewable energy sources like solar or wind, (ii) fuel cell storage power. **The** dc sources are connected in parallel to meet the common load demand. This parallel connection is preferred when: 1) the existing dc source is unable to meet the full load demand and 2) the power available from a cost-effective source is used in combination with the another source which supplies deficit demand. In any case,a power electronic converter is required for efficient handlingof power transfer. Converters can be paralleled in two differentways: 1) paralleling different power electronic converters at the load port and 2) connecting multiple sources through an integrated converter The various dc sources must be connected in parallel through an intermediate power electronic converter at the load port or through a single integrated converter. For two dc sources, the two-input integrated converter is preferred for power control as it results in a smaller number of components and simplicity in controller design. . A systematic approach for analyzing two-input integrated converters based on six basic topologies has been studied extensively . This reveals that the input sources can supply power to a load either individually or simultaneously without disturbing. One of such is, integrating buck and buck–boost converters,where power is drawn from low voltage and high-voltage dc sources and supplied to a common dc load. Eventhough, buck–boost converter integration in a double-input dc –dc converter works well for power transfer from a low-voltage source (LVS), the source current has more ripple content and requires an additional input filter. By using the SEPIC converter in place of the buck–boost converter gives an additional flexibility of voltage gain matching, low to high or vice versa, together with lesser source ripple current. One such double-input converter is studied, which is a combination of the buck and SEPIC topologies

II. MODELING AND ANALYSIS OF BUCKINTEGRATED SEPIC CONVERTER

The proposed BI-SEPIC is essentially a parallel combination of buck and SEPIC converter. However,to reduce the number of energy storage elements, the switching devices of the two converters are arranged so that o one inductor "L" on the load side is sufficient for processing the power in both of these converters.Having single

Second International Online and Multidisciplinary Conference
Organised by International Association of Research and Developed Organization
www.iardo.com
Date: 15th - 16th June 2020
ISBN : 978-93-90103-04-1
Conference World
www.conferenceworld.in

CERTAIN INVESTIGATIONS ON TWO INPUT INTEGRATED BUCK AND BUCK-BOOST CONVERTER

B. Jagadish Kumar[1], A. Anusha[2]

[1] Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

[2] Student,Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

ABSTRACT

The Multi Input Integrated Buck and Buck-boost converter is essentially a combination of buck and buck-boost converters. However, on account of integration only one inductor is sufficient enough for performing the power conversion. In order to have simple control strategy as well as simpler compensator design a single loop control scheme, voltage-mode and current-limit control, are proposed here for the power distribution. The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter.

Keywords: DC–DC converter, Multi input integrated converter, Multi input power converter, PI controller.

I. INTRODUCTION

The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter. A laboratory prototype is developed for experimental realization of the converter. The analysis, design, simulation, and experimental results of the converter prove that it is suitable in hybrid electric or renewable energy systems application.

Proceedings of the Fifth International Conference on Intelligent Computing and Control Systems (ICICCS 2021)
IEEE Xplore Part Number: CFP21K74-ART; ISBN: 978-0-7381-1327-2

Hacking wireless network credentials by performing phishing attack using Python Scripting

Harish Musthyala
Department of Computer Science
University of New Haven, CT, USA
hmust1@unh.newhaven.edu

Dr. P. Nagarjuna Reddy
Department of Electrical and Electronics Engineering
K.I.T.S., Warangal, India
pnreddy.eee@kitsw.ac.in

***Abstract* - The availability of number of open-source hacking tools over the internet and many hacking tools in-built with the Kali Linux operating system led to easy understanding and performing hacking by individuals. Even though, hacking the Wi-Fi passwords is considered a tedious task with open-source tools, they can be hacked easily with phishing. Phishing involves tricking the users with malicious emails and obtaining sensitive information from them. This paper describes the different wireless security protocols and tools for hacking wireless networks. A python script is developed which can be sent as phishing to get all the SSID's and passwords to which the system has been connected. The script has been executed and the results are presented.**

***Keywords* -- Wireless network, Wi-Fi password, Wi-Fi hacking, phishing, python script, Wireless security protocols**

I. INTRODUCTION

Wireless network is a computer network where the network nodes are connected wirelessly. Cell phone networks, wireless sensor networks, satellite communication networks, wireless local area networks (WLANs) are examples of wireless networks [1]. The wireless network highlighted in this paper is wireless local area network which is referred to as WLAN or Wi-Fi. Wi-Fi follows the IEEE 802.11 WLAN standards. Wireless networks are more affordable when compared with wired networks as they offer handiness and mobility which makes their usage extensive in houses, workplaces, hotels, hospitals and other business organisations [2]. Despite their advantages, wireless networks have vulnerabilities and are considered to be the weakest part in the network.

Hacking refers to unauthorized access or compromising the systems or a network and the persons or organisation involved in hacking are referred as hackers [3]. The vulnerabilities or weaknesses present in the security protocols or encryption methods used for WLANs help the hackers to easily hack the network. In order to perform any attack or hack the network, the hackers primarily aim at getting access to the network. Since the wireless networks are the weakest, these networks are most targeted.

Phishing is a method of obtaining sensitive information (username, password, credit/debit card etc.) by making the victim to trust by pretending to be a trustworthy person or an entity. Phishing is usually performed through emails (email spoofing) in which a link or a malicious code is embedded. The link or the URL appears to be legitimate, but it directs to a predefined malicious site. Sometimes it directs to a fake website and makes user to enter the credentials [4],[5].

To provide security to the wireless networks, various security protocols are introduced. These protocols prevent unauthorized connections to the network and encrypt the data sent through wireless networks. The various wireless security protocols are:

- WEP: Wired Equivalent Privacy
- WPA: Wi-Fi Protected Access
- WPA2: Wi-Fi Protected Access version 2
- WPA3: Wi-Fi Protected Access version 3 (Next generation of Wi-Fi security)

These wireless security protocols have their own advantages and disadvantages depending on the type of encryption used in the security protocol. Some of the details of each security protocol are described below [6]-[9].

Wired Equivalent Privacy (WEP)

- This security protocol uses RC4 Stream cipher (24-bit Initialization Vector is used) and performs cyclic redundancy check.
- The way that WEP combines initialization vector with the secret key enables cryptanalytic attacks.
- 24-bit Initialization Vector is too short that puts confidentiality at risk
- There is a 50% probability that same initialization vector will repeat after 5000 packets.
- It does not provide strong data integrity.

Wi-Fi Protected Access (WPA)

- This security protocol uses Temporal Key Integrity Protocol (TKIP)
- It also performs key mixing function that combines the secret key with the initialization vector before passing for RC4 cipher initialization.
- It employs sequence counter to protect from the reply attacks.
- It provides data integrity by using Message Integrity Check

Wi-Fi Protected Access 2 (WPA2)

- WPA2 security protocol is an improved version of WPA and uses Counter Mode Cipher Block Message Authentication Protocol based on AES Encryption.
- This protocol is more secure than WEP and WPA.

Wi-Fi Protected Access 3 (WPA3)

- WPA3 is referred to as next generation of Wi-Fi security.

978-0-7381-1327-2/21/$31.00 ©2021 IEEE

2021 2nd International Conference for Emerging Technology (INCET)
Belgaum, India. May 21-23, 2021

Comparitive Study of Conventional Inverter Topologies for Stand-Alone PV System

Radhavaram Sruthi
Scholar
Dept. of EEE,
KITSW
Sruthi.radhavaram95@gmail.com

Dr. P. Nagarjuna Reddy
Assistant Professor
Dept. of EEE,
KITSW
Pnreddy.eee@kitsw.ac.in

***Abstract*—Multilevel converters, generally, used in medium and high-power system applications, of any configurations, offer higher efficiency and lower THD. With the advance of renewable energy systems, particularly photovoltaic (PV) systems, there is always an ever-increasing need for highly efficient multilevel inverters to cater the AC loads. The present work aims at comparing the basic three inverter topologies [Diode clamped, Flying-Capacitor, Cascaded H-Bridge inverter] of five-level inverter for a stand-alone PV-system. The efficiency and harmonic distortion of these configuration are compared. The entire work is carried out in MATLAB Simulink Environment.**

Keywords--Five level inverter, Stand-alone PV-system, inverter topologies

I. INTRODUCTION

With the increased integration of renewable energy resources, several developments have been occurring in power electronics in the recent years. The renewable resources are environment-friendly and are replacing the traditional power generation plants which produce large carbon emissions polluting the environment. Among the different renewable energy resources that are been utilized for electrical power generation, solar energy is one of the extensively used resource because of its abundancy and simplicity in installation. The solar energy can be harnessed in DC form which in turn is to be converted to AC to integrate into the conventional AC power systems. Power converters are used for conversion of DC power to AC power. Usage of Multilevel Inverters (MLI) has increased in the recent times for DC to AC conversion of signals. A multilevel inverter is a power electronic device that offers desired AC output voltage level using one or more lower-level DC voltages as an input. The multilevel inverters offer lower dv/dt besides lower harmonic distortion. The higher the voltage levels are, the smoother is the output waveform [1]. But the complexity of the controller circuits and their components increases with an increase in the level of inverter. Different topologies of the multilevel inverters are available in the market. The difference among them lies in the control technique which includes the mechanism of switching and the input voltage source that is employed by the topology [2]. The commonly employed topologies are [3]:

- Diode clamped multilevel inverter (DCMLI)
- Flying capacitor multilevel inverter (FCMLI)
- Cascaded H-bridge multilevel inverter (CHBMLI)

The present work aims at comparing the basic three inverter topologies that are mentioned above for a five level inverter with a stand-alone PV-system. For this work, equal phase method and hybrid multicarrier pulse width modulation (H-MCPWM) technique are used for control. The performance and harmonic distortion of these topologies are compared and presented. LCL filter is employed to minimize the distortion in the output voltage.

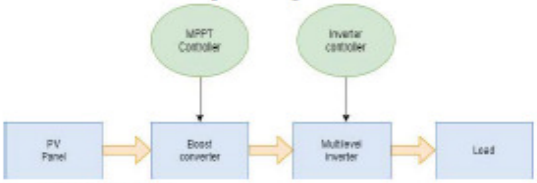


Fig. 1. Basic block diagram

Fig. 1 gives the basic block structure of the employed circuit. A PV panel is connected to the boost converter which improves the voltage magnitude developed by PV panel. This in turn is connected to a multilevel inverter which converters DC power to AC power and is fed to a 1-phase AC load. P & O based MPPT controller is used for providing gate signals for boost converter while different configurations of MLI are used in this study.

II. MODELLING OF SOLAR CELL

Solar PV cells being the basic units of solar PV array/panel, are arranged in a combination of series and parallel strings to achieve required voltage and current. When PV cell is exposed to light, it generates current. The widely used mathematical model of PV cell, shown in Fig. 2, is employed for the current work [4]

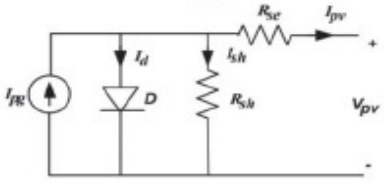


Fig. 2. PV module equivalent circuit

The current output of the PV module can be obtained using equation 1.

$$I_{pv} = I_{ph} - I_s\left(e^{\frac{q(V_{pv}+I_{pv}*R_s)}{nKT}} - 1\right) - \frac{V_{pv}+I_{pv}R_s}{R_{sh}} \quad \ldots (1)$$

Perturb & Observe (P&O) algorithms are the extensively used MPPT algorithms because of their simplicity in structure. They operate with periodicity of incrementing (or)

978-1-7281-7029-9/21/$31.00 ©2021 IEEE

Power Management System of a Particle Swarm Optimization Controlled Grid Integrated Hybrid PV/WIND/FC/Battery Distributed Generation System

T. Praveen Kumar*, N. Subrahmanyam and Maheswarapu Sydulu

Electrical Engineering, National Institute of Technology, Warangal, Telangana, India
E-mail: praveen0317@gmail.com
**Corresponding Author*

Received 27 February 2021; Accepted 19 April 2021;
Publication 24 June 2021

Abstract

In this manuscript, the Power management of grid integrated hybrid distributed generation (DG) system with Particle swarm optimization (PSO) algorithm is proposed. The hybrid DG system combines with photovoltaic, wind turbine, fuel cell, battery. Depending on the use of hybrid sources and the changes of power production the variation of power can occurs in the DG system. The major purpose of the proposed method restrains the power flow (PF) on active with reactive power between the source and grid side. In the power system control the proposed PSO method is utilized to maximize the active with reactive PF and the controllers. The proposed method interact the load requirement energy and maintain the load sensitivity due to charging and discharging battery control. In the DG system, the proposed PSO method allows maximum power flow. To assess the PF, the constraints of equality and inequality have been evaluated and they are utilized to determine the accessibility of renewable energy source (RES), electricity demand, and the storage elements of charge level. The protection of the power system is

Distributed Generation & Alternative Energy Journal, Vol. 36_2, 141–168.
doi: 10.13052/dgaej2156-3306.3624

An Intelligent ANFIS Controller based PV Custom Device to enhance Power Quality

Y. Manjusree and A. V. V. Sudhakar

Abstract The trend setting indicated paper in intelligent adaptive-neuro fuzzy interface system (ANFIS) controller-based photovoltaic (PV) system device to solve power quality (PQ) issues are presented. Optimal power electronic converters (PEC) are employed to get controlled balanced load voltage/current. The presence of nonlinear loads and sudden addition and removal of sensitive loads on distribution will always create harmonics in the network. It will cause to produce dip in voltage (sag) or rise in voltage (swell) means severe oscillation in load voltage. These PQ issues are suppressed to a large extent by employing solar custom devices with optimal cost over FACTS controllers, which are available in the literature. To get maximum output power from PV system, fuzzy MPPT technique is adopted. The best soft switching of series voltage source converter (SeVSC) is done by employing the proposed method. The results obtained are compared with other well-known conventional control techniques such as PI controller, fuzzy-based proportional integral (PI) controller, robust ECKF (RECKF) and proves that the proposed control strategy works very well.

Keywords ANFIS controller · PQ issues · PV system · PI controller

1 Introduction

The most effective challenge of control engineer in the field of power system (PS) is to suppress the power quality issues. It is much significant to provide harmonic-free power supply to the loads irrespective of its nature (linear/nonlinear load). The presence of nonlinear loads always originates disturbances and uncertainties in the PS network [1, 2]. If these nonlinear loads are available for the longer time period in

Y. Manjusree (✉)
Department of EEE, Kakatiya Institute of Technology and Science, Warangal, India
e-mail: manju547sree@gmail.com

A. V. V. Sudhakar
Department of EEE, S R Engineering College, Warangal, Telangana, India
e-mail: sudheavv@gmail.com

K. A. Reddy et al. (eds.), *Data Engineering and Communication Technology*,
Lecture Notes on Data Engineering and Communications Technologies 63,
https://doi.org/10.1007/978-981-16-0081-4_11

Fuzzy based controller for a hybrid electric vehicle with MMC and SRM drive

Sudhakar A V V[1], Manjusree Y[2] and Teja M S[3]

[1]Centre for Emerging Energy Technologies, S R Engineering College, Warangal, Telangana, India. Pin: 506371.
[2]Department of Electrical and Electronics Engineering, Kakatiya Institute of Technology & Science, Warangal, Telangana, India.
[3]Department of Electrical and Electronics Engineering, Sumathi Reddy Institute of Technology for Women, Warangal, Telangana, India. Pin: 506371.

Email: sudheavv@gmail.com

Abstract. In this article a novel fuzzy control based Hybrid Electric Vehicle (HEV) with Modular Multi Converter (MMC) fed Switched Reluctance Motor (SRM) is investigated. In this proposed approach MMC fed to the SRM motor with integration of Full Bridge (FB) converter. FB switching pattern operates with intelligent fuzzy control algorithm. The MMC inverter fed SRM drive HEV has been successfully simulated with MATLAB software package. The simulation results are proven that the harmonics are mitigated by employing proposed method. Performance characteristics of SRM motor such as, phase voltage, line voltage, speed, torque, rotor current, load torque is obtained, and these are compared with conventional methods i.e. current converter operated HEVs and solar (PV) integrated HEVs. It can be observed from the reported results that the proposed method is providing satisfactory output results.

Keywords. Hybrid Electric Vehicle, MMC converter, full bridge converter, switched reluctance motor.

1. Introduction

Over the recent years, a few iconic names like Hyundai, MG Hector, Tesla, Nissan, Maruti, Tata and Mahindra etc. making the market numerously very high. Industries are boosting their sales and satisfying desired performance to the customers. According to the Indian standards past 2014 more revolutions are coming in EVs and garnering over 3.0 million units are sold. The main aim is to encourage EVs/HEVs to suppress pollution in urban/semi urban smart cities, with replacement of conventional petrol/diesel vehicles [1-2].

India has declared to produce only EVs by 2030. EVs are more popular because its most significant inherent features, that are summarized as follows:

- EVs are mostly ecofriendly – Zero emission of carbon mixed molecules in the air (Remove global warming issues)

2021 International Conference on Sustainable Energy and Future Electric Transportation (SEFET) | 978-1-7281-5681-1/20/$31.00 ©2021 IEEE | DOI: 10.1109/SeFet48154.2021.9375644

Wind speed prediction using hybrid long short-term memory neural network based approach

G. Rakesh Yadav
Research Scholar
Dept. of EEE
Kakatiya University, Warangal, India
rakesh.yadav815@gmail.com

E. Muneender
Assistant Professor
Dept. of EEE
Kakatiya University, Warangal, India
emuninder@gmail.com

M. Santhosh
Member IEEE
Assistant Professor
Dept. of EEE
KITSW, Warangal, India
madasthusanthosh@ieee.org

***Abstract*—Accurate wind speed prediction is a essential for enhanced wind energy integration with grid. A hybrid forecasting model is implemented to improve prediction accuracy. Decomposition technique is utilized to separate the input training wind speed data into intrinsic mode functions (IMFs). Deep neural network is used for the feature learning from each sub-series signal. Thus, the developed approach is tested with National Institute of Wind Energy (NIWE) dataset. Experimental evaluation in terms of statistical indices confirms that proposed hybrid model outperforms the existing benchmark approaches.**

***Index Terms*—Hybrid approach, Prediction, Wind uncertainty, Deep learning, decomposition**

I. Introduction

Enhanced renewable energy sources (RES) integration at transmission level and distribution system is possible with accurate wind speed forecasting (WSF) [1]. Wind energy is pollution-free, abundant, and renowned among RES. Fig. 1 depicts global top five markets in 2019 with new installations. Precise WSF can minimize instability of wind energy integration and energy market trading [2]. WSF has become a significant area of interest within the field of energy research. However, it has been regarded as a tough job due to wind speed uncertainty.

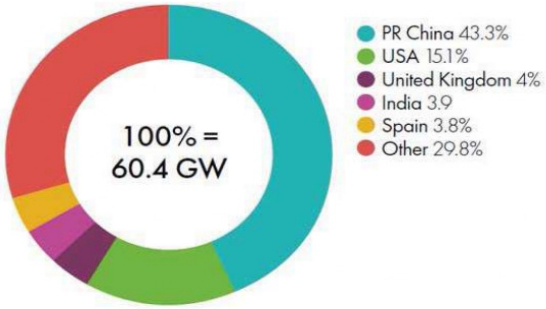


Fig. 1. New capacity in 2019 and share of top five markets (%) [1]

Wind speed prediction approaches are mainly classified into physical models, statistical models, and artificial intelligence (AI) models. Each model has its own merits and demerits. The physical models can use a set of mathematical equations considering numerical weather predictions (NWPs) and terrestrial conditions of the plant location. Physical models best suitable for long-term forecasts but they take immoderate computational resources. Statistical models such as autoregressive (AR), AR moving average (ARMA), AR integrated MA (ARIMA) utilize past wind speed data [3]. Existing statistical equations are utilized to model future wind speed. Statistical models are low-cost, easy to implement and best suitable for very short-term horizon. The main problem of these models is that the prediction accuracy is not desirable.

AI models such as artificial neural networks (ANNs) and support vector machines (SVMs) are utilize pattern recognition and machine learning algorithms to extract features for the enhancement of WSF accuracy [4]. Recently, hybrid models gained global attention to further improve the accuracy. AI models possess several demerits: (1) ANNs with shallow architecture consists single hidden layer and have poor generalization intelligence. So, shallow ANNs are not successful to extract high level abstractions from intermittent wind input. Because of the smoothness assumption, SVMs have the same difficulty. (2) Some of the deep learning models do not take account of wind input sequential features. (3) The wind speed feature extraction is indirect. Hence, the WSF researchers are implementing hybrid models for better performance and enhanced accuracy. The main aim of this work is to develop the hybrid deep learning neural architecture using long short-term memory (LSTM) network and complete ensemble empirical mode decomposition with adaptive noise (CEEMDAN). The developed approach is compared with several baseline models on NIWE wind dataset to demonstrate its superiority. The results show that developed approach can outperform the existing benchmark approaches. Therefore, hybrid CEEMDAN-LSTM approach is scalable and it can learn significant features from NIWE dataset.

The rest of this paper is organized as: Section II presents background methodology and proposed WSF framework. Section III gives developed model validation; finally, conclusions are drawn in Section IV.

978-1-7281-5681-1/20/$31.00 ©2021 IEEE

Wind speed prediction using hybrid long short-term memory neural network based approach

G. Rakesh Yadav
Research Scholar
Dept. of EEE
Kakatiya University, Warangal, India
rakesh.yadav815@gmail.com

E. Muneender
Assistant Professor
Dept. of EEE
Kakatiya University, Warangal, India
emuninder@gmail.com

M. Santhosh
Member IEEE
Assistant Professor
Dept. of EEE
KITSW, Warangal, India
madasthusanthosh@ieee.org

2021 International Conference on Sustainable Energy and Future Electric Transportation (SEFET) | 978-1-7281-5681-1/20/$31.00 ©2021 IEEE | DOI: 10.1109/SeFet48154.2021.9375644

***Abstract*—Accurate wind speed prediction is a essential for enhanced wind energy integration with grid. A hybrid forecasting model is implemented to improve prediction accuracy. Decomposition technique is utilized to separate the input training wind speed data into intrinsic mode functions (IMFs). Deep neural network is used for the feature learning from each sub-series signal. Thus, the developed approach is tested with National Institute of Wind Energy (NIWE) dataset. Experimental evaluation in terms of statistical indices confirms that proposed hybrid model outperforms the existing benchmark approaches.**

***Index Terms*—Hybrid approach, Prediction, Wind uncertainty, Deep learning, decomposition**

I. Introduction

Enhanced renewable energy sources (RES) integration at transmission level and distribution system is possible with accurate wind speed forecasting (WSF) [1]. Wind energy is pollution-free, abundant, and renowned among RES. Fig. 1 depicts global top five markets in 2019 with new installations. Precise WSF can minimize instability of wind energy integration and energy market trading [2]. WSF has become a significant area of interest within the field of energy research. However, it has been regarded as a tough job due to wind speed uncertainty.

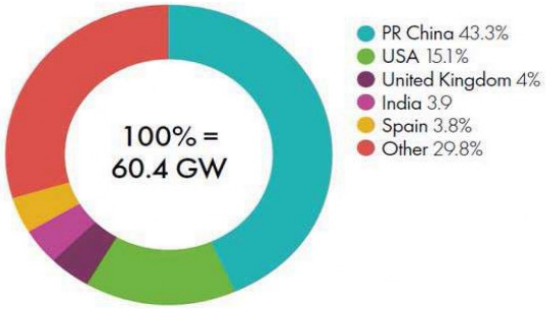


Fig. 1. New capacity in 2019 and share of top five markets (%) [1]

Wind speed prediction approaches are mainly classified into physical models, statistical models, and artificial intelligence (AI) models. Each model has its own merits and demerits. The physical models can use a set of mathematical equations considering numerical weather predictions (NWPs) and terrestrial conditions of the plant location. Physical models best suitable for long-term forecasts but they take immoderate computational resources. Statistical models such as autoregressive (AR), AR moving average (ARMA), AR integrated MA (ARIMA) utilize past wind speed data [3]. Existing statistical equations are utilized to model future wind speed. Statistical models are low-cost, easy to implement and best suitable for very short-term horizon. The main problem of these models is that the prediction accuracy is not desirable.

AI models such as artificial neural networks (ANNs) and support vector machines (SVMs) are utilize pattern recognition and machine learning algorithms to extract features for the enhancement of WSF accuracy [4]. Recently, hybrid models gained global attention to further improve the accuracy. AI models possess several demerits: (1) ANNs with shallow architecture consists single hidden layer and have poor generalization intelligence. So, shallow ANNs are not successful to extract high level abstractions from intermittent wind input. Because of the smoothness assumption, SVMs have the same difficulty. (2) Some of the deep learning models do not take account of wind input sequential features. (3) The wind speed feature extraction is indirect. Hence, the WSF researchers are implementing hybrid models for better performance and enhanced accuracy. The main aim of this work is to develop the hybrid deep learning neural architecture using long short-term memory (LSTM) network and complete ensemble empirical mode decomposition with adaptive noise (CEEMDAN). The developed approach is compared with several baseline models on NIWE wind dataset to demonstrate its superiority. The results show that developed approach can outperform the existing benchmark approaches. Therefore, hybrid CEEMDAN-LSTM approach is scalable and it can learn significant features from NIWE dataset.

The rest of this paper is organized as: Section II presents background methodology and proposed WSF framework. Section III gives developed model validation; finally, conclusions are drawn in Section IV.

978-1-7281-5681-1/20/$31.00 ©2021 IEEE

Ensemble deep learning model for wind speed prediction

M. Santhosh
IEEE Member
Assistant Professor
Dept. of EEE
Kakatiya Institute of Technology and Science, Warangal, India
madasthusanthosh@ieee.org
ORCID: 0000-0002-4106-7557

M. Dharani Sai
Dept. of EEE
KITSW
b16ee016@kitsw.ac.in

Sanober Mirza
Dept. of EEE
KITSW
b16ee054@kitsw.ac.in

2020 21st National Power Systems Conference (NPSC) | 978-1-7281-8552-1/20/$31.00 ©2020 IEEE | DOI: 10.1109/NPSC49263.2020.9331836

***Abstract*—Wind prediction is a significant prerequisite for look-ahead economic load dispatch. Wind speed data is normally exhibiting wide uncertainty nature. Evaluation of this wind data must be accurate to reduce the dangers of system operations. To address this problem, the hybrid approach is developed using long short-term memory (LSTM) network and ensemble empirical mode decomposition (EEMD). This decomposition technique is utilized to divide training data into distinct sub-series. The features of uncertainty involved in each sub-series are extracted and utilized to enhance forecasting accuracy by LSTM to learn the characteristics of the decomposed signals. This developed hybrid deep learning model is comprehensively validated with real-time data. The performance validation analysis using statistical error values shows that the developed approach gives superior performance to the existing benchmark approaches.**

***Index Terms*—Decomposition technique (EEMD), Neural network (LSTM), Hybrid deep learning model, Wind speed prediction**

Fig. 1. From 2015 to 2019 yearly wind installations (in GW) [1]

I. Introduction

As a renewable and environmentally friendly energy resource, wind energy is prominent among low-carbon energy technologies. As shown in Fig. 1, with new wind installations of 60.4 GW, 2019 was an outstanding year for the wind industry and this brings global cumulative wind power capacity to 651 GW [1]. This high penetration of wind energy into the grid must be supported by an accurate wind prediction approaches to help utilities and other grid managers in daily economic power dispatch scheduling, power reserve management, and unit commitment decisions. However, wind prediction is regarded as a difficult job because of uncertainty.

In wind speed prediction approaches, first, the physical approaches can use mathematical formulas taking into account numerical weather prediction (NWP) data and physical conditions of the wind farm location. Under stable weather conditions, these physical approaches accurate for long-term predictions but they have high computational burden and not cost-effective for small scale prediction. Second, statistical approaches entirely rely on past data collected from the wind farm. Using linear or non-linear estimations, look-ahead wind speed data values are predicted using correlations between past data. These statistical approaches are simple in implementation and suitable for very short-term horizon. Persistence approach is the simplest approach among these statistical approaches and it is also called the naive predictor. This persistence approach states that the present measurement value can be taken as the predicted value. Other statistical approaches such as autoregressive (AR), AR moving average (ARMA), AR integrated MA (ARIMA) and seasonal-ARIMA based approaches come under the category of linear time series-based approaches. But these approaches not suitable for short-term prediction horizon (from 10 min to 6 h). Third, AI-based approaches include artificial neural network (ANN), fuzzy logic method, and support vector regression (SVR) are used to obtain highly non-linear features from uncertain data. Further, hybrid approaches combine one or more prediction approaches to form one model. The data decomposition algorithms are combined with ANNs to improve prediction accuracy.

AI approaches hold the following disadvantages: (1) Most of the ANN-based models have one hidden layer. (2) The extraction of features from wind speed uncertainty has been indirect. (3) Some of the approaches demand expertise and advance knowledge of the specific area of application. Therefore, the practitioners are developing deep learning architectures such as extreme learning machine (ELM), deep belief network

978-1-7281-8552-1/20/$31.00 ©2020 IEEE

NLC and SFO Control Technique Based Multilevel Inverter fed 3-φ Induction Motor Drive

P. Mahesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
pm.eee@kitsw.ac.in

C. Venkatesh
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
cv.eee@kitsw.ac.in

V. Rajagopal
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science, Warangal, India
vrg.eee@kitsw.ac.in

***Abstract*—In this work, hybrid control technique based 3-φ induction motor drive fed from a cascaded multilevel inverter is presented. In the past decades regular two level inverters are, however these are having output voltage with harmonic content. To improve the solar photovoltaic system power quality and voltage rating, the multilevel inverters are employed along with several lower voltage dc sources is employed. In multilevel inverters power conversion is by synthesizing a staircase voltage waveform. The presented inverter configuration is derived from a module of addition and subtraction of sources. It helps to reduce the number of components - number of sources, switching drive, capacitors, diodes and majorly power switches. In this work, performance analysis and operating modes of 3-φ cascaded hybrid control technique based multilevel inverter for both symmetrical and asymmetrical topologies are explained. Further, the nearest level control (NLC) and switching frequency optimal (SFO) control techniques are employed in this work. To operate the power switches in this topology the switching signals are generated by using hybrid SFO-NLC technique. The enhanced features of this topology with the perspectives of power quality and optimized switching count are presented. The inverter fed drive system with proposed control technique is simulated by MATLAB/Simulink for the verification of the performance of the technique under both steady state and dynamic conditions.**

Keywords*— *Module of Addition and Subtraction of Sources (MASS), Modular Multilevel Inverter, Nearest Level Control (NLC), Switching Frequency Optimal (SFO), Induction Motor Drive (IMD)

I. INTRODUCTION

In many industrial applications, conventional DC motors were the best suitable for the variable speed drives because of excellent performance in torque and speed characteristics. These motors comprise of commutator and mechanical brushes, which undergo wear and tear with the progression of time. Because of these inherent disadvantages, nowadays the DC machines are replaced by AC machines [1]. Nowadays almost in all industrial drives, AC induction motors are preferred **as** compared to DC motors because of more advantages [2]. These motors are low cost, rugged, reliable, and relatively inexpensive with high efficiency. So that the induction motors are more preferable in many areas of industrial applications. But in past years, because of constant supply voltage and constant frequency the Induction motors are mainly suitable for only constant speed applications. In many industrial applications variable speed operation is required. For that, conventional mechanical gear systems were used. Due to the advancement in power electronic technology the mechanical gear systems are replaced. This technology is utilized for variable speed drives and also it can improve the response and performance of speed and torque characteristics of a motor under dynamic and steady state conditions [3]. For adjustable speed applications in the AC drive system, the variable frequency operation is required. So that AC drive system is fed from the power electronic converters [4]. The power electronic converters are suitable to conversion of fixed voltage & frequency to variable voltage & frequency, and then control the speed of AC motor. Generally, induction motor drive fed from the three-phase power electronic converters (inverter), but which is having poor voltage and current qualities that means it consisting of high THD. To improve the power quality and for reduction of THD, the power electronic converter must be operated with high switching frequency, but which causes an additional switching losses.

The multi level inverter [5] concept introduced to improve the power quality with reduced THD [6] and switching losses [7], so it can improves the dynamic performance of the converter and control the speed of induction motor with excellent speed and torque characteristics. Several conventional multilevel inverter (MLI) topologies are developed, such as flying capacitor clamped inverter, diode clamped inverter, cascaded H-bridge MLI, Neutral point clamped [8] and hybrid MLI [9]. The cascaded MLIs are popular due to its modularity in design of topology and possibility to extend the capacity as well as the number of the voltage levels in near future. However, the conventional inverters are consisting of high power conduction losses, as more number of power switches is used for increase the number of levels in inverter operation and normally which operate at higher switching frequency [10]. And also the novel multilevel inverter topologies are presented in [11]-[12] with reduced number of switches. Modular MLI are introduced to enhance the voltage rating with reduced number of switches. But which are having voltage equalizing problems across the source side capacitors [13]-[14].

To improve the multi level inverter performance compared to conventional multi level inverters in this research work a 3-φ hybrid cascaded modular multi level inverter is presented. In this work a three-phase cascaded structure with optimum component count is presented, viz., power switches count, gate drive count, capacitor count, diode count, and source count. The fundamental frequency hybrid control technique is used to generate the switching signals for power semiconductor switches, which is derived from nearest level control (NLC) and switching frequency optimal (SFO) switching control technique, is presented.

978-1-7281-5681-1/21/$31.00 ©2021 IEEE

Second International Online and Multidisciplinary Conference
Organised by International Association of Research and Developed Organization
www.iardo.com
Date: 15th - 16th June 2020
ISBN : 978-93-90103-04-1
Conference World
www.conferenceworld.in

CERTAIN INVESTIGATIONS ON TWO INPUT INTEGRATED BUCK AND BUCK-BOOST CONVERTER

B. Jagadish Kumar[1], A. Anusha[2]

[1] Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

[2] Student,Department of Electrical & Electronics Engineering, Kakatiya Institute of Technology and Science, Warangal, Telanagana, India

ABSTRACT

The Multi Input Integrated Buck and Buck-boost converter is essentially a combination of buck and buck-boost converters. However, on account of integration only one inductor is sufficient enough for performing the power conversion. In order to have simple control strategy as well as simpler compensator design a single loop control scheme, voltage-mode and current-limit control, are proposed here for the power distribution. The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter.

Keywords: DC–DC converter, Multi input integrated converter, Multi input power converter, PI controller.

I. INTRODUCTION

The converter has the ability to supply energy from storage and renewable energy sources individually to the load. It maintains a constant output voltage under various transient conditions of load as well as source. It has the capability to operate in buck, boost, and buck–boost modes of operation. The mathematical model of the converter is developed, which is further used to design controllers for the converter. A laboratory prototype is developed for experimental realization of the converter. The analysis, design, simulation, and experimental results of the converter prove that it is suitable in hybrid electric or renewable energy systems application.

Student's Publications

List of Students' Journals and Conference Papers published during A.Y. 2020-21:

S.No.	Name of the Student(s)	Title of the Paper	Name of the Journal/Conference	Details of Paper
1	Govulakonda Harshavardhan	Transparent Solar Cells	Journal of Informational and Computational Science	ISSN: 1548-7741 Vol. 14, Issue-1, 2021
2	Pandilla Shivani	Investigations on Changing the Electrical Safety Culture	Journal of Informational and Computational Science	ISSN: 1548-7741 Vol. 14, Issue-1, 2021
3	N.Ganesh	Investigations on Recharge Boost Converter	Journal of Informational and Computational Science	ISSN: 1548-7741 Vol. 14, Issue-1, 2021
4	K.Sahiti	Investigations on Multi-input Integrated Buck-Sepic Converter	International Journal of Science Technology & Management (IJSTM)	ISSN: 2394-1537 Vol. 9, Issue 06, 2020
5	Radhavaram Sruthi	Comparative Study of Conventional Inverter Topologies for Stand-alone PV System	IEEE-International Conference on Emerging Technologies (INCET)	Doi: 978-1-7281-7029-9/21/$31.00©2021 IEEE
6	M.Dharani Sai, Sanober Mirza	Ensemble Deep Learning Model for Wind Speed Detection	IEEE-National Power Systems Conference (NPSC)	Doi: 10.1109/NPSC 49263.2020.9331836
7	A. Anusha	Certain Investigations on two input integrated Buck and Buck-Boost Converter	International online and Multidisciplinary Conference, International Association Research and Developed organization, Gaziabad	ISBN: 978-93-90103-04-1

TRANSPARENT SOLAR CELLS

Govulakonda Harshavardhan[1] , Dr.B.Jagadish Kumar[2]

[1]*B.Tech (UG) Student, Electrical & Electronics Engineering, Kakatiya Institute of Technology and science,(India), govulakondaharshavardhan19@gmail.com*

[2]*Associate professor, Electrical and Electronics Engineering Department, Kakatiya Institute of Technology and Science, (India),jagadeesh908@gmail.com*

ABSTRACT

There are places where people still live without basic needs such as electricity. They are the places which are isolated and as difficult environmental conditions to build power plant and transport electricity. So, by producing their energy source in their areas solemnly depending on natural resources would be the ultimate salvation for those who are in abysmal. This will become possible if we implement using transparent solar cells. Unlike conventional solar cells, transparent solar cells trap photons of invisible light, such as ultraviolet rays. The stripes of the photovoltaic cells convert these photons into electricity. Moreover, these cells can be used as windows in their house, mobile phone screens and can replace any glass used for commercial purpose. Since the title suggests "transparent", these cells allow visible light to pass through them. Therefore, transparent solar cells allow the useful light to echo and on the other hand, it converts the useless light into energy, where a conventional solar cell cannot.

Keywords:*Antireflection coating, Absorptive Spectrum, Photovoltaic cell, Transparent Substrate, Transparent electrode, Ultraviolet light.*

I. INTRODUCTION

Intense changes in energy conversions system are foreseen because of deficiency of conventional fuels. Fuel deposit on the planet will soon exhaust and fossil fuel scarcity will be maximum. The fundamental explanations behind the above are due to increasing demand for energy, rising population, fast development in innovation. Indiscriminate utilization of commercial energy has lead to genuine climate issues like air and water contaminations. People who are harnessing the utilization of alternate source of energy should please and accept the environmental conditions, low cost electrical energy as a replacement for energy from quickly draining resources of fossil fuels is the basic requirement for the endurance of humanity.

Solar energy is the biggest source of energy when compared to all the forms of renewable energy and it is the prominent source of energy. Since all other sources of renewable energy have vulnerable limitations. Solar energy is the boon for future generations because of its opulence and never-ending characteristics. This unicity of solar energy regards the non-renewable energy as unpromising. Solar energy can enlighten the world since it is the major source of energy. The potential of solar energy is baffling; which is 178 billion MW and this myriad value of energy will promise a whole new world. Statistically, 178 billion MW is about 20000 times the total energy consumption of the world. Moreover, the energy radiated by the sun on a sunny day is almost 1km/m2.

But the problem associated with the utilization of this legion of potential is its availability. We cannot promise the same radiation of the sun throughout the year because the radiation of the sun changes with time. Sadly, the variations appear even in

INVESTIGATIONS ON CHANGING THE ELECTRICAL SAFETY CULTURE

[1]Dr. B. Jagadish Kumar , [2]Pandilla Shivani

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science, Warangal, India,

jagadeesh908@gmail.com

[2]B. Tech III year Student (UG,)Kakatiya Institute of Technolgy and Science, Warangal, India,

b18ee026@kitsw.ac.in

Abstract: *This paper analyses the ways to improve the electric safety culture in an organization .This analyses about the safety measures that was being taken and should be taken by the managements of any organization. Following few key issues are included in this paper. (i) The basic requirements of the electric safety culture are analyzed. (ii) By taking the past and present work practices in electrical safety culture into consideration, few suggestions are given to improve electric safety cultures in organization in future. The main argument of this paper is that representation of culture is the sum of what is commonly acceptable without analyzation and the most important thing included in this paper is that the training must be given to the non electrical personnel in order to avoid electric hazards and addressed the more difficult aspects of human performance in fair manner.*

Keywords: *Beliefs, Electrical safety, Safety culture, non electrical personnel.*

I. INTRODUCTION

Electrical safety culture is nothing but it is the set of values, attitudes, goals of an organization. Responsibility of keeping workplace safe will be in the hands of every single individual working at an organization. When we compare working conditions of past and present there are a lot of developmental changes have taken place. The future developments will be done on the basis of past and present working conditions in the electrical organization.

A.Electrical Safety:

Protecting electrical workers of electrical organization from the dangerous effects of electric currents, electrical arc, etc.. is known as electrical safety. Every worker working at electrical organization including electrical and non electrical workers should be educated and should have knowledge on every single equipment that is being used.In order to create awareness among workers, A workshop was conducted by IEEE IAS. Fig 1.1 shows the logo of the workshop.

Figure 1.1:Electrical Workshop logo

Figure 1.2:Working with Energized and de energized equipment

INVESTIGATIONS ON RECHARGE BOOST CONVERTER

[1]Dr. B. Jagadish Kumar , [2]N.Ganesh

[1]Departmen of EEE, Kakatiya Institute of Technolgy and Science,Warangal,India,
bjk.eee@kitsw.ac.in
[2]M. Tech Student (PE),Kakatiya Institute of Technolgy and Science,Warangal,India,nknganesh09@gmail.com

ABSTRACT:

In this paper,A Boost converter with a coupled-inductor is explored.In the proposed,method a coupled inductor and a switch with low voltage rating is used for improving voltage gain.A passive regenerative snubber circuit is used for reviting energy of the stray inductance,makes the switch to operate in a wide range of duty cycle which relatively increase,the voltage gain,compared to coupled inductor-based converters.These scheme have voltage clamped properties,low voltage stress than output voltage made to choose low-voltage low conduction devices,with no reverse-recovery currents within diodes used in the circuit.Moreover,the closed loop control technique used to reduce the voltage drift problems.The proposed converter topology boost the voltage gain of a conventional Boost converter using single inductor, and mitigate the demagnetization of transformer and leakage inductor of coupled-inductor based converter.

***Keywords**: Battery, Passive Regenerative snubber circuit,coupled-inductor, reverse recovery,fuel cells,proton exchange membrane.*

INTRODUCTION:

In present days,many industrial application require steep voltage ratio.For example,boost converters are used in hybrid electric vehicles (HEV) and lighting systems,telecommunication industry.By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic interference problem is more.Several converter topologies are proposed in past decades.

By using conventional Boost converter,results in serious reverse-recovery problem,with low voltage gain,even for extreme duty cycle,cause the efficiency to decrease and the Electromagnetic Interference problem.Eventhough Voltage clamped techniques are used to decrease the reverse-recovery problem,The switch voltage stress is more and voltage gain is limited by turn-on time of the switch,a boost soft-single converter topology in pulse width modulation manner is used.The high-step up ratio is achieved by using coupled inductor and switch voltage accordingly,also improves the reverse-recovery problem of output diode.

International Journal of Science Technology and Management
Volume No.09, Issue No. 06, June 2020
www.ijstm.com
ISSN 2394 - 1537

INVESTIGATIONS ON MULTI INPUT INTEGRATED BUCK- SEPIC CONVERTER

[1]B. Jagadish Kumar, [2]K. Sahithi,

[1]Associate Professor, Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology & Science, Warangal 506015, India

[2]UG Student, Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology & Science, Warangal 506015 ,India

ABSTRACT— The application of high-frequency switching converters and their controls in dc power distribution has been increasing in recent years . The major concern with recent dc distribution systems, such as in automotive and telecom power supply systems, is to meet the increased power demand and to reduce the burden on the primary energy source, i.e.,built-in battery. This is possible by adding additional power sources in parallel with the existing battery source. The additional power source can be a renewable energy source such as photovoltaic (PV) or fuel cell (FC) storage power . In this paper analysis and control of two-input buck integrated SEPIC converter, suitable for photovoltaic (PV) applications, is presented. This converter is essentially combination of individual buck and SEPIC converters

Keywords: DC–DC converter, Multi input integrated converter, power management, trailing-edge modulation.

I. INTRODUCTION

High frequency switching converters application in the dc power distribution is increasing in the recent years. . One of the main orientations in power electronics in the last decade has been the development of switching-mode converters with higher power density and low electromagnetic interference(EMI). As the power conversion system is becoming miniaturized, increasing the power density is one of the challenging issues for the power supply designers. Furthermore, light weight, small size and high power density are also some of the key design parameters. In the recent dc distribution systems the prominent issue, in automotive and telecom powersupply systems, is to meet the increasing power demand and reduce the burden on the primary energy source, i.e. built-inbattery. This is implemented by using additional power sources in parallel to the existing primary source. The additional power sources are (i) renewable energy sources like solar or wind, (ii) fuel cell storage power. **The** dc sources are connected in parallel to meet the common load demand. This parallel connection is preferred when: 1) the existing dc source is unable to meet the full load demand and 2) the power available from a cost-effective source is used in combination with the another source which supplies deficit demand. In any case,a power electronic converter is required for efficient handlingof power transfer. Converters can be paralleled in two differentways: 1) paralleling different power electronic converters at the load port and 2) connecting multiple sources through an integrated converter The various dc sources must be connected in parallel through an intermediate power electronic converter at the load port or through a single integrated converter. For two dc sources, the two-input integrated converter is preferred for power control as it results in a smaller number of components and simplicity in controller design. . A systematic approach for analyzing two-input integrated converters based on six basic topologies has been studied extensively . This reveals that the input sources can supply power to a load either individually or simultaneously without disturbing. One of such is, integrating buck and buck–boost converters,where power is drawn from low voltage and high-voltage dc sources and supplied to a common dc load. Eventhough, buck–boost converter integration in a double-input dc –dc converter works well for power transfer from a low-voltage source (LVS), the source current has more ripple content and requires an additional input filter. By using the SEPIC converter in place of the buck–boost converter gives an additional flexibility of voltage gain matching, low to high or vice versa, together with lesser source ripple current. One such double-input converter is studied, which is a combination of the buck and SEPIC topologies

II. MODELING AND ANALYSIS OF BUCKINTEGRATED SEPIC CONVERTER

The proposed BI-SEPIC is essentially a parallel combination of buck and SEPIC converter. However,to reduce the number of energy storage elements, the switching devices of the two converters are arranged so that o one inductor "L" on the load side is sufficient for processing the power in both of these converters.Having single inductor in the integrated topology shows order of the power

2021 2nd International Conference for Emerging Technology (INCET)
Belgaum, India. May 21-23, 2021

Comparitive Study of Conventional Inverter Topologies for Stand-Alone PV System

Radhavaram Sruthi
Scholar
Dept. of EEE,
KITSW
Sruthi.radhavaram95@gmail.com

Dr. P. Nagarjuna Reddy
Assistant Professor
Dept. of EEE,
KITSW
Pnreddy.eee@kitsw.ac.in

***Abstract*—Multilevel converters, generally, used in medium and high-power system applications, of any configurations, offer higher efficiency and lower THD. With the advance of renewable energy systems, particularly photovoltaic (PV) systems, there is always an ever-increasing need for highly efficient multilevel inverters to cater the AC loads. The present work aims at comparing the basic three inverter topologies [Diode clamped, Flying-Capacitor, Cascaded H-Bridge inverter] of five-level inverter for a stand-alone PV-system. The efficiency and harmonic distortion of these configuration are compared. The entire work is carried out in MATLAB Simulink Environment.**

Keywords--Five level inverter, Stand-alone PV-system, inverter topologies

I. INTRODUCTION

With the increased integration of renewable energy resources, several developments have been occurring in power electronics in the recent years. The renewable resources are environment-friendly and are replacing the traditional power generation plants which produce large carbon emissions polluting the environment. Among the different renewable energy resources that are been utilized for electrical power generation, solar energy is one of the extensively used resource because of its abundancy and simplicity in installation. The solar energy can be harnessed in DC form which in turn is to be converted to AC to integrate into the conventional AC power systems. Power converters are used for conversion of DC power to AC power. Usage of Multilevel Inverters (MLI) has increased in the recent times for DC to AC conversion of signals. A multilevel inverter is a power electronic device that offers desired AC output voltage level using one or more lower-level DC voltages as an input. The multilevel inverters offer lower dv/dt besides lower harmonic distortion. The higher the voltage levels are, the smoother is the output waveform [1]. But the complexity of the controller circuits and their components increases with an increase in the level of inverter. Different topologies of the multilevel inverters are available in the market. The difference among them lies in the control technique which includes the mechanism of switching and the input voltage source that is employed by the topology [2]. The commonly employed topologies are [3]:

- Diode clamped multilevel inverter (DCMLI)
- Flying capacitor multilevel inverter (FCMLI)
- Cascaded H-bridge multilevel inverter (CHBMLI)

The present work aims at comparing the basic three inverter topologies that are mentioned above for a five level inverter with a stand-alone PV-system. For this work, equal phase method and hybrid multicarrier pulse width modulation (H-MCPWM) technique are used for control. The performance and harmonic distortion of these topologies are compared and presented. LCL filter is employed to minimize the distortion in the output voltage.

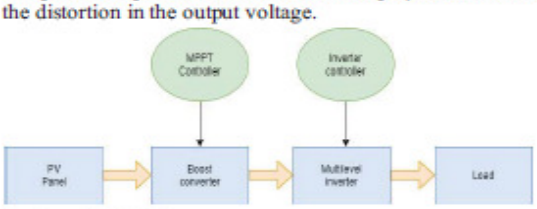


Fig. 1. Basic block diagram

Fig. 1 gives the basic block structure of the employed circuit. A PV panel is connected to the boost converter which improves the voltage magnitude developed by PV panel. This in turn is connected to a multilevel inverter which converters DC power to AC power and is fed to a 1-phase AC load. P & O based MPPT controller is used for providing gate signals for boost converter while different configurations of MLI are used in this study.

II. MODELLING OF SOLAR CELL

Solar PV cells being the basic units of solar PV array/panel, are arranged in a combination of series and parallel strings to achieve required voltage and current. When PV cell is exposed to light, it generates current. The widely used mathematical model of PV cell, shown in Fig. 2, is employed for the current work [4]

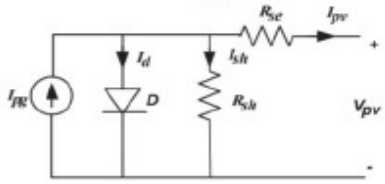


Fig. 2. PV module equivalent circuit

The current output of the PV module can be obtained using equation 1.

$$I_{pv} = I_{ph} - I_s\left(e^{\frac{q(V_{pv}+I_{pv}*R_s)}{nKT}} - 1\right) - \frac{V_{pv}+I_{pv}R_s}{R_{sh}} \quad \ldots (1)$$

Perturb & Observe (P&O) algorithms are the extensively used MPPT algorithms because of their simplicity in structure. They operate with periodicity of incrementing (or)

978-1-7281-7029-9/21/$31.00 ©2021 IEEE

Ensemble deep learning model for wind speed prediction

M. Santhosh
IEEE Member
Assistant Professor
Dept. of EEE
Kakatiya Institute of Technology and Science, Warangal, India
madasthusanthosh@ieee.org
ORCID: 0000-0002-4106-7557

M. Dharani Sai
Dept. of EEE
KITSW
b16ee016@kitsw.ac.in

Sanober Mirza
Dept. of EEE
KITSW
b16ee054@kitsw.ac.in

2020 21st National Power Systems Conference (NPSC) 978-1-7281-8552-1/20/$31.00 ©2020 IEEE | DOI: 10.1109/NPSC49263.2020.9331836

***Abstract*—Wind prediction is a significant prerequisite for look-ahead economic load dispatch. Wind speed data is normally exhibiting wide uncertainty nature. Evaluation of this wind data must be accurate to reduce the dangers of system operations. To address this problem, the hybrid approach is developed using long short-term memory (LSTM) network and ensemble empirical mode decomposition (EEMD). This decomposition technique is utilized to divide training data into distinct sub-series. The features of uncertainty involved in each sub-series are extracted and utilized to enhance forecasting accuracy by LSTM to learn the characteristics of the decomposed signals. This developed hybrid deep learning model is comprehensively validated with real-time data. The performance validation analysis using statistical error values shows that the developed approach gives superior performance to the existing benchmark approaches.**

***Index Terms*—Decomposition technique (EEMD), Neural network (LSTM), Hybrid deep learning model, Wind speed prediction**

Fig. 1. From 2015 to 2019 yearly wind installations (in GW) [1]

I. Introduction

As a renewable and environmentally friendly energy resource, wind energy is prominent among low-carbon energy technologies. As shown in Fig. 1, with new wind installations of 60.4 GW, 2019 was an outstanding year for the wind industry and this brings global cumulative wind power capacity to 651 GW [1]. This high penetration of wind energy into the grid must be supported by an accurate wind prediction approaches to help utilities and other grid managers in daily economic power dispatch scheduling, power reserve management, and unit commitment decisions. However, wind prediction is regarded as a difficult job because of uncertainty.

In wind speed prediction approaches, first, the physical approaches can use mathematical formulas taking into account numerical weather prediction (NWP) data and physical conditions of the wind farm location. Under stable weather conditions, these physical approaches accurate for long-term predictions but they have high computational burden and not cost-effective for small scale prediction. Second, statistical approaches entirely rely on past data collected from the wind farm. Using linear or non-linear estimations, look-ahead wind speed data values are predicted using correlations between past data. These statistical approaches are simple in implementation and suitable for very short-term horizon. Persistence approach is the simplest approach among these statistical approaches and it is also called the naive predictor. This persistence approach states that the present measurement value can be taken as the predicted value. Other statistical approaches such as autoregressive (AR), AR moving average (ARMA), AR integrated MA (ARIMA) and seasonal-ARIMA based approaches come under the category of linear time series-based approaches. But these approaches not suitable for short-term prediction horizon (from 10 min to 6 h). Third, AI-based approaches include artificial neural network (ANN), fuzzy logic method, and support vector regression (SVR) are used to obtain highly non-linear features from uncertain data. Further, hybrid approaches combine one or more prediction approaches to form one model. The data decomposition algorithms are combined with ANNs to improve prediction accuracy.

AI approaches hold the following disadvantages: (1) Most of the ANN-based models have one hidden layer. (2) The extraction of features from wind speed uncertainty has been indirect. (3) Some of the approaches demand expertise and advance knowledge of the specific area of application. Therefore, the practitioners are developing deep learning architectures such as extreme learning machine (ELM), deep belief network

978-1-7281-8552-1/20/$31.00 ©2020 IEEE

Student's Articles

List of Students' Articles submitted to Technical Magazine:

S.No.	Name of the Students	Semester & Section	Title of the Article
1	Samhitha Kandula	B.Tech VI Sem-EEE-II	Driver's Anti-Sleep Alarm
2	Peddapally Sushmitha	B.Tech VI Sem-EEE-II	Wifi Smart Bulb
3	Bommineni Bhuvana Priya	B.Tech VI Sem-EEE-II	Conservation of Energy Systems Using Solar Power Management
4	Mandhira Jeripothula	B.Tech VI Sem-EEE-II	Earthquake Detection & Alarm Using Buzzer
5	Ch. Shreya Reddy	B.Tech VI Sem-EEE-II	Automatic Street Light Control Using Arduino
6	Potharaju Susmitha	B.Tech VI Sem-EEE-I	Heartbeat Sensor using Arduino
7	Muddasani Harini	B.Tech VI Sem-EEE-I	Algorithm for Demand Response to Maximize the Penetration of Renewable Energy
8	Madikonda Rumitha	B.Tech VI Sem-EEE-I	Smart Stick For Blind People Using Aurdino

Driver's Anti-Sleep Alarm

1st Samhitha Kandula
dept. Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science
Warangal, India
b18ee069@kitsw.ac.in

2nd T Praveen Kumar
dept. Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science
Warangal, India
tpk.eee@kitsw.ac.in

***Abstract*— Anti-sleep alarm is intended to warn the driver of unexpected sleepiness, as dozing off at the wheel may lead to grave consequences like road accidents. In Anti-sleep alarm circuit, it has a tilt sensor that detects whenever the driver bends his /her neck and drives the buzzer and the buzzer produces an intermediate beep sound, making the driver alert and then the red LED glows on when the buzzer produces intermediate sound. When the driver gets back to normal position then the buzzer stops producing a sound, then the red LED gets OFF and green LED is switched ON, which implies that the driver's position is normal. This alarm keeps the driver awake and would help in lessen the tendency of road accidents during night.**

Keywords—Anti-sleep, driving, Alarm, buzzer, Accidents, LED

I. INTRODUCTION

Driver's sleepiness during the journey can cause accidents especially during nights and leading to dangerous consequences. It becomes a threat to the traffic participants and drivers. It is required for the driver to have sufficient amount of sleep before the journey commences. The driver should be aware of his sleepiness during the drive but sometimes due to fatigue and restlessness the driver may unknowingly doze off. It is very important to overcome this situation with possible approach that reduce the road accidents to some extent. One such approach is the driver's anti sleep alarm that would intimate the driver with a sound of his sleepiness making him alert.

The main purpose of this project is to make the driver alert when he/she dozes off to sleep with a sound using a buzzer and reduce the risk of accidents. For this, a tilt sensor is given to the driver which is placed at the pinna of the ear while driving in order to make the driver alert during the journey.

Once, the tilt sensor is placed to the driver on his ear, the sensor detects the motion of the head and buzzer gives a beep sound whenever a motion is detected from the sensor making the driver alert.

II. DRIVER'S ANTI-SLEEP ALARM

2.1 what is an Anti-sleep Alarm?

A. Any circuit or a device that retains you under scrutiny by making a beep sound or emitting any flash light in order to make you alert while driving when you doze off while driving. These driver's anti-sleep alarm are also called as drowsiness detection devices.

B. These anti-sleep alarms circuits can be designed in different ways based on the application and convenience therefore, each have a different working of its own. The anti-sleep alarms are categorized mainly into

i Based on the physical parameters such as activity

ii. Based on the behaviour such as head motion, eye blinking, steering wheel patterns etc. Some of the approaches such as alarms based on tilt sensor, blink sensor etc.

iii. Based on the driver's prior sleep history

iv. Based on the combination of the above said methods

The tilt sensor circuit is very simple and does not affect the vision of the driver when used while driving where as the anti-sleep alarm based on the blink sensor has an effect of the sight of the drivers as the device is fixed to the glasses in order to observe the driver. This makes the anti-sleep alarm to be more reliable on tilt sensor than the eye blink sensor.

2.2 Driver's Anti-Sleep Alarm

Driver's anti-sleep alarm is intended to warn the driver of his unexpected sleepiness. This device has a tilt sensor that detects the motion of the driver which means that whenever the driver tilts or bends his/her head then the motion is detected by the sensor and the buzzer produces an intermittent beep sound when the motion is detected. When the driver gets back to the normal position the buzzer stops producing the beep sound. The position of the driver can also be understood simply the LED's in the circuit, whenever the red LED is ON it indicates that the tilt sensor has detected a motion of the driver and makes the driver to be alert during while driving with a buzzer sound and whenever the green LED is switched glows which indicates that the driver is in his/her normal position.

The main functionality of this device is to avoid accidents due to drowsy driving and to avoid its grave consequences. This provides a security and safety to the driver and helps them to get of the risk.

III. COMPONENTS

Driver's anti-sleep alarm device consists of the following components.

3.1 Hardware components:

i. Tilt sensor
ii. Arduino UNO board
iii. Buzzer
iv. Bread board
v. Resistors
vi. LEDs (Red, green)
vii. Jumper wires

3.2 Software components

Arduino- software

3.1 Hardware components

3.1.1 Tilt sensor

Tilt sensor is a device or an instrument which is used for measuring the tilting position with reference to the gravity. They give us an information about the vertical and horizontal inclination of the plane. The tilt sensor has a metallic ball which is designed in such a way that, whenever the sensor reaches a pre-set value of the angle the ball moves the two pins of the instrument from ON to OFF and vice-versa.

Fig.1 Tilt Sensor

These are used in applications according to the requirement. This concept is applied in the driver's anti-sleep alarm to detect the head movement of the driver. It is used to detect the motion whenever the driver bends means that whenever dozes off while driving his/her head. It detects the inclination of the driver. The tilt sensor has advantageous such as:

i. Very simple and compact
ii. Cost effective
iii. Low power consumption
iv. High accuracy

3.1.2 Arduino UNO

Arduino is an electronic prototyping device which is intended for creating any kind sort of interactive projects such as motor control, sensor networks and other applications. The main features of the Arduino UNO board are it has an operating voltage of 5V. It has 14 digital pins and 6 analog pins. It has a flash memory of 32KB. The programming language that is used in an Arduino is the C/C++ 'dialect'. Here the code required for the operation of the driver's anti-sleep alarm is uploaded in the Arduino through PC.

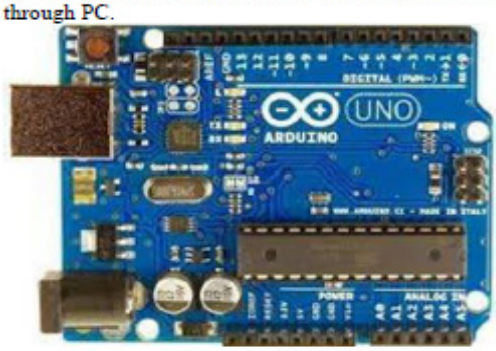


Fig.2 Arduino UNO

It is very easy to connect the components to the Arduino also, very simple. It simply needs to be connected to the computer using a USB cable or it can be powered with a battery to get it started.

3.1.3 Buzzer

Fig.3 Buzzer

Buzzer is an electric device that produces an intermittent beep sound. These buzzers are mainly used in the alarm circuits, timers etc. Buzzer consists of two pins that can be connected to ground and power.

3.1.4 Bread Board

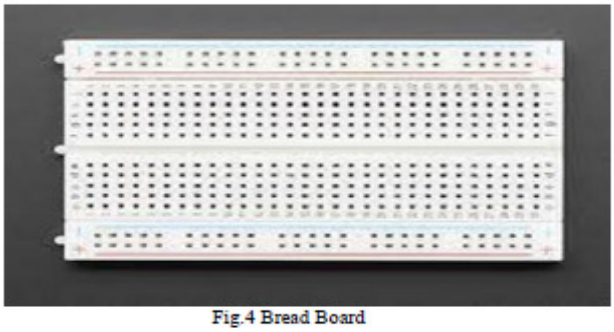


Fig.4 Bread Board

Bread board is a device used for prototyping and for testing the circuits. It is mainly used for interconnection of the components required for a project or working model simply by inserting the terminals of the components into the holes of the bread board. It does not require any soldering

3.1.5 Resistors

Fig.5 Resistor

Resistor is an electrical component which limits the flow of electric current. The values of the resistor can be determined by colour coding of the resistor.

3.1.6 LED

Fig.6 LED

LED-Light emitting diode. It is a semiconductor diode that glows on whenever a suitable voltage is applied. LED's are used in the lightening applications. The purpose of the LED in the project driver's anti-sleep alarm in order to indicate whether the driver's head position is normal or tilted. Here we use two different LED's (red and green) to have difference in the representation of the head position of the driver.

3.1.7 Jumper wires

Fig.7 Jumper Wires

Jumper are the electrical cables or wires used to connect the components of the bread board without the help of the soldering.

3.2 Software components

The software components required for the project is the Arduino software-Arduino 1.8.13 version. The software is used as a platform of the Arduino coding and uploading it for the operation the project. This software provides a platform which is a simple and easy to work with the Arduino projects.

IV. CIRCUIT DIAGRAM AND WORKING

The purpose this project driver's anti-sleep alarm to reduce the accidents due to drowsy driving especially during nights and its grave consequences. To is basically a safety device that makes the driver alert during the journey.

4.1 Circuit diagram

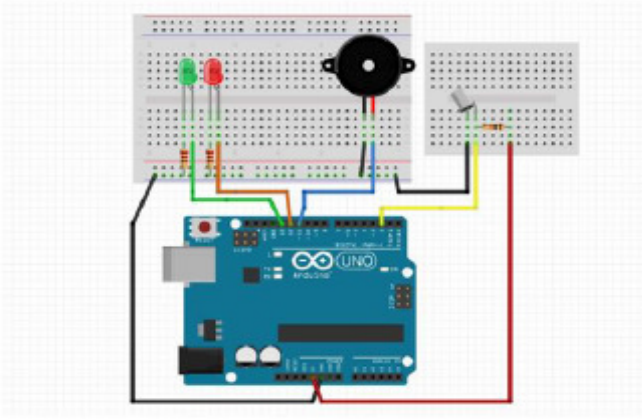


Fig.8 Circuit diagram of Driver's Anti-sleep Alarm

4.2 Working

Firstly, all the components are connected on the bread board with the help of a jumper wires then a code for the working of the model is uploaded into the Arduino through the Arduino software. The working of the project is that the tilt sensor is placed to the pinna of the ear of the driver while driving. Whenever the driver falls asleep the person tends to tilt or bend his/her head, the tilt sensor detects this motion and gives an input and this input makes the buzzer to produce an intermittent beep sound. This sound makes the driver alert, reminding him that he is driving. LED's are used for the indication of the driver's head position whether he is in normal position or dozing off to sleep (tilting head position). Whenever the red LED glows on it indicates that the driver is not in normal position similarly whenever the green LED glows on indicates that the driver is in normal position. In this way the alarming circuit help the driver being awake. The code required for uploading it in the Arduino is given below

```
int inPin = 2; // the number of the input pin
int reading;// the current reading from the input pin
int GreenLedPin = 13; // the number of the Green LED output pin
int RedLedPin = 12;// the number of the Red LED output pin
const int SpeakerPin = 10; // the number of the Speaker/Buzzer pin

void setup ()
{
 pinMode (inPin, INPUT);
 pinMode (GreenLedPin, OUTPUT);
 pinMode (RedLedPin, OUTPUT);
 Serial.begin(9600);
}

void loop ()
 {
 reading = digitalRead(inPin);
 if (reading == 1)
{
   digitalWrite (RedLedPin, HIGH); // if tilted, turn the red LED ON
   digitalWrite (GreenLedPin, LOW);
   tone (SpeakerPin, 494, 500); // if tilted, turn the Speaker ON
  delay (500);

 }
else
{
   digitalWrite (RedLedPin, LOW);
   digitalWrite (GreenLedPin, HIGH); // if not tilted, turn the green LED ON

 }
 Serial.println(reading); // not really needed

 delay (200); // pause 200 milliseconds between readings
}
```

4.3 Advantages and disadvantages

i. Driver's anti sleep alarms are very simple where the whole purpose can be fulfilled with a single tilt sensor

ii. It does not require much input

iii. It does not interrupt or affect the sight of the driver as it is placed to the pinna of the ear

iv. One drawback is that as the tilt sensor detects the even a small motion of the driver's head so there is a possibility of producing a sound even if the driver turns his/her head while driving. Frequent beep sound from buzzer may cause irritability and the driver may not be able to concentrate on driving.

V CONCLUSION

The main functionality of the Driver's anti-sleep alarm is to overcome risk of falling asleep on the wheel which can lead to serious consequences, there may be accidents and people may even lose their lives it is very important to counter this problem using Driver's anti-sleep alarm the above referred issue can be overcome. Drivers anti-sleep alarm are very convenient for reducing the risk of road accidents due to drowsiness, restlessness of the driver which may have grave consequences to the person also the people around. The system is for the security purpose to caution the driver while driving without any interruption to the sight of the driver. Also, the above said system has a simple construction and easy to use. Though it has a disadvantage of producing a sound even when there is a small tilt of the driver head position but it can be gets back to control by further developments in the system.

ACKNOWLEDGMENT

I would like to express my deep gratitude to my guide to T. Praveen Kumar, Asst. Professor, and the Miniproject coordinator to G. Sunil Kumar, Asst. Professor for their patient guidance, support and encouragement also for giving valuable suggestions for the progress of the work. I also extend my gratitude to Prof. C. Venkatesh, Professor & Head of the Department, Electrical and Electronics Engineering for their constant support.

REFERENCES

[1] Arpit Agarwal, "Driver's Drowsiness Detection System," Portfolio of projects on Human Computer Interactions, December, 2010

[2] N A Wright, B M stone, T J Horberry and N Reed, "A review of in-vehicle sleepiness detection", TRL limited, QinetiQ, 2007

WIFI SMART BULB

Peddapally Sushmitha

Electrical and Electronics Engineering

Kakatiya Institute of Technology and Science

Warnagal,India

b18ee108@kitsw.ac.in

***Abstract*—A Smart bulb is a LED light bulb, that is capable of internet which can be controlled remotely. Smart bulbs can be controlled remotely. Smart bulbs can be controlled through a mobile app with the integration of wi-fi. Smart bulb is the one which connects wirelessly to its surrounding network. Generally, smart lightening uses mesh networking. These connections are controlled by a hub that is intern connected to the router. By just using a app in a smart phone we can turn on or turn off the smart bulb. Smart bulb uses less amount of electricity and it has a longer life span. It is of low cost and also improves the standard living at home.**

Keywords—Smart bulb, Wi-fi , Blynk app, mobile

I. INTRODUCTION

"Home automation" has remained for the more number of years. The word "Smart home", "Intelligent home" so on are used to start the idea of networking devices in the home. The home automation i.e., HASs constitutes a considerable research chance in designing new field in engineering and also architecture. Home automation system is fetching desired in present days and is also coming fast in the engineering market.

The power of WIFI is sufficient to be executed in the design. And also, the present laptops, mobiles are coming with the fixed wi-fi adaptor. Because of the fixed adaptor the cost will be decreased.

In this we will see about the design of Home automation system which is of less cost and also with wireless remote control. This is designed in a way to help the old age people and also the disabled people. And even we can also increase the standard of living.

The actual control system executes the wireless wi-fi technology to supply remote access from laptop or a smart phone. The design exists in the electrical switches and gives control much safely with less voltage operating technique. The position of switches synchronizes in all of the control system.

II. CIRCUIT DIAGRAM AND COMPONENTS

2.1 Circuit Diagram

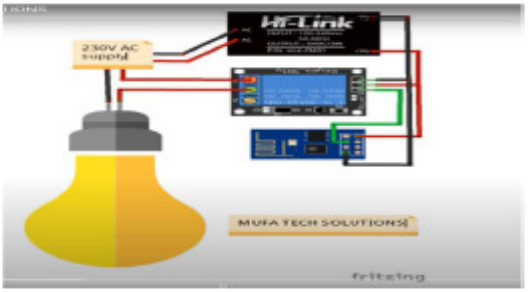


Fig 2.1: Circuit Diagram

2.2 Components

The components used are:

(i) Esp01
(ii) Relay
(iii) 5v, 2Amp Adaptor
(iv) Ac bulb

2.2.1 ESP01

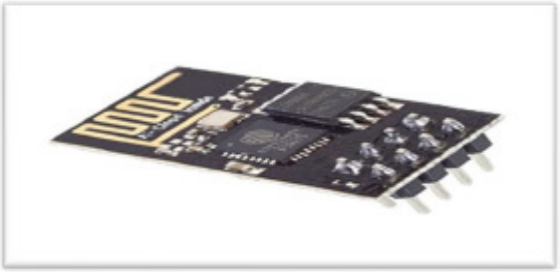


Fig 2.2: ESP01

Node MCU inserts firmware that runs on ESP8266 wi-fi self-contained (SoC) from the Espressif systems, and hardware that depends on ESP-12 module. The Word "Node MCU" mentions the firmware instead of the growing kits and it

uses the language called lua scripting. It depends on elua project and setup on the Espressif Non-OS SDK for ESP8266.

2.2.2 Relay

Fig 2.3: Channel Relay module

A switch which is controlled electrically is known as a relay. These are used only where it is required to manage a circuit by a separate less power signal.

A simple electromagnetic relay contains a coil of wire lapped on every side of a soft iron core. When current is sent through coil it produces a magnetic field, then armature gets started and accordingly motion of the transportable contact either makes or breaks the connection with the stable contact.

2.2.3 Adaptor

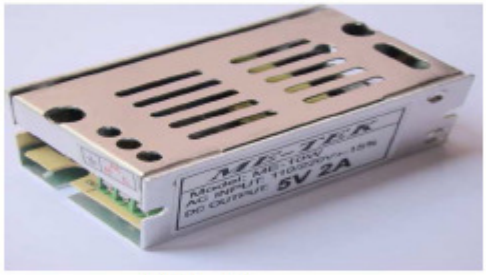


Fig 2.4: Adaptor

An Ac or Dc adaptor is a kind of either power supply which is surrounded in a case same as an Ac plug.

Ac adaptors are used with electrical appliances that needs power but does not have any interior parts to obtain the needed voltage and power from main power. Initially, most of the Ac or Dc adaptor were linear power supplies, having a transformer to change the voltage of main electricity into a lower voltage, a Dc and a filter into a smooth waveform which is pulsating to Dc with the small variations to leave the device that is powered to be unchanged.

2.2.4 AC Bulb

Fig 2.5: AC Bulb

A bulb is an electric light that has a wire filament which is heated to high temperature that shines with the light. In the bulb the filament is secured from oxidation with a glass quartz bulb which is filled with the inert gas.

The incandescent bulbs are made from 1.5 volts to 300 volts. These bulbs works uniformly either on Ac or Dc.

III UPLOADING OF PROGRAM

The steps to upload a program are,

Step 1: Firstly, we should connect Arduino by using the USB cable where the square end should be linked to Arduino and the straight end should be linked to USB port of a computer.

Step 2: Select the tools, board, Arduino UNO to notice board in the list of Arduino. We can also search all boards in this list Arduino mega 2560 and Arduino Leonardo.

Step 3: Select the exact serial port of the board. Then we can see the index of all the accessible serial ports by selecting tools then serial port then com. In window if we connect Arduino, the com port will be the greatest number like com3 or com15.

Most of the devices are shown in com port list. If we keep many Arduino's then each Arduino will get a new number.

Step 4: Then click on the upload. The upload is placed to the right of the Arduino.

IV PROGRAM CODE AND EXPLANATION

4.1 Program code

First download the latest Blynk library.

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.

// Go to the Project Settings (nut icon).
```

```
char auth[] = "F-dERaEvJXZgIAasuZvNcmyxHWPYcYTN";

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "smart bulb";

char pass[] = "1234578";

void setup()

{

 // Debug console

 Serial.begin(9600);

 digitalWrite(0,HIGH);

 Blynk.begin(auth, ssid, pass);

}

void loop()

{

 Blynk.run();

}
```

4.2 Code Explanation

Using of ESP8266 wi-fi library that gives Esp8266 particular wireless ethernet network and we are calling it to link to the network. Blynk library starts conveying between the Blynk app and ESP8266.

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>
```

Then obtain the auth token and also type that has come in the Blynk app when designing the project.

```
char auth[] = "Your auth token";

char ssid[] = "server name";

char pass[] = "server password";
```

Then we should keep the design code in the setup which will execute one time in the start-up. Then in the setup function, it will prepare conveying for debugging and logging with a baud rate of 9600. That starts the link for respective Blynk auth token, name of the server and also password.

```
 Blynk.run();

} void setup()

{

 Serial.begin(9600);

 digitalWrite(0,HIGH);

 Blynk.begin(auth, ssid, pass);

}
```

Then we should keep the main code in void loop() to execute continuously.

```
void loop()

{

 Blynk.run();

}
```

V INSTALLATION, CONFIGURATION OF BLYNK APP AND WORKING PRINCIPLE

5.1 Installation and configuration of Blynk app

Step 1: From the play store install the Blynk app and then open the app.
Step 2: Then by using Email account create an account.
Step 3: Then press on new project and type your project name then select device "Node MCU" and "wi-fi" the connection type and then press on "create".
Step 4: When the project is created that app will send auth token code to the email id used.
Step 5: Then press on "+" icom that is on the right side on the top of the app.
Step 6: Enter the name of button and choose GPIO pins.

5.2 Working Principle

Home automation circuit is established around the ESP8266, Blynk library app and a relay. Set the component as per the circuit diagram. Ac bulb is controlled by ESP8266 that are connected to relays. When we open the app and press on, on or off the information will be sent to ESP8266 wi-fi and then bulb turns on or off.

VI ADVANTAGES

The advantages are,

(i)The installation is very simple and also cost is less.
(ii) They also have less impact on the environment.
(iii) Due to this we can on or off the bulb by just using the app that is there is no need of using switch.
(iv) Using of smart light needs less energy and also has longer life span i.e., 750 to 2000 hours.
(v) "Home automation" helps the physically challenged people and also disabled people very much.

VII CONCLUSION

The system is created in a way that it increases the standard of living of the house and is also made of less cost. As we use smart phone or laptop for functioning of bulb in which an app is installed it helps many people especially old people and disabled people. To be safe for the people using this low voltage system instead of the electrical switches.

The installation of this system is done in a very easy way. We can use the Home automation based on Node MCU and ESP8266 module for even controlling of fans, temperature, lights.

VIII REFERENCES

1. R. Piyare and M. Tazil, "IoT Based Home Automation System using Cell Phone," in Consumer Electronics, 2011, pp. 192-195.
2. Kailash Pati Dutta, Pankaj Rai and Vineet Shekher, "Microcontroller Based Voice Activated Wireless Automation System: VSRD-IJEECE", Vol. 2(8), 2012, 642-649.
3. Baris Yuksekkaya, A. Alper Kayalar, M. Bilgehan Tosun, M. Kaan Ozcan, and Ali Ziya Alkar, "A GSM, Internet and Speech Controlled Wireless Internet Home Automation System", IEEE Transactions on Consumer Electronics, Vol. 52, No. 3, AUGUST 2006.
4. N. Sriskanthan and Tan Karande, "Bluetooth Based Home Automation Systems," Journal of Microprocessors and Microsystems, 2002, Vol. 26, pp. 281-289.

ACKNOWLEDGMENT

I wish to express sense of gratitude to my guide to Dr.Y.MANJUSREE Asst Professor, Dept. of EEE, Electrical & Electronics Engineering Department, Kakatiya institute of Technology & Science, Warangal, who guided me at every moment during my Miniproject and giving valuable suggestions. Her continuous encouragement at each of work and effort to push the work through are grateful acknowledged.

I sincerely thank the Miniproject coordinator, Mr. G. SUNIL KUMAR, Asst. Professor, Dept. of EEE for timely conduction of Miniproject.

I am indebted to Prof. C. VENKATESH, Professor & Head of the Department, Electrical & Electronics Engineering. I also extend my gratitude to all the faculty members of the department without whose support at various stages this report will not be materialized.

Also, I offer my sincere admiration to Prof. K. ASHOKA REDDY, Principal, Kakatiya institute of Technology & Science, Warangal for his kind patronage and permission to utilize the resource of institute to carry out the work.

Last but not the least I wish to thanks my friends, seniors who helped me directly or indirectly in the successful completion of this work.

Conservation of Energy Systems Using Solar Power Management

Bommineni Bhuvana Priya
Department of Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science(Autonomous under Kakatiya University)
Warangal, India
bhuvana.bommineni1105@gmail.com

Abstract—**Considering the fact that the demand for solar energy will grow faster, this project objective is about the protection of load and charge using solar power management. From photo voltaic cells, solar gets converted into electrical energy. This energy is preserved in batteries during sunlight so that, it can be consumed during night time, which helps in saving energy. In addition, this project also has many advantages equivalent to existing devices. This power management deals with a controlled charging mechanism, that helps to avoid overload charge, high discharge and less or high voltage of the battery and load. Unless the limitations like under charge or over charge are vanquished, maintaining and increasing electricity supplies from solar energy will affect in cost increase.**

Keywords—photo voltaic, energy, electricity, charge.

I. INTRODUCTION

Electricity is also a Solar power is the sun's rays reaching the earth. It is the most rapidly obtainable source of energy. Sun is the earth's primary energy and the source of all energy for our planet. Solar energy is the energy force that comforts life on Earth for all plants, animals and people. This energy is acquired by grasping heat and light from the Sun. Energy from Sun is mentioned as solar energy. This technology has been giving many ways to utilize this plentiful resource. It delivers a captivating solution for all societies to reach their needs for the clean and surplus sources of energy in the future. Our country is highly populated and has high solar insolation, which is an ideal union for utilizing solar power, which is widely used in India

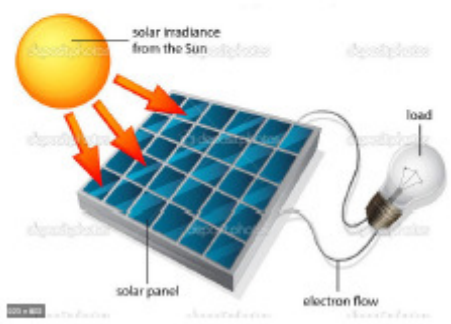


Figure 1.1. Energy flow through solar panel

The solar energy could produce all the present and future energy sources, of the world. Solar Photovoltaic systems methods for long-term benefits. The sun works as power station of earth and also the source of all energy on our planet. An important research about the method or process for capturing of solar energy for various applications have been working, recent times.

A feature of electricity that it is not naturally available in the nature so it should be produced. Production is supervised in power stations. Electricity production involves all advanced techniques that change some amount of energy into useful electricity. Electricity can be a sort of energy that may contain magnetically, radiant and chemical effects. Electric energy is made by a flow of electrons The photovoltaic effect will be occurring in solar cells. These solar cells are originated from two different types of semiconductors p-type and n-type - that are combined together to form a p-n junction. Joining these two types of semiconductors, an electric field is formed in the junction region as these electrons move towards the positive p-side and the holes move towards the negative n-side. This field moves negatively charged particles in only single direction and those positively charged particles will be in the other direction. Photons can be absorbed by the photovoltaic cells that make up the solar cell. When the light has the correct wavelength. When the photon energy falls into these cells, it is transferred to the atoms of the semiconductor

material at the PN junction. In particular, the energy in the material is transferred to the electrons. This causes the electrons to enter a greater energy state called the conduction band. This leaves a "hole" in the valence band from which electrons jump out. Due to the increased energy, the movement of the electron will generate two charge carriers, an electron-hole pair.

II. SOLAR POWER CHARGE CONTROLLER

Solar power (or) Photovoltaic power generation uses solar panels, which consist of a series of cells containing photovoltaic materials. It is formed by a combination of several photovoltaic cells connected in series and parallel to provide the essential output voltage and current. Today, relative to the entire distribution chain from the end of production to the end of consumption, the efficiency index of photovoltaic products is very low. It can be used in different areas. It can be used in residential solar systems, hybrid systems, solar pumping systems, etc. In this case, solar panels convert solar energy into electrical energy through an electrochemical process called photovoltaic process. Solar panels store energy in the battery through diodes. The energy stored in the battery can also be used in the absence of sunlight, because chemical energy is converted into electrical energy during the discharge process, thereby illuminating electrical equipment. This is why this is our need. When using a load or under voltage, in order to prevent the battery from overcharging and deep discharge, because this is the main component of the solar charge controller.

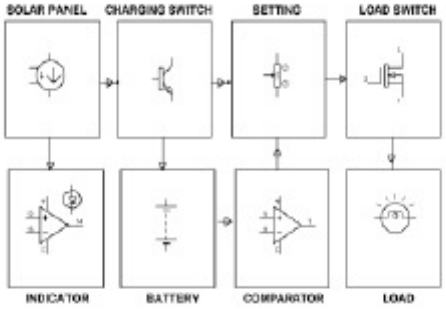


Fig2.1-Block Diagram

A solar panel is a collection of solar cells. Solar panels convert solar energy into electricity. Solar panels contain resistor materials for connections and external terminals. The electrons generated in the n-type material pass through the electrodes to the connected wires. The electrons pass through the battery to the P-type material. Here, electrons are connected to holes.

When you connect a solar panel to a battery, it behaves like another battery, and both systems are connected in series like two batteries in series. Solar panels have a complete four-step process: charging, loading, low battery and deep discharge. The output of the solar panel is connected to the switch, from there to the battery, and then from there to the load switch, and finally to the output load. The system includes 4 different parts: overvoltage detection and indication, overload detection, overload indication, low battery indication and detection. When an overload occurs, the power from the solar panel will be transferred to the MOSFET switch through the diode. When the load is low, the power is disconnected from the MOSFET switch to turn it off, thereby cutting off the power to the load.

III. COMPONENTS

Solar Charge controller consists of the following components

1. Solar Panel
2. Charging Module
3. 7805
4. LM324
5. XL6009
6. 10k potentiometer
7. BC547
8. Relay

A. Solar Panel

Solar panels collect neat renewable energy in the shape of sunlight and that can be convert it into electrical energy, which will be used to generate electricity to generate electrical charges. A solar panel is composed of various amount individual solar cells, which in turn are composed of layers of silicon, phosphorous.

Fig 3.1-Solar Panel Model

Solar panels soak up the photons and in doing so provoke an electric powered current.. This whole procedure is referred to as the Photovoltaic Effect. An common domestic has greater than sufficient roof region for the essential variety of sun panels to provide sufficient sun power to deliver all of its strength wishes extra power generated is

going onto the principle strength grid, paying off in power use at night.

B. Charging Module

Lithium ion and lithium polymer batteries may explode if they are short-circuited, overcharged, or the current is too high during charging or discharging. When charging and discharging lithium batteries. The DW01A module and FS8205A P-MOSFET are used inside the IC.

Fig.3.2-Charging Module

The charging process is controlled by the TP4056A linear voltage chip. Set the charging current by connecting a 1.2kΩ resistor between RPROG (pin: 2) and GND. The battery protection IC DW01A protects the lithium-ion/polymer battery from damage or shortened service life by overcharging or over-discharging. Due to the internal structure of the PMOSFET FS8205A, there is no need for an isolation diode and can prevent negative charging circuits.

C. 7805

Fig.3.3-7805-3 terminal

7805 is a three terminal linear voltage regulator IC that is of a fixed output voltage of 5V which is used for various numbers of applications. Some of the main properties of the 7805 IC are as follows:

- It can provide up to 1.5 A of current (with heat sink).
- It requires very low external components to completely function.

D. LM324

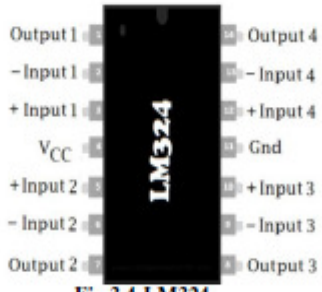


Fig.3.4-LM324

The operating of the LM324 comparator circuit will be consisting of three comparators of LM324 and some of the other components like resistors, capacitors.

- If the power of the non-inverting terminal is less than the inverting voltage of the operational amplifier, then the output will become zero, which implies no current. Because, it is clear that when "+ > – = 1". Here the '+ 'sign means non-inverting terminal and '-' sign means the inverting terminal.
- When the non-inverting voltage is higher compare to the inverting voltage then the output will result as high.
- In this output of LM324 is internally connected to a resistor at this output, and the layout in the IC is very different from other comparators.
- It is the internal boost, so there is no need to connect a resistor from the power supply.

Features of LM324 Comparator Circuit:

- Wide bandwidth is of 1 MHz
- Wide power supply range can be up to Single supply 3V to 32V
- Does not depend on supply voltage.

E. XL6009

The boost converter is one of the simplest types of switching converters. As the name implies, it requires an input voltage and amplifies or amplifies it. Anything consisting of inductors, solid-state switches (now this is a MOSFET, now you can get very good transistors), diodes and capacitors.

Fig.3.5-Boost Converter

Characteristics:

- Wide range of 5V to 32V Input Voltage Range
- Fixed 400KHz of Switching Frequency
- Maximum 4A Switching Current

F. 10k Potentiometer

Fig.3.6-Potentiometer

When the sliding contact is in the "A" position, the resistance between the A terminal and the sliding contact is closer to the resistance between the B terminal and the sliding contact. The voltage between pin B and the sliding contact is half. For example, if the total battery voltage is 100V, the voltage between pin B and the slider is 40V, and the voltage between pin A and the slider is 60V; if the slider is moved to pin A, the resistance will decrease .Terminal B must be larger. Therefore, tension is shared.

G. BC547

Fig.3.7-Transistor

There are two working states:

- Forward Bias.
- Reverse Bias.

In a ahead bias mode, the 2 terminals like emitter & also collector are related to permit the waft of contemporary via it. Whereas in a opposite bias mode, it doesn't permit the waft of contemporary via it as it works like an open switch.

H. Relay

Fig.3.8-Realy

Relay has 2 conditions i.e., closed condition and the other one is normally open condition.

Relay in NORMALLY CLOSED condition:

If there is no voltage is applied to the magnetic core, it will not generate a magnetic field and that will not function like a magnet. Therefore, it cannot wear active armor. Therefore, the original location itself is the armature connected in the normally closed (NC) position.

Relay in NORMALLY OPENED condition:

After enough voltage has applied to the iron core, the iron core starts to generate a magnetic field around the iron core and acts like a magnet. As the movable armor is within range, it will be attracted by the magnetic field generated by the iron core, causing the armor to change its position. Now, it is connected to normally open contact of the relay, and that external circuit that is connected to it will work differently.

IV. SOLAR CHARGE CONTROLLER FUNCTION

In these we have used solar panel to charge the lithium ion battery and load is connected to battery which should be should be protected from under voltage and over voltage. First we will connect the solar battery output to voltage regulator and then output voltage to the input charging module and output of the charging module is given to the battery .The charging module will take of over voltage it means it will not allow to get charged beyond their voltage and it will also take care under discharge that means it will not allow to get battery to discharge beyond threshold level as it will damage the battery .This module takes care of both under discharge and over charge as required .

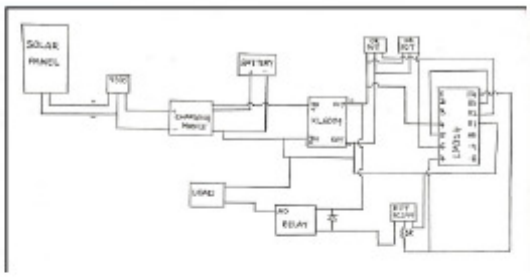


Fig.4.1-Circuit Diagram

Next we have used 5v fan as load for battery .In order to protect the load from under voltage and over voltage we have used LM324 IC which is consist for 4 comparator When the power will be applied to the non-inverting terminal which is less than that of the inverting voltage of op-amp then the output will be zero it means there is no current flow. If the non-inverting voltage is greater than that of the inverting voltage then the output will be high.

In this we have using 2 comparator one for under voltage and another for over voltage .For over voltage we have given non-inverting terminal the reference voltage and inverting terminal given the pot output if the voltage is more than 5v the output will be zero as voltage at inverting terminal is more than at non-inverting terminal thus the bjt will not be due to this the relay will not be on and load i.e., fan will be off and in other condition it will be on. Now for the under voltage protection the reference voltage i.e., 5v is given at inverting end and pot output will be given at non-inverting terminal once the voltage is less than operating voltage of load the output will be zero as inverting terminal voltage is more than non inverting voltage this in turn will not turn on the bjt as bjt is not on relay will not be on our load will be protected from under voltage. In this our battery is protected from under discharge and over charge and load is protected from under voltage and over voltage.

V. APPLICATIONS

- The solar street light system uses photo-voltaic cells to transform sunlight into electricity. It utilizes DC power and consists of a solar control device to store the DC power in the battery pack, so the power is not visible at night or in the sun.

- Solar home system is that energy produced from the PV module to supply for domestic purposes. The system encompasses solar charge controller to keep DC within side in battery bank and fits for using in areas where the avail grid isn't available.

- Solar water pump system device is that makes use of sun energy to that pump water from herbal and floor reservoirs for home, irrigation, cattle and different applications.

- Solar Street light system will be using PV module that will be convert sunlight into DC electricity. This system only uses DC power and have a solar charge controller will store DC power in the battery bank so that the supply is not appeared in sunlight or at night.

VI. CONCLUSION AND FUTURE WORK

Solar energy control is used for safety of load and rate i.e. how rechargeable battery is used to keep electricity with the assist of sun electricity. It consists of safety techniques for the battery so as to scale back troubles like overcharging, deep discharge or under voltage which damage the lifestyles of a battery. The proposed gadget used sun PV module as enter and load (LED light) as an output. Further, the assignment may be better with the aid of using the usage of microcontroller and GSM modem to talk the reputation o the gadget to manage through SMS. This gadget also can be upgraded to ordinary UPS, while related with the sun charger

will convert to SOLAR INVERTERS/UPS with sun rate as priority.

ACKNOWLEDGMENT

I wish to express sense of gratitude to my guide to **Prof. G. SUNIL KUMAR**, **Asst.Professor**, Electrical & Electronics Engineering Department, Kakatiya institute of Technology & Science, Warangal, who guided me at every moment during my entire Mini Project and giving valuable suggestions. His continuous encouragement at each of work and effort to push the work through are grateful acknowledged.

I sincerely thank the Mini Project coordinator, **Mr. G. SUNIL KUMAR, Asst. Professor**, Dept. of EEE for timely conduction of Mini Project Sessions.

I am indebted to **Prof. C. VENKATESH**, **Professor** & Head of the Department, Electrical & Electronics Engineering. I also extend my gratitude to all the faculty members of the department without whose support at various stages this report will not be materialized.

Also, I offer my sincere admiration to **Prof. K. ASHOKA REDDY**, **Principal**, Kakatiya institute of Technology & Science, Warangal for his kind patronage and permission to utilize the resource of institute to carry out the work.

Last but not the least I wish to thanks my friends, seniors who helped me directly or indirectly in the successful completion of this work.

REFERENCES

1 . Mofakkharul Islam; Md. Abul Bashar Sarkar "An Efficient Smart Solar Charge Controller for Standalone Energy Systems" in IEEE Explore

2. DPR on "Grid Connected Solar Photovoltic (Spv) Power Plant", under Rooftop and other Small Solar Power generation Program (RPSSGP) and Jawaharlal Nehru National Solar Mission (JNNSM),by PHTO ENERGY SYSTEM LIMITED.

3. Ojha Aparna, Singh Chandra Shekhar "Protection of Load and Charge using Solar Power Management" International Journal of Advance Research and Development ,vol.3,2018.

.

EARTHQUAKE DETECTION & ALARM USING BUZZER

1st Mandhira Jeripothula
dept. Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science
Warangal, India
b18ee119@kitsw.ac.in

2nd M Srinivas
Assistant Professor
dept. Electrical and Electronics Engineering
Kakatiya Institute of Technology and Science
Warangal, India
msk.eee@kitsw.ac.in

***Abstract*— The device uses sensor to detect earth vibrations and produces a warning signal when the frequency of earth vibrations exceeds a certain threshold.Voice Message Service is used to send alert messages (buzzer). Large-magnitude earthquakes can cause significant loss of life and property. Creating an earthquake alarm that can detect the quake's amplitude and sound an alarm. The present disclosure describes a process that involves using a MEMS accelerometer to detect a longitudinal wave of a seismic movement and sending an alert warning signalling seismic movement to at least one alarm device.If you make a lot of warning systems, they will connect to form a network and communicate with one another. The aim of this project is to create an earth vibrations alarm that will sense the severity of a disaster and warn people.**

Keywords- Earthquake, Alarm, Sensor, Detection

I. INTRODUCTION

Earthquakes are one of the most destructive of natural hazards. Earthquake occurs due to sudden motion of the ground as a result of release of elastic energy in a matter of few seconds. The impact of the event is most dangerous because it affects large area, occurs all on a sudden and almost unpredictable. They can cause large scale loss of life and property and disrupts essential services such as water supply, sewerage systems, communication and power, transport etc. They not only destroy villages, towns and cities but lead to destabilise the economic and social structure of the nation. A tsunami is a very long-wavelength wave of water that is generated by sudden displacement of the seafloor or disruption of any body of standing water. Tsunami is sometimes called "seismic sea waves", although they can be generated by mechanisms other than earthquakes. Because tsunami occur suddenly, often without warning, they are extremely dangerous to coastal communities.

Tsunamis are caused by earthquakes that damage the seafloor. As a result, tsunamis may be produced by earthquakes that occur near coastlines or elsewhere underneath the oceans. The scale of the tsunami is normally proportional to the magnitude of the earthquake, with bigger earthquakes producing larger tsunamis. The sense of displacement, on the other hand, is crucial. Tsunamis are only created after an earthquake occurs vertical displacement of the seafloor. So, a system is being developed to find the vibration levels of earth and to alert if the vibration levels are above normal. The alerting is done by sending automated SMS message generated by the system to the concerned authorities. Early warning regarding earth quakes or Tsunami can make possible for shifting people from the coastal regions to safe places.

II. PROPOSED SYSTEM

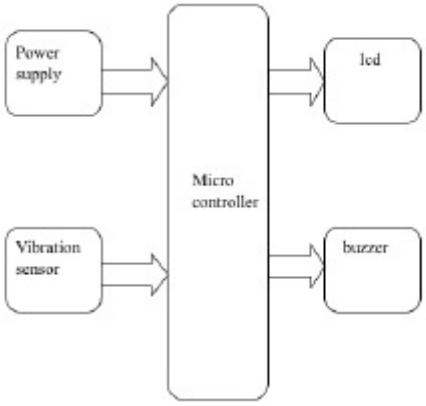


Fig 2.1 block diagram of the proposed system

- Power Supply, to supply required power to the system
- Vibration sensors, which is capable of sensing the vibrations.
- Lcd, which indicates the detection of the quake.
- Micro-controller, to judge whether the vibrations are normal or above normal. Also, to send the alert information, if the vibrations are above normal. Buzzer ,which sends alert message is voice message service(buzzer).

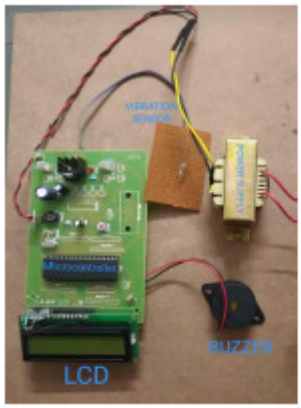


Fig 2.2 The real image of the proposed system

III. PROPOSED CONFIGURATION

3.1 power supply unit

The most crucial section is the power supply. For the project to operate properly, it must have a constant output controlled power supply. For this, a 0-12V/500 mA transformer is used. This transformer's primary is connected to the main supply through an on/off switch and a fuse for overload and short circuit safety. To convert, the secondary is connected to the diodes 12V AC to 12V DC voltage.The capacitors filter the signal, which is then controlled to +5v by the IC 7805.

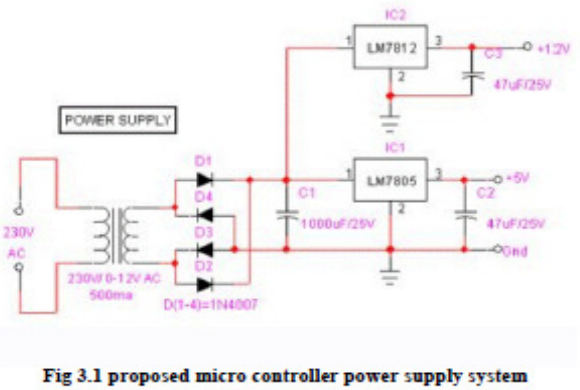
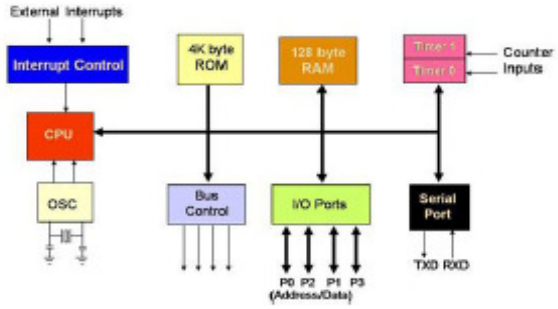


Fig 3.1 proposed micro controller power supply system

Every Electronic Device, has to be either directly plugged into a power source or operate from a battery source which makes it mandatory to have some level of Power Supply Circuit within it. Depending on the application these circuits can be a simple, AC-DC Converter, DC-DC Converter

3.2 proposed controller

The first micro-processor was invented by intel corporation, the 4004. They also purposed 8085 and 8086 micro-processors. Intel released the 8051, an 8-bit micro-controller, in 1981. Since it had 128 bytes of RAM, 4K bytes of on-chip ROM, two timers, one serial port, and four ports (8-bit wide), it was dubbed "machine on a chip." When it became well-known, With Intel's code compatible with 8051, other manufacturers were able to create and sell different flavours of the 8051. It shows that if you write a programme for one flavour of 8051, it will also run on others, regardless of the manufacturer. As a result, there are a variety of models with varying speeds and quantities of on-chip RAM.



3.2 Block Diagram of 8051 Micro-controller

Intel developed the 8051 micro-controller in the 1980s. It was designed primarily to put Embedded Systems into play and was based on Harvard Architecture. It was originally designed using NMOS technology, but since NMOS needs more power to operate, Intel redesigned the Micro-controller 8051 to use CMOS technology and a micro-controller a new version was released in the title name as alphabet 'C', for example: 80C51.An 8051 micro-controller can be used in a variety of applications. As a result, 8051 Micro-controller Projects are extremely important in the final year of engineering. The design and operation of the 8051 micro-controller are discussed in this article.

The micro-controller like 8051 was designed in the year 1981 by Intel. The micro-controller is one kind of integrated circuit that includes 40-pins with dual inline package or DIP, RAM-128 bytes, ROM-4kb & 16-bit timers–2. Based on the requirement, it includes addressable & programmable 4 – parallel 8-bit ports. In the 8051 micro-controller architecture, the system bus plays a key role to connect all the devices to the central processing unit. This bus includes a data bus- an 8-bit, an address bus-16-bit & bus control signals. Other devices can also be interfaced throughout the system bus like ports, memory, interrupt control, serial interface, the CPU, timers.

IV. ADVANTAGES

1. This paper presents an instrumentation method for detecting variations in these precursors that alter well before the case.
2. This warning allows us to take precautionary safety steps.
3. Early warning regarding earth quakes or Tsunami can make possible for shifting people from the coastal regions to safe place.

V. CONCLUSION

The proposed research entails the design and construction of an earthquake warning detection circuit based solely on electronic devices, which will be extremely useful in determining high frequency vibrations that will cause an impulse when the S wave is detected by the earthquake sensor, which in this case is a shaft with a load that represents steel or a house When the resulting surface wave hits the earth, the structure shakes, causing vibrations. A global earthquake alert system based on a peer-to-peer network is feasible. If the system's participants receive the alert first, the distribution will be fast. After the first generation of this framework is implemented, a lot can be known about how the signals appear and when a true warning should be sent, with the goal of saving many lives.

VI. ACKNOWLEDGEMENT

I wish to express sense of gratitude to my guide to **Asst. Prof. M. Srinivas**, Electrical & Electronics Engineering Department, Kakatiya institute of Technology & Science, Warangal, who guided me at every moment during my entire Mini Project and giving valuable suggestions. His continuous encouragement at each of work and effort to push the work through are grateful acknowledged.

I sincerely thank the Mini Project coordinator, **Mr. G. SUNIL KUMAR, Asst. Professor, Dept. of EEE** for timely conduction of Seminars.

I am indebted to **Prof. C. VENKATESH, Professor & Head of the Department,** Electrical & Electronics Engineering. I also extend my gratitude to all the faculty members of the department without whose support at various stages this report will not be materialised.

Also, I offer my sincere admiration to **Prof. K. ASHOKA REDDY, Principal,** Kakatiya institute of Technology & Science, Warangal for his kind patronage and permission to utilise the resource of institute to carry out the work.

Last but not the least I wish to thanks my friends, seniors who helped me directly or indirectly in the successful completion of this work.

VII. REFERENCES

[1] A.Ryall, Earthquake hazard in the Nevada region. Bull. Seismol. Soc. Am.67,517–532,1977.

[2] C. H. Scholz, L. R. Sykes, & Y. P. Aggarwal, Earthquake prediction: a physical basis. Science, 181(4102), 803-810,1973.

[3] D.D. Bowman, G .Ouillon, C.G.Sammis,A. Sornette and D. Sornette An observation test of the critical earthquake concept. J. Geophys. Res. 103:24359-24372, 1998.

[4] E.N. Khalilov Method for recording the low-frequency gravity waves and device for the measurement thereof. Patent of PCT. WO 2005/003818 A1, Geneva, 13.01,2005

[5] H N Srivastava. Forecasting earthquakes. National Book Trust, 1983.

AUTOMATIC STREET LIGHT CONTROL USING ARDUINO

Ch. Shreya Reddy,
VI semester, EEE, KITS Warangal
Email: b18ee062@kitsw.ac.in

ABSTRACT

The Street light systems have a problem with poor energy efficiency. To provide automatic control for street lamps is the idea of the project. The lighting system which chooses the automatic operation is profit wise nominal for the streets and sends information to the control room regarding the street lamp liability. The street light system examines whether for street lamp ON/OFF conditions, weather is bright or dark, and is recognized through a LDR sensor. When the weather is bright, the system will be OFF otherwise the system will be ON. The light condition is also used to check the lamp glowing status through the LDR sensor. For future development, this system can be improved for two-way roads mostly in highways, traffic routes and urban areas. This project offers the finest solution for minimizing electrical current wastage and also the automatic functioning of lighting system.

I. INTRODUCTION AND LITERATURE SURVEY

Now a days automated system has high flexibility, less manual operations. The main aim of the project is to reduce the wastage of electricity. For this motive LDRs, Relay, IRs are used as the sensors. Initially by using LDRs the street lights are in OFF position, as the IR senses the vehicle. Street light which is compatible with that sensor will automatically switch ON when the vehicle passes. IDE is text editor program that assist to write the Arduino code. The coding language which it uses is C++.The work of IDE is to take human understandable code and convert it to the machine-readable code, executed by Arduino.

I.1 Literature Survey

S. No.	Reference Number	Outcomes of the paper
1	ref 1	➢ In this paper it is suggested to reduce the loss of LPSP and COP. ➢ Optimal configuration decreases the fuel cell size from 123W to 70W for street light. ➢ Load Management can also decrease the power consumption of system to 37.92%
2	ref 2	➢ In this paper it is concluded that by by referring to all the results, by using Arduino UNO working prototype of street light Automation street light can be built successfully ➢ 16.67% of energy can be saved by using LED for street light automation systems. ➢ 58.33% of energy can be saved by using LED when compared to HPS (High Pressure Sodium) street lights.
3	ref 3	➢ A design scheme has been demonstrated based on the Arduino UNO for controlling the street light system. ➢ Lights turn to DIM state and lights turn to high state (i.e; object detection) are the two operational modes which are provided in the proposed scheme.

S. No.	Reference Number	Outcomes of the paper
		➢ Proposed systems can be effortlessly tested under real conditions at a large scale.

II BLOCK DIAGRAM OF THE PROJECT ITS WORKING

Photoresistor, it detects the light intensity. LDRs working principle is photoconductivity. When the light is engrossed by the material then the conductivity of it is decreases, when the light drops on the LDR electrons in valence bond of material jump to conduction band but the photons in incident light will have energy that is higher than the band gap of material to make electrons bound from one band to another.

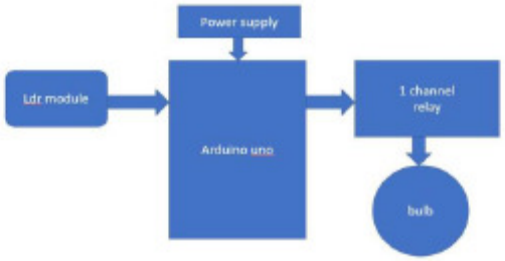


Figure 2.1 Block diagram using one relay and LDR module

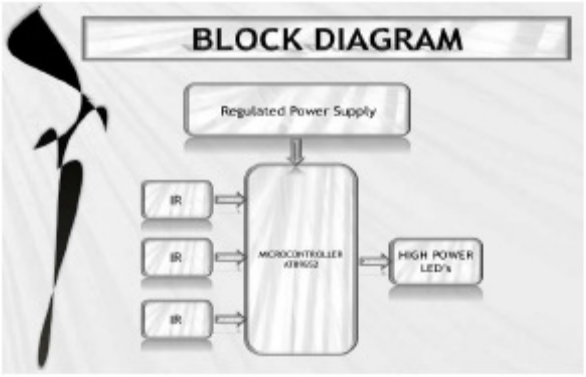


Figure 2.2 Block diagram using IR sensors

Terminal 1 of photoresistor is given to 5 volts. It is important to attach a resistor because resistor helps to prevent the excessive current flowing through LDR, so that it won't be burned out. Relay which is the electrical switch, converts the small stimulant to larger currents based on the principle electromagnetic induction. Arduino is a microcontroller that accepts inputs from the sensors and provide an output action under desired machine connected to it. In front of the IR sensor when no object is detected then no infrared wave is received by the IR receiver, thus Zero output is sent from output pin to Arduino board. V output pin sends digital data to Arduino UNO. When the object is near, the IR sensor gives value Zero, when the object is away IR sensor gives value One. Values which are getting from IR sensor gets printed on serial monitor. Using this functionality of IR sensor whenever an object comes in front of it, LED turns ON. Whenever an object is not in front of it, the LED turns OFF.

III SIMULATION OF MINIPROJECT

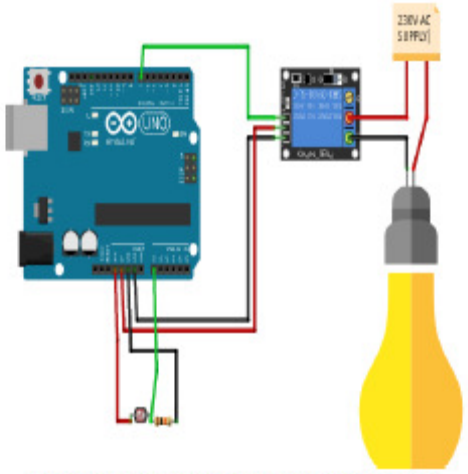


Figure 3.1 circuit diagram using one relay

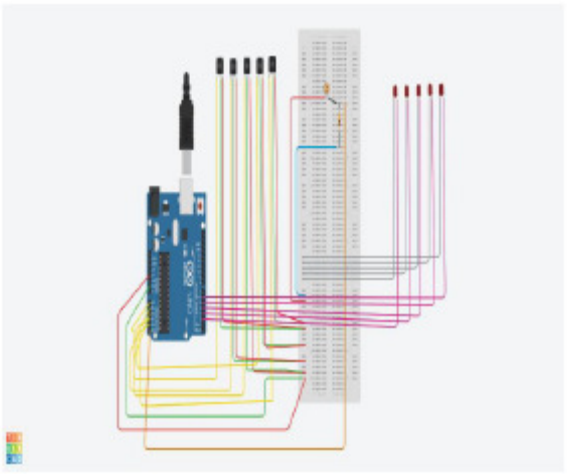


Figure 3.2 Simulation circuit using IR sensor

IV ALGORITHM AND RESULTS

step 1: Start

step 2: Read the data from the sensors

step 3: if (LDR status<=500) then turn on the LED

step 4: Else Turn OFF the Light

step 5: Read Analog from pinA0

step 6: if (analog Read(A0) <300) then turn on the LED

step 7: Else turn OFF the LED

step 8: Above steps are repeated continuously

By using the above algorithm, the below results are obtained

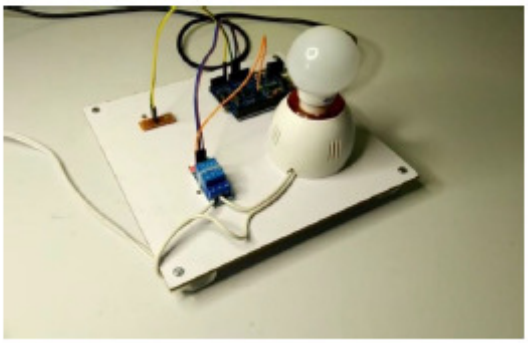


Figure 4.1 LED is OFF when there is no light

Figure 4.2 LED is ON when the object is detected

V CONCLUSION AND FUTURE SCOPE

By looking at all the results, it can be stated that hardware and software development can meet the aim of the design of this project. By using the Arduino UNO, a working prototype that is street light automation system can be successfully built.16.67% of energy is saved with street light automation system when compared to LED which is used for public street lighting. System can be developed for the future development mostly for traffic routes, urban areas and the highways.

REFERENCES

[1] Farah Ramadhani, etal., "Optimization of Standalone Street Light System with Consideration of Lighting Control", IEEE, 2013.

[2] M. Palani Kumar, etal., "Automatic Street Light Control Using Arduino", *IJESC*, vol.9, Mar. 2019.

[3] Zain Mumtaz "An Automation System for Controlling Street lights and Monitoring Objects using Arduino", MDPI, August

HEARTBEAT SENSOR USING ARDUINO

POTHARAJU SUSMITHA

B18EE011

Department of Electrical and electronics engineering

Kakatiya Institute of Technology and Sciences

Warangal, India

B18ee011@kitsw.ac.in

Abstract—**Heart is the most wanted part of human being to live in the world, at the same time the heart rate analysis is increased in the medical field and the heart analysis is an important parameter of human health. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy. In order to measure the body temperature, we use a thermometer and a Sphygmomanometer to monitor the blood pressure. Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart. There are many ways to measure heart rate and the most precise one is using an electrocardiography. But the more easy to monitor the heart rate is to use a heartbeat sensor.**

Keywords: **Heartbeat sensor, heartbeat range, serial communication.**

I.INTRODUCTION

Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrocardiography But the most easy way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat. Heartbeat Sensors are available in Wrist Watches (Smart Watches), Smart Phones, chest straps, etc. The heartbeat is measured in beats per minute or bpm, which indicates the number of times the heart is contracting or expanding in a minute.

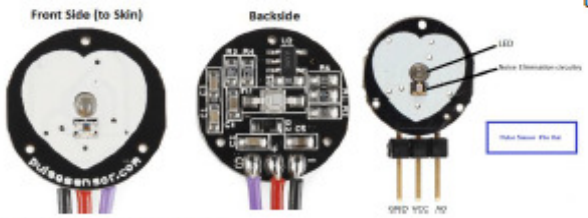


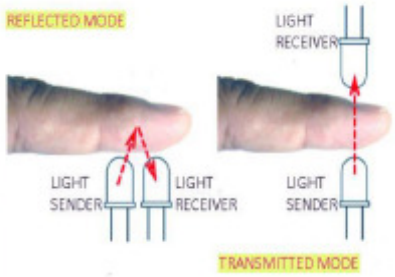
fig:1 heart beat sensor

Heartbeat sensor has two sides. on the front side it has the IR led in the heart shape and in the back side it has a control circuit.

II. Principle of Heartbeat Sensor

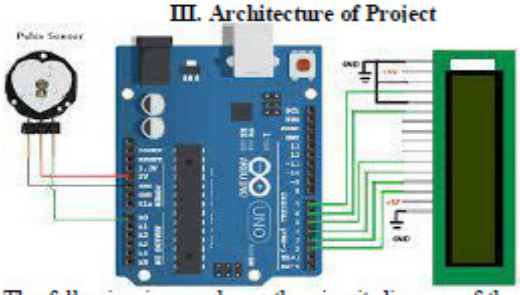
The principle behind the working of the Heartbeat Sensor is Photoplethysmograph. According to this principle, the changes in the volume of blood in an organ is measured by the changes in the intensity of the light passing through that organ.

Usually, the source of light in a heartbeat sensor would be an IR LED and the detector would be any Photodetector like a Photodiode, an LDR (Light Dependent Resistor) or a Phototransistor. With these two i.e. a light source and a detector, we can arrange them in two ways: A Transmissive Sensor and a Reflective Sensor.



In a Transmissive Sensor, the light source and the detector are placed facing each other and the finger of the person must be placed in between the transmitter and receiver. The Reflective Sensor, on the other hand, has the light source and the detector adjacent to each other and the finger of the person must be placed in front of the sensor.

III. Architecture of Project

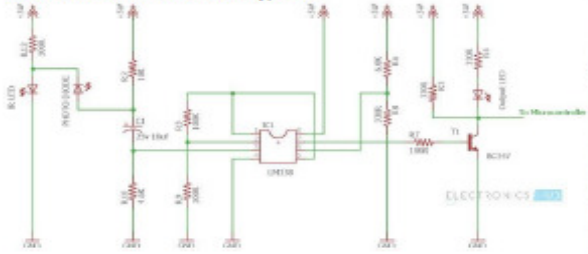


The following image shows the circuit diagram of the Arduino based Heart Rate Monitor using Heartbeat Sensor. The sensor has a clip to insert the finger and has three pins coming out of it for connecting VCC, GND and the Data. Heart beat sensor module's output pin is directly connected to pin 8 of the arduino. Vcc and GND are connected to Vcc and GND. A 16x2 LCD is connected with arduino in 4-bit mode. Control pin RS, RW and En are directly connected to arduino pin 12, GND and 11. And data pin D4-D7 is connected to pins 5, 4, 3 and 2 of arduino.

Working of Heartbeat Sensor

A simple Heartbeat Sensor consists of a sensor and a control circuit. The sensor part of the Heartbeat Sensor consists of an IR LED and a Photodiode placed in a clip.

The Control Circuit consists of an Op-Amp IC and few other components that help in connecting the signal to a Microcontroller. The working of the Heartbeat Sensor can be understood better if we take a look at its circuit diagram.



The above circuit shows the finger type heartbeat sensor, which works by detecting the pulses. Every heartbeat will alter the amount of blood in the finger and the light from the IR LED passing through the finger and thus detected by the Photodiode will also vary. The output of the photodiode is given to the non – inverting input of the first op – amp through a capacitor, which blocks the DC Components of the signal. The first op – amp acts as a non – inverting amplifier with an amplification factor of 1001.

The output of the first op – amp is given as one of the inputs to the second op – amp, which acts as a comparator. The output of the second op – amp triggers a transistor, from which the signal is given to a Microcontroller like Arduino. The Op – amp used in this circuit is LM358. It has two op – amps on the same chip. Also, the transistor used is a BC547. An LED, which is connected to a transistor, will blink when the pulse is detected.

Working on this project is quite easy but a little calculation for calculating heart rate is required. There are several methods for calculating heart rate, but here we have read only five pulses. Then we have calculated total heart beat in a minute by applying the below formula:

Five_pusle_time=time2-time1;

Single_pulse_time= Five_pusle_time /5;

rate=60000/ Single_pulse_time;

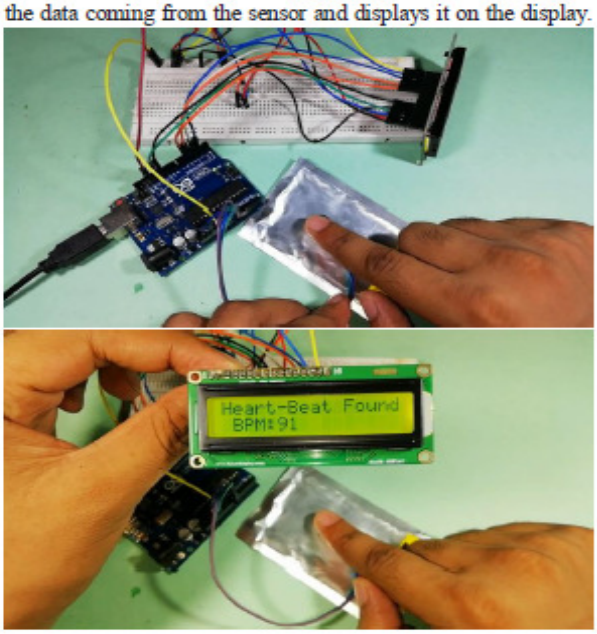
where time1 is first pulse counter value

time2 is list pulse counter value

rate is final heart rate.

Working of heartbeat sensor with arduino

Heart beat sensor, 16X2 lcd display are connected to the arduino according to the pin diagram. Then the arduino, potentiometer are placed on the breadboard by using the jumper wires. After the completion of connections upload the program to the arduino and power on the system. To measure heart rate, place a finger on the sensor front side, it displays the heart rate according to the data coming from the sensor and displays it on the display.



IV. Applications

- A simple project involving Arduino UNO, 16×2 LCD and Heartbeat Sensor Module is designed here which can calculate the heart rate of a person.
- This project can be used as an inexpensive alternative to Smart Watches and other expensive Heart Rate Monitors.

V. CONCLUSION

This system measures the heart rate in beats per minute. To measure the heart rate we have to upload the code to the arduino. After uploading the code to the arduino power on the system. In this project we are using a reflective sensor mode heartbeat sensor. After power on the system places a finger on the front side that is the heart shape side . According to the data from the sensor, arduino calculates the heartbeat in beats per minute.

Maximum and target heart rate

AGE	TARGET HEART RATE ZONE 50–85%	AVERAGE MAXIMUM HEART RATE, 100%
20 years old	100–170 bpm	200 bpm
30 years old	95–162 bpm	190 bpm
35 years old	93–157 bpm	185 bpm
40 years old	90–153 bpm	180 bpm
45 years old	88–149 bpm	175 bpm
50 years old	85–145 bpm	170 bpm
55 years old	83–140 bpm	165 bpm
60 years old	80–136 bpm	160 bpm
65 years old	78–132 bpm	155 bpm
70 years old	75–128 bpm	150 bpm

Source: American Heart Association INSIDER

VI. REFERENCES

- https://www.electronicshub.org/heartbeat-sensor-using-arduino-heart-rate monitor/#Applications_of_Heart_Rate_Monitor_using_Arduino
- https://www.youtube.com/watch?v=_J7pyL_3-AI

ALGORITHM FOR DEMAND RESPONE TO MAXIMIZE THE PENETRATION OF RENEWABLE ENERGY

Muddasani Harini
Student, Dept. of EEE
K.I.T.S., Warangal
B18ee035@kitsw.ac.in

Dr. P. Nagarjuna Reddy
Assistant Professor, Dept. of EEE
K.I.T.S.W., Warangal
Pnreddy.eee@kitsw.ac.in

Abstract - ***Due to urbanization, demand for lighting systems, efficient heating, and air conditioning as well as other types of hardware are growing rapidly. To ensure sustainability, reliability of electricity, a significant increase in energy generated from renewable sources is required. It is a challenging task to balance between demand and production. To use the energy of renewable sources with an automation system for home appliances, an algorithm is developed which is described in this work. The main purpose of this work is to control the power consumption of microgrid testbed using a dynamic algorithm developed with different software platforms such as MATLAB, Python, Java. This algorithm then sets different schemes for intelligent lighting and air conditioning based on the State of Charge (SOC) value of the storage system. The experimental results show the maximum use of renewable energy by reducing the peak demand, cost of users.***

Keywords—Automation system, Renewable Energy, Demand response algorithm, State of charge.

I. INTRODUCTION

The lack of availability of fossil fuels made the electricity price increase and the harmful gas emissions evoked global warming which made the world to face many issues regarding the environment. As the advantages of renewable energy sources and global awareness problems are diffused, making our electricity with renewable sources is more convenient. BAS is an integrated, unified hardware network that regulates and tracks the climatic conditions. This electrification tool ensures that the cumulative impact of energy works best when working with different construction schemes to comfort and protect buildings. Demand side management organizes power input and power supply activities, aiming to stay away from fluctuations to achieve stable power input that meet the supply characteristics. The state of charge (SoC) is the electric battery's level of charge relative to its capacity. Percentage points are the units of SOC. The depth of discharge (DoD), the opposite of SoC, is an alternate form of the same calculation.

II. INSTALLATION AND SPECIFICATIONS OF MICROGRID

While making our electricity with renewable energy sources we may face the uncertainty of the RES. Energy Storage Systems (ESS), however, have turned out to be a certain part of RES as they provide high-quality methods to keep away from this uncertainty problem. This aggregate of Energy Storage Systems with Renewable Energy Systems is regularly taken into consideration as Hybrid Renewable Energy Systems. The set of rules for the Building Automation System combines with the Demand Side Management for a goal of efficient power control from RES and ESS.

A. MICROGRID INSTALLATION

A microgrid is a nearby power grid with manage capability, because of this it could disconnect from the conventional grid and perform autonomously. This type of grids deployed in off-grid villages, army operations, or business projects. But more and more they are being used in cities or towns. Hybrid Renewable Energy System is deployed in the Science Research Center, Tagus Park in Portugal.

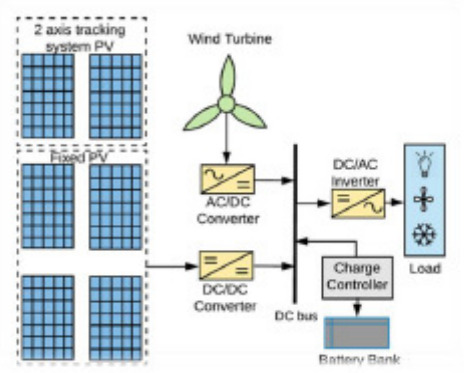


Figure 1(A) Functional pattern of a microgrid system

A HRES system will produce continuous renewable energy by using photo voltaic panels and wind turbines. There are six Photovoltaic panels that are used for Photovoltaic power generation. Out of six two are with axis tracking PV system and remaining are fixed photovoltaic panels. The overall potential output of the PV system is 1400W. There are three units of energy storing cells that have a capacity of 240W each. The layout of power system additionally implies the lifestyles of power control structures to sustain and stable the most input figure with the features of the power delivery structure. In comparison, its miles are necessary to note the robust volatility of the power of sustainable re-properties.

B. SPECIFICATIONS

EQUIPMENT	QUANTITY	SPECIFICATIONS
Wind Turbine	1	400W
PV Modules	6	1400W
Battery System	3	720Ah/5h
Inverter	1	230V,2200W
Charge Controller	3	24V,20A

Table 2(B) System specifications

From 06 divisions of sun modules and a wind turbine, the total power is generated and run into the end person. The result is connected to a battery from the solar panels and wind turbine of 720Ah, 24V via the inverter. The technical parameters for all essential systems of the box are proven in the table above.

III. DEMAND RESPONSE ALGORITHM

1. DEMAND SIDE MANAGEMENT

DSM or call for reaction lets in the purchaser to manipulate the hundreds primarily based totally on the energy deliver through diverse procedures relying upon the specifications used with inside the control system. The load shifting method is used broadly because of the highest well-structured and most effective technique.

This study has established and created an important result in the collection of rules for the DSM primarily based totally on an interpreted and advanced load shifting technique to lessen the strength value for the end-user. The collection of rules consists of demonstrating a fully evolutionary algorithm (EA) focused primarily on testing to extend a value-powerful framework.

2. COMMUNICATION NETWORK

An industrial infrastructure for domestic automation has been set up to gain access to the device records via the computer system management to monitor the HVAC device, lighting, doors, and window blinds.

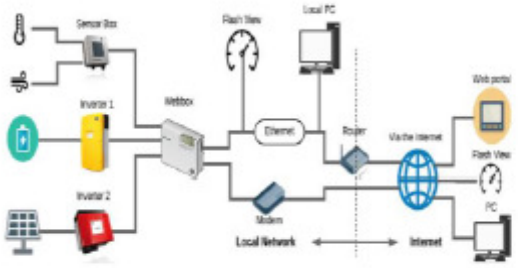


Figure 3.2 Total communication structure

This picture demonstrates the general device that lets in transmitting the energy records thru hard drive from the field to the manage PC within side the lab. The series of rules is advanced to maximize the use of renewable strength without sacrificing the first-class consolation level after a successful set-up of the primarily dependent system between the electric field and the controlled PC, to optimize demand response in line with the electricity production. The set of rules is done in 3 distinctive computing languages to make certain reliability and resiliency of the network.

3. MODEL EVOLUTION

This version is primarily evolved based on the concern of the hundreds supplied via way of means of the quit person and the delivery of State - of - charge batteries or the output of energy from sources.

- The energy output estimation is mainly based entirely on the forecasting facts of solar radiation.
- Calculating the battery's SOC.
- Regulation of loads in compliance with the SOC battery

There is a complete lightening system with eight lights, which are located at the pairs from the front to the end of the room, and air conditioner at the middle of the room. The lighting pair's and the two air conditioners are operated continuously.

i. STEP 1: PRODUCTION ESTIMATION

The manufacturing facility comprises 6 units of photovoltaic panels with a complete output capacity of 1.2 kWh. Because there are distinctive energy sources, the method of measurement is also distinctive for the respective suppliers, and because of the summation of such energy productions, maximum energy is envisaged.

[1] FROM SOLAR PANEL:

The power output of electricity relies upon this radiation value. The solar irradiation, in this case, is accumulated immediately from one week ahead, an online approach offers facts for forecasting.

The gateway offers weather prediction details of radiation exposure alongside the preceding facts for the next 1 week with c language. Global average temperature data from much of the global powerhouse is determined using sun irradiation from the web to be projected.

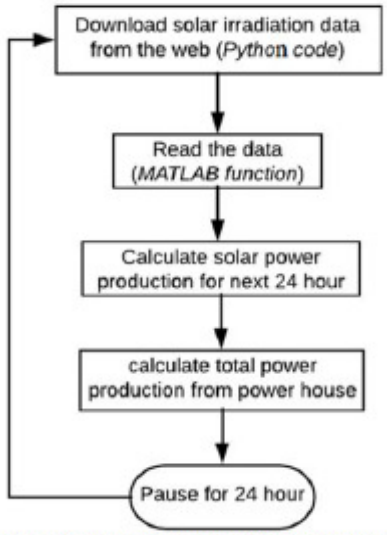


Figure 3.3.1(a) A flowchart of the calculation of solar production

The set of rules downloads this forecasted irradiation facts by using programming language through one week in textual material. Then this downloaded textual material is analyzed via way of means of a MATLAB characteristic this is advanced to get the irradiation facts from and calculate the whole electricity manufacturing for twenty-four hours of the day.

[2] FROM WIND TURBINE:

The velocity is manually decided from the climate forecasting information and measures the entire wind velocity. While the wind turbine is rated at four hundred Watt, due to normal wind velocity fluctuations, the entire output may be much less.

ii. STEP 2: ESTIMATION OF SOC

The battery is the most essential part of the system, due to its capacity to deliver energy at some stage in the yearly periods. Autonomy specifically refers to the time at the same time as the energy deliver from a renewable supply is not always available. An online approach offers details for forecasting. The total charging of battery mode depends upon energy manufacturing and consumption.

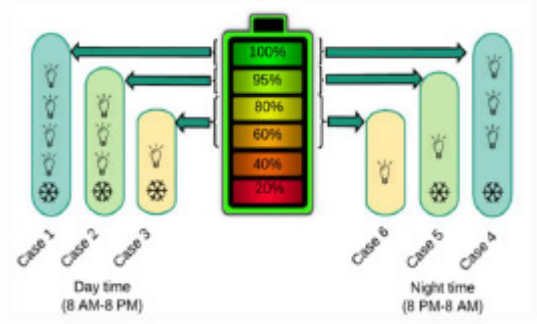


Figure 3.3.2 Load profiles for different battery SOC values

Once the battery charge state is estimated, the SOC should be used for the first hour of an algorithm calculated for the subsequent hours using simple output and former charge value status.

iii. STEP 3: DEMAND RESPONSE

The set of rules for the method of load management primarily depends on the consumers load demand, based on the available energy and load demand the consumer will proceed accordingly. The load demand is likewise prepared with certain time intervals according to the consumer's willingness. Besides, the battery SOC is calculated as a percentage of (%). For every time collection, three exceptional SOC levels are used. 95%- 100%, 80% - 95%, and far less than 80% are the 3 SOC averages. To measure the battery's or subsequent hour SOC, it is far from the obligatory conversion of the cost of the SOC in the form of energy (kWh) from the cost of the SOC.

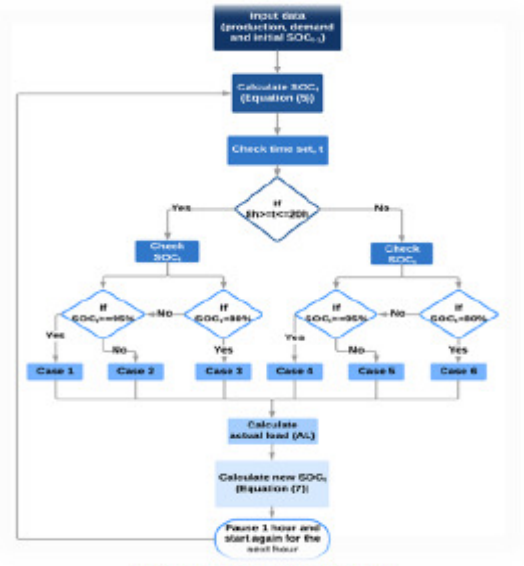


Figure 3.3.3 Overall load strategy

Each hour, the set of rules runs and evaluates the manufacturing, demand, and antique SOC as entered for SOC calculation. The system selects the appropriate load prole from 6 separate instances focused on the SOC value, which still contains the individual selection and luxury level. The set of rules then calculate the actual load (AL) for time t, which is eventually used to estimate the brand new SOC for the following loop of the set of rules, once the burden prole is set.

Each hour, the set of rules runs and evaluates the manufacturing, demand, and antique SOC as entered for SOC calculation. The system selects the appropriate load prole from 6 separate instances focused on the SOC value, which still contains the individual selection and luxury level. The set of rules then calculate the actual load (AL) for time t, which is eventually used to estimate the brand new SOC for the following loop of the set of rules, once the burden prole is set.

For the measurement of the SOC for the following hour, the cumulative performance of the newly measured SOC is used again. The system aims to achieve an optimal temperature by the recurrent loop collection of rules strategy, ensuring that non-stop or uninterrupted energy is transmitted to the end person without or with energy injection from the grid. As the consequence, the person will enjoy the most use of renewable energy without having a situation roughly directing the function of the burden and supplying the energy saved.

IV. EXPERIMENTAL RESULTS

The present algorithm and the set of rules have been experimented and observed around four days uninterruptedly, the experiment had been carried out with none guide interruption of the system. Six distinct cases (load manage schemes) are taken into consideration for the calculation of the SOC via way of means of the set of rules which varies at some point of the whole day.

The battery SOC varies between 60 percent and 100 percent within the range over the four days, time-period. The call outnumbered most effective for some hours is due to a surprising big intake is used at the start of every day within side the load prole, otherwise, the call for changed into completely. This may be effortlessly mitigated via way of means of the use of a gradual deviation within side the load prole among the hours. A fixed call for prole is used for the set of rules, however, any flexible call for prole also can be incorporated with the identical set of rules.

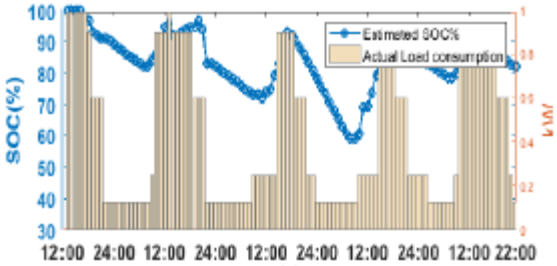


Figure4 Actual load vs SOC value

Due to the reality of weather forecasts and the efficiency of the solar panel, actual production is barely lower than the real production cost. Although, integrating all feasible variables inside a single machine will bring about greater efficiency for the clients that is the output of this work.

V. CONCLUSION AND FUTURE WORK

In this work an algorithm for demand response to maximize the renewable energy in to grid is discussed. It can be a creative and beneficial load management system for control device for domestic appliances, aimed at assuring the appropriate levels of both quality of life and energy production saving for the conservation of natural resources. The process has been completely allowed to estimate the capacity of the storing and monitor the storage usage of energy inside the house. As the consequence, an appealing predicted SOC battery has been discovered which degrees from more than 50%, at the same time as the curve has long gone beneath 80% most effective for some hours over the whole experimental period. It may be mentioned that the set of rules has been advanced primarily based totally on exclusive load systems, viz lighting, and aircon to set up the automated load manipulate gadget withinside the lab. Moreover, in phrases of low or no electricity manufacturing intervals which could arise throughout awful climate situations, the gadget may be supported with the aid of using outside electricity deliver gadget.

VI. REFERENCES

[1]. M. A. Elhadidy and S. M. Shaahid, "Parametric study of hybrid (wind + solar + diesel) power generating systems," Renew. Energy, vol. 21, no.2, pp. 129-139, Oct. 2000.

[2]. M. K. Deshmukh and S. S. Deshmukh, "Modeling of hybrid renewable energy systems," Renew. Sustain. Energy Rev., vol. 12, no. 1, Jan. 2008, pp. 235-249.

[3]. N. Arghira, L. Hawarah, S. Ploix, and M. Jacomino, "Prediction of appliances energy use in smart homes," Energy. Vol. 48, no. 1, pp. 128-134, Dec. 2012.

[4]. R. Barzin, J. J. J. Chen, B. R. Young, and M. M. Farid, "Peak load shifting with energy storage and price-based control system," Energy, vol. 92, pp. 505-514, Dec. 2015.

[5]. A. Sheikhi, M. Rayati, S. Bahrami, and A. M. Ranjbar, "Integrated demand side management game in smart energy hubs," IEEE Trans. Smart Grid, vol. 6, no. 2, pp. 675-683, Mar. 2015.

SMART STICK FOR BLIND PEOPLE USING AURDINO

MADIKONDA RUMITHA
B18EE012
Department of Electrical and electronics engineering
Kakatiya Institute of Technology and Sciences
Warangal,India
b18ee012@kitsw.ac.in

Abstract—Technologies are growing in no time, which helps people to urge a far better and easier life. According to WHO,30 million people are permanently blind and 285 billion peoples with vision impairment. As in our day to day we generally notice blind people. And we are very well aware of about them as they can't walk themselves without others help. So The smart stick may be a technique to assist sightless people to acknowledge their way. They suffer from the shortage of ability to do their daily activities, from walking within the street to visiting friends or relative or any daily things. Therefore, the solution for this major problem is proposed by designing a stick which will aid the person to steer safely without having fear of hitting someone on the way or any solid objects. This stick detects the object in front of the person and give response to the user either by vibrating or by buzzer so, the person can walk without any fear. This will be the best solution to overcome their difficulties. This smart stick will guide the person by indicating the obstacles or riddles that person is facing in their way by giving the sound of the buzzer or in some devices may vibrate to alert the user or blind person to cross or overcome the persons riddles. So this smart stick is very usefull as it as many uses to implement in real life style

Keywords— impairment, assist, detection, buzzer, riddles

1.INTRODUCTION

The tendency of making manually managed items computerized turn out to be a widespread exercise nowadays. The technique developing the objects automating is important in nearly each principal area of life. Making the objects managed from net reduces burden on human. The items (Embedded gadgets) which might be linked to Internet and occasionally those gadgets may be managed from the internet is commonly called Internet of things.We are presently heading into one of the essential hard levels of the united states in phrases now no longer having the capacity to care the people who're visually impaired. India is one a number of the quickest developing economies and this mission isn't always handiest for making the united states economically rich, however additionally to assist our residents develop and assist the state in turning into a advanced state. All of this comes with the era and prepared to apply The strength of imaginative and prescient is one of the maximum sizeable components of human physiology. Our senses of sight and listening to arecrucial to our information of our surroundings. According to a look at launched through the World Health Organization, about 285 million humans international are visually impaired, with 39 million of them blind (WHO). Blind humans elderly 50 and up account for eighty two percentage of the population A clever taking walks stick is one which has been specifically made.to discover limitations that can be of help to the unaware of navigate effortlessly The messages on tape will maintain the consumer wide conscious and alert for a long term Reduce the range of injuries. A voice-activated computerized machine Switching is regularly blanketed to help them additionally in a personal setting. This scheme proposes a idea for offering wise digital help to blind humans in each public and personal spaces. The ultrasonic sensor, water sensor, voice playback board, raspberry pi, and speaker are all a part of the proposed tool. With the resource of a sensor, the proposed tool detects the impediment pix which might be found in each out of doors and indoor environments. Using an ultrasonic sensor, the Stick assessments the gap among the items and the clever taking walks stick. When any items or limitations method an ultrasonic sensor, the headphone publicizes the call of the impediment in the front of the stick. The clever taking walks stick is a simple, all-mechanical tool that detects floor limitations. This machine is compact and lightweight. However, because of its small size, its variety is limited. It gives the satisfactory tour help for the individual. The blind individual will tour from one place to any other with out the help of others. The structures principal aim is to offer an powerful navigation resource for blind humans that offers them a feel of imaginative and prescient through offering know-how approximately their surroundings.

II LITERATURE SURVEY

The earliest version of a navigational aid for the A walking stick has served as a method of blindness Md. S.Arefi and, T. Mollick Design of an Ultrasonic Distance Meter,I International journal of scientific and engineering research. However, the The lack of required skills, as well as the cost, are disadvantages of using it.and a time of preparation It is now possible to do so thanks to technological advancements.It is now possible to design and implement technical solutions. solutions that can assist a visually disabled person in completing tasks Feel free to move about A navigation tool was created using GPS, a voice module, and an ultrasonic sensor to detect obstacles. It gives instructions to the person who is using the stick. It is powered by an ARM processor, which has more memory and a faster processing speed. However, due to the lack of GPS detection, this device cannot be used indoors.S.Koley and R. Mishra, —Voice Operated Outdoor Navigation System for Visually Impaired Persons,IInternational journal of engineering trends and technology, Vol.3,Issue 2, 2012.

Another design incorporates proximity sensors, ultrasonic sensors, a GPS module, stereo cameras, and a dual feedback system that includes both auditory and vibratory feedback.

Stereo cameras mounted on a helmet provide information about the height of objects in the road. Obstacle detection is handled by the proximity sensor and ultrasonic sensor unit. The obstacle's position relative to the blind is determined by the GPS module. The blind man can receive directions from a voice navigation device. It is difficult to design due to the circuit's complexity. Furthermore, the instrument is expensive. 2nd National Conference on Information Technology, S.Dhambare and A. Sakare, Smart Stick for Blind: Obstacle Detection, Artificial Vision, and Real-time Assistance through GPS

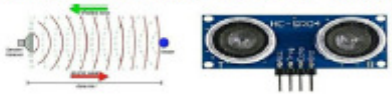
The blind stick is made up of a detachable ultrasonic ranger and vibrator device that has a 3m range and can sense obstacles above knee level. The user receives distance information through vibratory patterns that change incrementally in response to changing obstacle distance. The disadvantage of this method is its expense, which is prohibitively expensive for people living in developing countries.

The concept of a walking stick is suggested in this paper to detect the existence of obstacles in a blind person's direction. The aim is to make the device less susceptible to noise from the environment. The technology is reasonably priced and compact enough to be carried on a walking stick.

III. COMPONENTS

Ultrasonic Sensor:

used to measure the distance of existing objects in the containers by according to sound waves. ultrasonic sensor measures the distance through sending sound waves at specific frequency and then listening for that the distance is measured as distance = (speed of sound x time taken) / 2 Ultrasonic Sensors are placed on the top of bin, and it is used to determine the waste level of bin of calculated by above



Types	Pin Symbol	Pin Function Description
HC-SR04	VCC	5V power supply
	Trig	Trigger pin
	Echo	Receive pin
	GND	Power ground

equation

- Arduino UNO:

Is an open source microcontroller based on easy to use hardware, it is similar to the computer and used to connect and control the sensors through Arduino software

Fig: Arduino UNO Board

Led

Led is diode of p-n junction, which emits the light when it get activated by applying a suitable potential difference to the leads

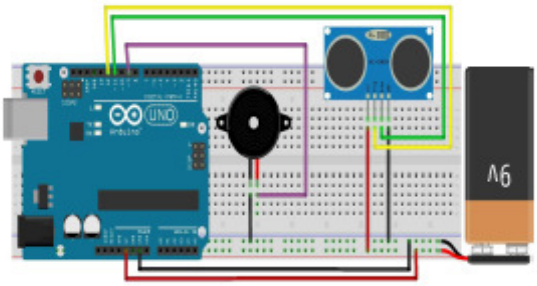
Buzzer

Buzzer will have piezo crystals in middle / between the two conductors. When we apply a potential across the crystals that are present between the conductors they push on one of the conductor and pull on the other conductor This push and pull action generates a sound wave by this sound wave we get the buzzer sound

-power supply

power supply will provide an electric power to the controller. It is foremost primary part that to be done for In-built system

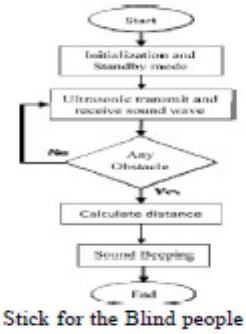
IV.CONNECTIONS



The HC-SR04's Vcc pin is connected to the Arduino's 5 volt pin.The HC-SR04's trigger pin is linked to the Arduino's D12 pin.The HC-SR04's echo pin is linked to the Arduino's D11 pin.The HC-SR04's ground is connected to the Arduino's GND pin.The Buzzer's phase terminal is connected to D9 pin of Arduino The Buzzer's neutral terminal is connected to GND pin of Arduino Led phase terminal is connected to D13 pin of Arduino.Led neutral pin is connected to GND pin The phase or +ve terminal and neutral or-ve terminal of the 9v battery is connected to the 5V pin and GND pin of Arduino respectively.

V. METHODOLOGY

The following steps are included in the design of the Ultrasonic

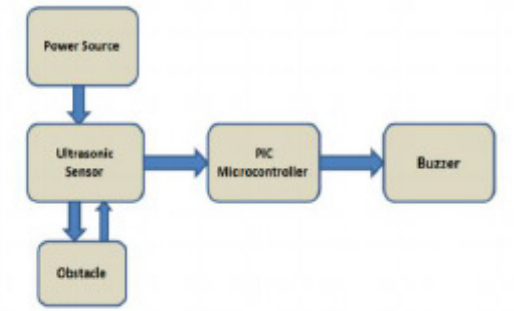


Walking Stick for the Blind people The Ultrasonic Sensor HC-

SR04 is the device's main component. The ultrasonic sensor sends out a high-frequency sound pulse and then calculates the time it takes for the sound echo signal to return. The HC-SR04 has a surface for both the transmitter and the receiver. One of them serves as the transmitter, sending out the ultrasonic waves. The other acts as a receiver, picking up the echoed sound signal. The sensor is calibrated based on the speed of sound in air. In the air, sound travels at 341 metres per second, and the distance between the sensor and the object is equal to time multiplied by the speed of sound divided by two.

Distance = (Time * Speed Of Sound) ÷ 2

Following the distance measurement, Arduino generates a



beep format using a buzzer; when the distance is great, the frequency of the beep is reduced, and when the distance is small, the frequency of the beep is increased

VI. ADVANTAGES

In this system device will measure Accurate distance The system Components are simple to use & low cost.With little software and sensor up gradation , can extensible to any other application and specifications. This system helps the blind people to easily reach to destination with the help of this Smart blind stick which detects the obstacles and alert the user with buzzer sound When blind people walk on the street if there is a dig on the way then this smart stick will Alert blind people about dig In this pandemic even this system helps us to maintain social distance in crowd. When we go out from the home if meet our friends we automatically go close to them without maintaining the social distance if we keep this system with us it will remind us with buzzer sound and remind us not to go close to them It can measure the distance to a wide range of objects regardless of shape, color or surface texture. They are also able to measure an approaching or receding object

VI.CONCLUSION

The prototype of the Blind Walking Stick, which Can be used to direct the blind,has finally been completed. It's worth noting at this stage that the study's main goal, which was to develop and introduce a smart walking stick for the blind, was fully met. The Smart Stick serves as a foundation for the next generation of As sistive technologies that will assist the visual impaired in safely navigating both indoor and outdoor environments It is both efficient and cost-effective. Its aim is to solve the challenges that blind people face on a daily basis. In addition, the device takes precautions to ensure their safety. This project would benefit all blind people around the world by making it easier for them to walk anywhere they want. It was done to help the blind in their infron movement.

In a developing country like India, a cost-effective solution is needed so that the majority of the population can benefit from the product proposed in this paper

VII. References

1. Base paper : Dey, N., Paul, A., Ghosh, P., Mukherjee, C., De, R., & Dey, S. (2018). Ultrasonic Sensor Based Smart Blind Stick. 2018 International Conference on Current Trends Towards Converging Technologies (ICCTCT). doi:10.1109/icctct.2018.8551067
2. In 2020, at International 6th conference on advanced computing gave an IEEE research paper on "Advanced smart stick for blind people" Department of EEE, Coimbatore, tamilnadu
3. Osama Bader AL-Barrm International Journal of Latest Trends in Engineering and Technology (IJLTET)
4. Cardin, Daniel Thalmann and Frederic Vexo,Wearable Obstacle Detection System for visually impaired people" Virtual Reality Laboratory (VRlab)Ecole Polytechnique Fédérale de Lausanne (EPFL)CH-1015 Lausanne, Switzerland.
5. Badern siedle AL - ren International Journal of Trends in Engineering and Technology(IJTETJ)
6. Smart Cane Assisted Mobility for the Visually Impaired, World Academy of Science, Engineering and technology International Journal and Information Engineering Vol:6 No:10,2012

****