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

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Silver Jubilee Year

TECHNICAL MAGAZINE

A.Y. 2019-20

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

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.

Editorial Message

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 and is now celebrating Silver Jubilee year. 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 two 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 15 of them have Doctorates, 10 are pursuing PhD and 09 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.

This newsletter stands special with research papers and articles for the Silver Jubilee Year–A.Y.2019-20. 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 in odd semester of academic year 2019-2020.

Prof. C. Venkatesh
HOD, EEE Dept.

Faculty publications - Journals

List of Journals published by Faculty during A.Y. 2019-20:

S.No.	Name of the Faculty	Title of the Paper	Name of the Journal	Details of Paper
1	Dr.V.Rajagopal	Compensation of Voltage based Power Quality Problems using Sliding Mode Observer with Optimized PI controller Gains	***IET Generation, Transmission & Distribution***	ISSN 1751-8687 **SCI**
2	Dr.M.Santhosh	Short-term wind speed forecasting approach using Ensemble Empirical Mode Decomposition and Deep Boltzmann Machine Vol. 19, p.100242	SustainableEnergy, Grids and Networks (Elsevier journal)	ISSN 2352-4677 **SCIE**
3	Dr.C.Venkatesh	Hybrid Multicarrier Modulation Transformerless Multilevel Inverter Fed Induction Motor Drive", Vol. 9, Issue 01, 2020, pp. 4293-4298.	*International Journal of Scientific & Technology Research*	ISSN 2277-8616 **Scopus**
4	Prof.V. Ramaiah	Fault Detection in IEEE 33kV Distribution and Micro-Grid Systems Using Hybrid Fuzzy-GA Approach	Journal of Green Engineering	ISSN 2245-4586 **Scopus**
5	M.Narasimha rao	Single Phase solar PV system with cascaded H-Bridge inverter in standalone Mode. Page No 311-319	IEEE-Springer	ISSN 1876-1100
6	Dr.B.Jagadish Kumar	Current Mode Proportional Resonant Controlled Multi Input SEPIC Re- Boost-System and pp. 682-689	International Journal of Power Electronics & Drives System	ISSN 2088-8694 **Scopus**
7	C.Pavan Kumar	Single Phase solar PV system with cascaded H-Bridge inverter in standalone Mode. Page No 311-319	IEEE-Springer	ISSN 1876-1100
8	Dr.Y.Manjusree	Performance Analysis of grid Connected Hybrid Solar Photovoltaic-Wind Energy System	IJAST	ISBN 978-93-80831-59-6
9	Dr.M. Santhosh	A hybrid forecasting model based on Artificial Neural Network and Teaching Learning Based Optimization algorithm for Day-ahead Wind Speed Prediction volume 607, pp. 455-463	Lecture Notes in Electrical Engineering Springer, Singapore	ISBN 978-981-15-0214-9 **Scopus**

10	V.Prakash	Overview of Restructured Power System	Springer - Innovations in Electrical and Electronics Engineering.	ISBN 978-981-15-2256-7 ESCI
11	V.Prakash	Single-Phase PV System with Continuous H-Bridge Inverter	Springer - Innovations in Electrical and Electronics Engineering.	ISBN 978-981-15-2256-7 ESCI
12	P. Mahesh	*Hybrid Multicarrier Modulation Transformerless Multilevel Inverter Fed Induction Motor Drive (4293-4298)*	International Journal Of Scientific & Technology Research Volume 9, Issue 01	ISSN 2277-8616 Scopus
13	Dr.B. Jagadish Kumar	Investigations on Multi input Integrated Buck-Sepic Converter	International Journal of Science and Technology	ISSN/ISBN 2394-1537 UGC
14	Dr.B. Jagadish Kumar	Improve Power Quality of Grid Connected PV System with PI Controller	International Journal of Scientific Research and Review	ISSN/ISBN 2279-543X UGC
15	Dr.B. Jagadish Kumar	Modelling and Simulation of a Novel multilevel inverter DC-AC Inverter	Grenze International Journal of Engineering and Technology	ISSN/ISBN 2395-5295 Other
16	Dr.B.Vijaykumar	Power System Loss Minimization by Using UPFC Placed at Optimal Location Given by Artificial Bee Colony Algorithm	IJRAT	ISSN/ISBN 2321-9637 UGC
17	Dr.M. Santhosh	Current advances and approaches in wind speed and wind power forecasting for improved renewable energy integration: A review	Engineering Reports Wiley	ISSN 2577-8196
18	V.Prakash	Comparision Of Pi And Fuzzy Controller Based Im Drives Fed By Four-Switch Three-Phase Inverter	International Journal of Management, Technology And Engineering	ISSN 2249-7455

IET Generation, Transmission & Distribution

Research Article

IET Journals
The Institution of Engineering and Technology

Compensation of voltage-based power quality problems using sliding mode observer with optimised PI controller gains

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Abstract: This study discusses a control algorithm for dynamic voltage restorer (DVR) based on sliding mode observer (SMO) with an optimisation-based proportional integrator (PI) tuning to compensate the voltage related power quality problems. In this work, a three-phase VSC-based topology of DVR is selected with a self-supported capacitor. This DVR configuration using the proposed control algorithm has been used for mitigation of unbalance, sag, and swells in the supply voltage. The estimation of grid parameters in undesirable situations based on the exosystemic model are the advantages proposed control. New nature-inspired optimisation algorithm named as Harris hawks optimiser (HHO) has been applied to obtain the PI gains in the control algorithm to eliminate the time required for the tuning process. The main advantage of HHO is the avoidance of local minima and exploration and exploitation features of the algorithm. DVR system with a combination of SMO-based control algorithm along with HHO optimised PI controllers have been developed in MATLAB/Simulink and tested for above said voltage-based disturbances mitigation in the supply voltage.

1 Introduction

Power quality (PQ) has got gradually increased concern from both utility and user side [1]. New loads, which are more sensitive to PQ issues, adjustable speed motor drives, and interconnected network are being major reasons besides the end-user awareness about PQ importance. Compensation techniques have been invented for all types of PQ disturbances. PQ issues related voltage and current are to be compensated by series and shunt filters respectively [2]. The frequently occurred issues related to voltage in the distribution system are voltage variations due to several reasons. For addressing the problems related to voltage in the distribution supply, a device named as dynamic voltage restorer (DVR) has been founded suitable [3].

DVR is a series-connected VSC-based device, which is used to mitigate the voltage-based PQ issues in sensitive loads [4]. In text [5], authors have reported that the DVR is used for the mitigation of voltage unbalances in supply with topology having super capacitor as an energy storage element. DVR with photo voltaic array module as a DC supply has been investigated in case of supply voltage sag, swell [6]. Saleh *et al.* in [7] have given the DVR configuration with Butterworth passive LC filter using discrete wavelet transform-based control. DVR has also been implemented as fault current limiter by topology, which uses bidirectional thyristor switches across the conventional DVR [8]. It has been evaluated under different fault conditions with different fault conditions. In [9], authors have simply modified the reference frame theory-based controller to control DVR for compensating sag, swell, and harmonics in the system, however, the transformations which make control complex have not been eliminated in this control. A rechargeable ultra-capacitor has been integrated to DVR with the help of bidirectional converter for compensation of temporary voltage disturbances [10].

There have been the various type of control techniques developed for controlling DVR for compensating PQ issues in recent times [11–15]. A symmetrical component estimation method of control has been implemented on DVR to compensate the voltage disturbances in the supply voltage [11]. Here only voltage sag has been addressed with the proposed control, which shows the less utilisation of DVR capacity. A fundamental voltage amplitude detection method has been proposed for DVR control, which can be used for both single and three-phase DVRs [12], in which addressed voltage sag, harmonics, frequency variations, and phase jumps in the system. Roldan-Perez *et al.* in [13] have proposed a repetitive control method for improving the steady-state performance in DVR while addressing the voltage sag. Karthikeyan *et al.* in [14] have developed cascaded delay signal-based pre-filter for extraction of symmetrical components from the disturbed voltage supply voltage to generate the DVR reference voltage.

Authors in [15], have presented the design of SMO of second-order to estimate the real-time parameters of the system, which has been used for the estimation of grid voltage parameters using the exosystemic model. As this SMO estimator executes in the real-time parameters estimation, this may be useful in the application of PQ where the fundamental components of the disturbed signals are needed. As stated in [16], SMO is robust against the system uncertainties. The important aspect of the control is tuning of PI controllers gains, for which the manual tuning was the usual practice, which increases the time of control process. To address this issue, it is identified that an optimisation-based tuning method in which some heuristic-based optimisation algorithms [17]. Authors in [18] have used the application of optimisation techniques in tuning process of PI controllers. It has been observed that as optimisation-based tuning method is the better solution for PI controller's gains estimation. Heidari *et al.* in [19], have developed a novel optimisation algorithm based on the behaviour or style of chasing of Harris' hawks in finding prey. As the name suggests the algorithm has been named as Harris hawks optimisation (HHO) algorithm. The main inspiration of this algorithm has come from the trick the Hawks play while hunting prey. In this method, more number of hawks collectively pounce a prey in one attempt from all the directions to surprise it. It is developed mathematically by considering the patterns and behaviours for developing an optimisation algorithm.

Authors in this paper have developed a control algorithm for controlling DVR based on SMO and an HHO-based optimisation algorithm. DVR with the proposed control has been studied for different types of issues in the supply voltage. In this regard, the supply voltage has been made non-ideal by introducing the sag, swell, and unbalances in it. As the SMO-based control algorithm with the use of HHO generates the fundamental components from

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Short-term wind speed forecasting approach using Ensemble Empirical Mode Decomposition and Deep Boltzmann Machine

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ABSTRACT

In the recent past, significant growth in renewable generation and integration with grid have resulted in diversified experiences for planning and operation of modern electric power systems. Electrical power system planners and operators have to work with technical issues of photovoltaic and wind resources integration into the grid to provide clean, reliable, safe, and affordable energy for people around the globe and also to minimize the use of fossil fuels. Wind energy is a fairly dependable source of renewable energy for generating electricity in spite of its highly non-linear and chaotic nature. But the prediction of such data demands highly non-linear temporal features. A new robust hybrid deep learning strategy (HDLS) is developed for enhanced prediction accuracy by preprocessing the raw input. The most effective signal decomposition technique, ensemble empirical mode decomposition (EEMD) is used for preprocessing. This technique decomposes the input into finite intrinsic mode functions and a residue after which training input matrices are established. In the next step, each Deep Boltzmann Machine (DBM) model is constructed by stacking four restricted Boltzmann machines (RBM). The training input matrices formed by each of the extracted intrinsic mode functions and a residue are applied to each DBM. Then the summation of all the predicted results is evaluated to attain the final result of time-series. For adequate performance assessment, hybrid deep learning strategy is developed for analyzing wind farms in Telangana and Tamilnadu. Finally, the proposed deep learning strategy is found to give more accurate results in comparison with existing approaches.

1. Introduction

Renewable energy sources (RES) have been playing a vital role in advanced power systems [1]. These renewable sources such as hydro, solar, wind, and geothermal are capable of reducing greenhouse gases emission to meet the primary objectives of the Paris agreement [2]. To facilitate the enhanced integration of RES, it is necessary to deal with vulnerabilities caused to the grid because of the intermittent and uncertain nature of these resources. Wind energy has been emerging rapidly in the renewable energy generation technologies around the world [3]. As per the global wind statistics-2018 released by global wind energy council (GWEC), industry installed wind power was 51.3 GW in 2018 [4]. This brings the total global wind installed capacity to 591 GW. Fig. 1 shows changes in new installations from year 2017 to 2018. Electricity dealers and grid engineers need to know, hour-ahead and day-ahead RES power generation for system balancing, reserve management, scheduling and commitment of generating units [5,6]. This has encouraged many utilities and researchers to develop accurate and reliable prediction techniques for wind speed and power forecasting [7].

For acquiring comprehensive knowledge about wind speed forecasting approaches in literature, a brief comparison of fundamental approaches is presented in Table 1. Based on the time-horizon, wind speed forecasting is categorized into four types: very short-term (less than 30 min), short-term (from 30 min to 6 h), medium-term (from 6 h to 24 h) and long-term forecasting (from 1 day to 7 days). The current wind speed prediction methods are broadly categorized into five approaches: persistence method, physical method, statistical method, artificial intelligence (AI) models, and hybrid models. Persistence method is most popularly used as a benchmark method among all prediction techniques. This method is the most straightforward approach and states that future wind speed value (w(t+1)) is the same as the past hour predicted wind speed value (w(t)) [8]. It can exhibit the best performance for short-term forecasting applications but as the forecasting time horizon increases, its error value also increases rapidly. Physical method depends upon

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Hybrid Multicarrier Modulation Transformerless Multilevel Inverter Fed Induction Motor Drive

P. Mahesh, Dr. C. Venkatesh

Abstract : In this paper, performance analysis of PV based hybrid multicarrier modulation transformerless multilevel inverter is employed for induction motor drive. The presence of harmonics in a conventional inverter fed adjustable speed drive applications, the performance of the drive is poor with low quality of voltage and current, so the power losses are also higher in level. Recently, multilevel inverter topologies are used in high power medium voltage control. The transformerless inverter topology provides higher efficiency with reduced total harmonic distortion (THD), simple structure with less weight and enhanced power quality. In this work, inverter output voltage control is obtained using hybrid multicarrier pulse width modulation (HMCPWM) technique. Performance analysis of 5-level transformerless inverter fed induction motor controlled by HMCPWM is performed by simulation using MATLAB/Simulink.

Keywords: Multi Level Inverter, induction motor drive, hybrid multicarrier pulse width modulation (HMCPWM), total harmonic distortion

1 INTRODUCTION

In many industrial applications, conventionally, DC motors were the best suitable for the adjustable speed drives because of their excellent torque and speed response. And also these motors comprise of commutator and mechanical brushes, which undergo wear and tear with the progression of time. Because of these inherent disadvantages, in most cases DC motors are replaced by AC motors. In majority of industrial drives use ac induction motor because of more advantages compared to DC motors. And these motors are low cost, rugged, reliable, and relatively inexpensive with high efficiency. So all these features of induction motors are make the use of it a mandatory in many areas of applications. Because of the unavailability of variable voltage and variable frequency, the induction motors are mostly applicable for constant speed application [1][2]. But, now a day's in many applications variable speed drive operation is required. For the speed and torque control of a induction motor, the power electronic converters are playing an major role [3] [4]. Now a day's Non Conventional energy source advances are considered as spotless wellsprings of vitality and optimal utilization of these assets limit the environmental impacts and produce the less optional wastes and feasible dependent on present and future economic and social needs. Non Conventional energy advances give a better opportunity for expanding the ozone depleting substance discharge and reducing global warming compared to conventional energy sources. The one of major non conventional energy source is solar photovoltaic system, it is used for commercial and household purpose, and transformerless centralized photovoltaic inverter can be established [5]. This can be made to develop for high power ratings. In previous days after the production of DC from solar PV cell we need to boost the voltage by using transformers for that we have rectify DC to AC with the help of special power electronic converter which is called as inverter [6]-[7].

But with the presence of transformers the cost, weight, losses may increases and also harmonics distortion will increase which may cause to reduce the efficiency and performance of the output [8]. The conventional two & three –level inverter is unable to provide the modern grid requirements with high efficiency for high power ratings applications. To provide the high voltage and power ratings with high efficiency the multilevel inverter topologies are introduced [9]. Among the different multilevel inverter topologies the transformerless cascaded multilevel inverters have various advantages [10]. The use of transformerless cascaded topology system eliminates transformer operation from the solar PV system [11] and the cost and weight of the proposed system can be reduced. In general for operation of inverter there are different modulation techniques are available sinusoidal pulse width modulation (SPWM), space vector modulation (SVM)[9] and multicarrier pulse width modulation (MCPWM)[10]-[11]. In SVM the switching operation of sequence and modulation depends upon user. However, the selection of switching state is overcome by MCPWM, but the computational burden because of higher number of carrier signals is available in it [12]. In this paper, a three phase hybrid multicarrier modulation transformerless cascaded multilevel inverter (MLI) which reduce voltage transition in common mode and the multicarrier modulation technique is to be implemented without any complexity compared to conventional method [13]. The carrier based pulse width modulation switching technique is most effective technique for multi level inverter operation and it performed by the intersection of a modulating signal with triangular carrier waveform [14]. The article is organized as follows. In Section II three phase transformerless converter topology is described. In Section III principle of operation of the hybrid multicarrier transformerless inverter is explained. In Section IV modeling of induction motor is explained. In Section V simulation results of the proposed system are developed and analyzed. In Section VI the conclusions of the paper are presented.

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Fault Detection in IEEE 33kV Distribution and Micro-Grid Systems Using Hybrid Fuzzy-GA Approach

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Abstract

In this article, an intelligent technique of Fuzzy – GA (FGA) approach is proposed for detecting faults (or defects). To decrease the outage time in addition to improve service dependability, it is necessary on behalf of operators to detect the defect segments as speedily as possible. This method requires drastically less memory to keep the database and recognizes crucial device regions. $S_{healthy}$ for the healthy enclave and S_{island} for the inability enclave by means of post defect condition with circuit breakers (CB's) and Relays (or transfers). Next determines membership function (or participation function) for every potential defect segment. The most achievable defect segment is chosen by highest choosing technique. The technique is described and verified on an IEEE 33kV distribution system and also applied on a Micro-Grid system as case studies.

Keywords: Fault detection, Fuzzy-GA approach, Hybrid Fuzzy-GA Approach, Membership function, distribution system, Micro-grid system.

1 Introduction

Power service dependability has huge brunt on the utility recovery rate and customer loyalty while a defect occurs, and is, as a result, an enormous challenge inside the electricity supply sector. For condensing blackout

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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

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Current mode proportional resonant controlled multi input–SEPIC-re-boost-system

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ABSTRACT

The intention of this paper is to identify a suitable controller for closed loop multi converter system for multiple input sources and to improve time response of high-gain-step up-converter. Closed-loop Multi Converter System (MCS) is utilized to regulate load-voltage. This effort recommends suitable-controller for closed-two loop-controlled-SEPIC-REBOOST Converter fed DC motor. The estimation of the yield in open-two loop and closed- two-loop-circuit has been done using MATLAB or Simulink. Closed-two loop-control of Multi Converter System with Propotional+Integral (PI)-Propotional+Integral (PI) and Proportional+Resonant (PR)–Proportional+Resonant (PR) Controllers are investigated and their responses are evaluated in conditions of rise time, peak time, settling time and steady state error. It is seen that current-mode PR-PR controlled MCS gives better time domain response in terms of motor speed. A Prototype of MCS has been fabricated in the laboratory and the experimental-results are authenticated with the simulation-results.

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1. INTRODUCTION

High Step-up Converter with three-winding coupled inductor for fuel cell energy source applications is given by Kuo. This paper presents a high step-up converter for fuel cell energy source applications. The proposed high step-up dc-dc converter is devised for boosting the voltage generated from fuel cell to be a 400-V dc-bus voltage. Through the three-winding coupled inductor and voltage doubler circuit, the proposed converter achieves high step-up voltage gain without large duty cycle. The passive lossless clamped technology not only recycles leakage energy to improve efficiency but also alleviates large voltage spike to limit the voltage stress [1].

A High Step-Up Converter with a voltage multiplier module for a photovoltaic system is presented by Shih. A novel high step-up converter is proposed for a front-end photovoltaic system. Through a voltage multiplier module, an asymmetrical interleaved high step-up converter obtains high step-up gain without operating at an extreme duty ratio. The voltage multiplier module is composed of a conventional boost converter and coupled inductors. An extra conventional boost converter is integrated into the first phase to achieve a considerably higher voltage conversion ratio [2].

An Isolated DC/DC converter using high-frequency unregulated LLC resonant converter for fuel cell applications is suggested by Han. This paper suggests an isolated dc/dc converter using an unregulated LLC converter for fuel cell applications. The LLC converter operates as an isolated voltage amplifier with a constant voltage gain, and a nonisolated converter installed in the input stage regulates the output voltage

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.

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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

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PERFORMANCE ANALYSIS OF GRID CONNECTED HYBRID SOLAR PHOTOVOLTAIC - WIND ENERGY SYSTEM

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Abstract:

This paper describes the analysis of a solar photovoltaic-wind power generation system using non-conventional sources of energy such as wind and solar . The proposed model consists of wind turbine and solar panels that wired together are connected to the boost converter in which MPP technique is incorporated and then connected to the three-level inverter (VSC) that supplies AC power from inverter to the grid. Due to exponential increase in demand for electricity causes an imbalance which leads to several problems in the existing grid. The problems caused by imbalance are unbalanced voltage and load shedding which affect the end consumers. Using renewable energy sources can overcome the problems that are raised by increase in demand. When configuration of wind power or solar power used individually may lead to power fluctuations in the desired system. When combined the system provides a sustainable and reliable source of energy that is constant. The non-conventional energy sources, solar PV and wind turbine are connected in parallel to the utility grid. The hybrid system provides continuous and uninterruptable power supply compared to the individual system. The generated power by the hybrid system i.e., PV/Wind is directly fed to the grid from the grid side inverter. The results show the affect of wind speed and irradiance on system's output power. The paper presents grid connected hybrid model using MATLAB/Simulink..

A Hybrid Forecasting Model Based on Artificial Neural Network and Teaching Learning Based Optimization Algorithm for Day-ahead Wind Speed Prediction

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Abstract. In this analytical study, a hybrid day-ahead wind speed prediction approach for high accuracy is implemented. The hybrid approach initially converts raw wind speed data series into actual hourly input structure for reducing uncertainty and the intermittent nature of wind speed. The back-propagation neural network is utilized for its better learning capability and also for its ability for nonlinear mapping among complex data. The teaching learning-based optimization algorithm is used to auto-tune the best weights of the artificial neural network. This optimization algorithm is used for its powerful ability to search and explore on a global scale. Then, the artificial neural network-teaching learning-based optimization approach is implemented for wind speed forecasting. After that, the day-ahead prediction is performed using the proposed hybrid model for actual hourly input structure. The hybrid model prediction results give enhanced prediction accuracy when compared to existing approaches.

Keywords: Day-ahead Wind Speed Prediction, Hybrid Model, Artificial Neural Network (ANN), Teaching Learning Based Optimization (TLBO), Parameter optimization

1 Introduction

Electrical energy has come to play a significant role not only in modern human life but also in the growth of the world economy. Specifically, wind energy is clean, pollution-free and is part of the fast-growing renewable energy sources (RES) and this form of energy is drawing worldwide attention among RES. As per the Global Wind Energy Council (GWEC) report, the new worldwide total wind installed capacity was 539.1 GW by the end of 2017 [1]. Advancement of power electronic devices gives us better grid reliability services with wind turbines than with conventional power plants. The reliable and efficient energy supplement planning requires accurate wind speed and wind power prediction.

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.

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Hybrid Multicarrier Modulation Transformerless Multilevel Inverter Fed Induction Motor Drive

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Abstract : In this paper, performance analysis of PV based hybrid multicarrier modulation transformerless multilevel inverter is employed for induction motor drive. The presence of harmonics in a conventional inverter fed adjustable speed drive applications, the performance of the drive is poor with low quality of voltage and current, so the power losses are also higher in level. Recently, multilevel inverter topologies are used in high power medium voltage control. The transformerless inverter topology provides higher efficiency with reduced total harmonic distortion (THD), simple structure with less weight and enhanced power quality. In this work, inverter output voltage control is obtained using hybrid multicarrier pulse width modulation (HMCPWM) technique. Performance analysis of 5-level transformerless inverter fed induction motor controlled by HMCPWM is performed by simulation using MATLAB/Simulink.

Keywords: Multi Level Inverter, induction motor drive, hybrid multicarrier pulse width modulation (HMCPWM), total harmonic distortion

1 INTRODUCTION

In many industrial applications, conventionally, DC motors were the best suitable for the adjustable speed drives because of their excellent torque and speed response. And also these motors comprise of commutator and mechanical brushes, which undergo wear and tear with the progression of time. Because of these inherent disadvantages, in most cases DC motors are replaced by AC motors. In majority of industrial drives use ac induction motor because of more advantages compared to DC motors. And these motors are low cost, rugged, reliable, and relatively inexpensive with high efficiency. So all these features of induction motors are make the use of it a mandatory in many areas of applications. Because of the unavailability of variable voltage and variable frequency, the induction motors are mostly applicable for constant speed application [1][2]. But, now a day's in many applications variable speed drive operation is required. For the speed and torque control of a induction motor, the power electronic converters are playing an major role [3] [4]. Now a day's Non Conventional energy source advances are considered as spotless wellsprings of vitality and optimal utilization of these assets limit the environmental impacts and produce the less optional wastes and feasible dependent on present and future economic and social needs. Non Conventional energy advances give a better opportunity for expanding the ozone depleting substance discharge and reducing global warming compared to conventional energy sources. The one of major non conventional energy source is solar photovoltaic system, it is used for commercial and household purpose, and transformerless centralized photovoltaic inverter can be established [5]. This can be made to develop for high power ratings. In previous days after the production of DC from solar PV cell we need to boost the voltage by using transformers for that we have rectify DC to AC with the help of special power electronic converter which is called as inverter [6]-[7].

But with the presence of transformers the cost, weight, losses may increases and also harmonics distortion will increase which may cause to reduce the efficiency and performance of the output [8]. The conventional two & three –level inverter is unable to provide the modern grid requirements with high efficiency for high power ratings applications. To provide the high voltage and power ratings with high efficiency the multilevel inverter topologies are introduced [9]. Among the different multilevel inverter topologies the transformerless cascaded multilevel inverters have various advantages [10]. The use of transformerless cascaded topology system eliminates transformer operation from the solar PV system [11] and the cost and weight of the proposed system can be reduced. In general for operation of inverter there are different modulation techniques are available sinusoidal pulse width modulation (SPWM), space vector modulation (SVM)[9] and multicarrier pulse width modulation (MCPWM)[10]-[11]. In SVM the switching operation of sequence and modulation depends upon user. However, the selection of switching state is overcome by MCPWM, but the computational burden because of higher number of carrier signals is available in it [12]. In this paper, a three phase hybrid multicarrier modulation transformerless cascaded multilevel inverter (MLI) which reduce voltage transition in common mode and the multicarrier modulation technique is to be implemented without any complexity compared to conventional method [13]. The carrier based pulse width modulation switching technique is most effective technique for multi level inverter operation and it performed by the intersection of a modulating signal with triangular carrier waveform [14]. The article is organized as follows. In Section II three phase transformerless converter topology is described. In Section III principle of operation of the hybrid multicarrier transformerless inverter is explained. In Section IV modeling of induction motor is explained. In Section V simulation results of the proposed system are developed and analyzed. In Section VI the conclusions of the paper are presented.

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INVESTIGATIONS ON MULTI INPUT INTEGRATED BUCK- SEPIC CONVERTER

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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

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Improve Power Quality of Grid Connected PV System with PI Controller

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ABSTRACT

In this article investigates the power quality (PQ) of Grid Connected solar energy conversation systems (SECS) based on PI Controller when non linear loads are connected in distribution network. When non linear loads such as three Phase Bridge rectifiers are connected in the network, because of its switching operation harmonics are generates in the network it may lead to generate voltage sags and swells in the network. This PQ problems are severe impact on dynamic performance of the SECS, this are solved by employing PI controller based voltage source converters. Verified simulation results in MATLAB satisfactory results are obtained.

Keywords: *SECS, PQ, PI controllers.*

I. INTRODUCTION

Since a decade power generation through renewable energy sources are rapidly growing because of its numerous features such as free from green house problems, environmental friendly, and no acid rain and doesn't create any problem to ozone layer. Various types of RES are available like solar, wind, geothermal and wind etc, in these solar is more dominant to adopt distribution power generation because it doesn't contains rotating parts to generate power. Absence of mechanical parts PV power generation, it is more economical and more efficiency. From a survey PV power production in 2013 is 40,000MW this may prove the utilization of solar.

SECS are broadly classified into Stand-alone PV systems and the grid-connected PV systems, categorises [1-5]. The major differences between these two SECS are that in stand-alone systems the PV output is equally balanced with the load demand, Grid connected SECS both PV and grid are responsible for to achieve the load demand. When non linear loads such as three phase bridge rectifier is connected in the circuit grid connected PV systems are suffered with power quality issues as harmonics, voltage sags, voltage swells etc. This power quality problems are occurred due presence of non linear loads in the distribution (load).

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Modelling and Simulation of a Novel Multilevel DC-AC Inverter

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Abstract—**In this paper, a Novel multilevel DC-AC inverter has been proposed. The Proposed multilevel inverter (MLI) generates seven level AC output voltage with appropriate gate signals design. Here the operating principles of proposed MLI and voltage balancing of input capacitors are discussed by implementing RSCC circuit to proposed topology of inverter. The MLI is controlled with carrier-wave based Sinusoidal Pulse Width Modulation (SPWM) technique to produce different operating modes to generate respective voltage level at each mode by giving input of 400V DC across the capacitors and generating an output of 220Vrms AC voltage.**

Index Terms— **Multi-level Inverter, Pulse Width Modulation, Sinusoidal Pulse Width Modulation, Total Harmonic Distortion, Phase Distortion, Resonant Switched Capacitor Converter, Cascaded H-Bridge.**

I. Introduction

Because of high technology development, the demand and the quality of electric power is higher than before. Due to the advancement of semiconductors, the specification of power devices and power conversion techniques is promoted. One of the power converters which can transform DC to AC is called "inverter". In past few years, many standards and regulations have been introduced to limit quality of harmonics and power factor in electrical equipment's. The industry demands high power applications, which results in high power switches. Even though Insulated Gate Bipolar Transistor (IGBT) have high power application characteristics, it cannot operate at high frequencies and designing of its gate-driver circuit is complex. To solve this problem, we can implement Metal Oxide Semiconductor Field Effect Transistor (MOSFET) instead of IGBT i.e., many different topologies of multilevel inverters are developed using low power rating component at high power applications [1].

To meet the requirements in high power applications, such as high-power rating of power electronic converters, MLI concept has been introduced. Cascaded H-bridge MLIs are widely used in both symmetrical and comparison asymmetrical topology (i.e., unequal voltage sources across the input side) has better performance results than symmetrical configuration topology and produces higher number of output voltage levels with same power switches requirement that is implemented for symmetrical topology [2][3][6].

The main drawback of MLIs are using IGBTs and diodes as power components which are less capable of operating at high frequencies [1][4]. If the input sources are utilized alternately in full cycles of output waveform, voltage balancing must be achieved in two cycles. To implement equal load sharing in MLIs, Carrier-

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Power System Loss Minimization Using Optimal Placement of UPFC Given by Bat Algorithm

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Abstract- In this paper a heuristic method for minimizing active power loss of the power system using Unified Power Flow Controller is proposed. The novelty of the proposed method is to use the Bat algorithm to find optimal location of UPFC. Bat algorithm provides superior searching ability. Here, the bat algorithm optimizes location of UPFC when the generator outage occurs in the system. Generator outage affects the power flows, bus voltages, power loss, real and reactive power. By placing The UPFC at the optimal location, performance of the system is analyzed. The proposed method is implemented in the MATLAB/Simulink platform and tested on IEEE 30 bus standard bench mark system. The proposed method's performance is evaluated by comparison with different conditions. The comparison results proved the effectiveness of the proposed method and confirm its potential to minimize power loss.

Keywords: Bat algorithm, Power loss, UPFC.

1. INTRODUCTION

The quantity of electrical power transmitted safely by a transmission system is restricted [1]. Electrical power utilities through the world are working under pressured, in order to maximize total capacities due to the the environmental along with economic constraints to emerge a new generating plants and transmission lines [2] [3]. Power flow in the lines and transformers shouldn't be allowed to raise into a level in which a haphazard occurrence might lead to the actual system fall down as cascaded breakdowns [4] [5]. With regard to managing the power transmission system, Flexible Alternating Current Transmission System (FACTS) is often a better device that's utilized [6-7]. FACTS is regarded "an electric power automated dependent process along with other fixed device in which present management of a number of AC transmission system parameters to build up controllability in addition to magnify power transfer capability" [8]. The actual several types of FACTS devices available for this function contains Static Var Compensator (SVC), Thyristor controlled series Capacitor (TCSC), Static Synchronous series compensator (SSSC), Static Synchronous Compensator (STATCOM), Unified Power Flow Controller (UPFC) and Interlink Power Flow Controller (IPFC) [9]. UPFC is probably the best FACTS devices which can control both active and reactive power flow in transmission line. [10].

The optimum position of UPFC device permits to manage its power flows for an interconnected system, and thus to raise the system load ability [11]. Various kinds of optimization algorithms are used to solve this sort of issue, for example genetic algorithms, reproduced annealing, tabu search and etc. [12].

This paper proposes a heuristic method for minimizing power loss in the power system using UPFC. The novelty of the proposed method is to use the Bat algorithm to find optimal location UPFC under generator outage conditions. When the generator outage occurs, which in turn affects the power flow constraints like voltage, power loss, real and reactive power? For improving the system performance, UPFC is placed in the optimum location given by Bat algorithm. The objective of this paper is to reduce the power loss. The rest of the paper is organized as follows: Recent research works are discussed in section 2. Section 3 deals with UPFC structure, problem formulation and Heuristic algorithm. Section 4 gives the results and section 5 concludes the paper.

2. RECENT RESEARCH WORK: A BRIEF REVIEW

Number of similar performs are available in literary works, which dependent on improving the power transfer ability to electrical power process. Some of them are usually assessed here.

Mark Ndubuka Nwohu[13] presented an approach to find and choose the optimal location of Unified Power Flow Controller (UPFC) based on the sensitivity of the total system active power loss with respect to the control variables of the Unified Power Flow Controller (UPFC). The control system of the UPFC's injection model is developed and its contributions to avoiding a

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REVIEW

WILEY

Current advances and approaches in wind speed and wind power forecasting for improved renewable energy integration: A review

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Comprehensive review of wind forecasting.

Abstract

Wind power is playing a pivotal part in global energy growth as it is clean and pollution-free. To maximize profits, economic scheduling, dispatching, and planning the unit commitment, there is a great demand for wind forecasting techniques. This drives the researchers and electric utility planners in the direction of more advanced approaches to forecast over broader time horizons. Key prediction techniques use physical, statistical approaches, artificial intelligence techniques, and hybrid methods. An extensive review of the current forecasting techniques, as well as their performance evaluation, is here presented. The techniques used for improving the prediction accuracy, methods to overcome major forecasting problems, evolving trends, and further advanced applications in future research are explored.

KEYWORDS

artificial intelligence, decomposition-based models, deep learning, hybrid prediction, numerical weather prediction, wind speed and wind power forecasting

1 | INTRODUCTION

Electricity has been playing the pivotal part in human life. With the increase in earnings and the adding of extra 1.7 billion population to urban areas in developing countries, global electricity demand will rise by more than a quarter by 2040 (as per the world energy outlook by international energy agency).[1] Economical renewable energy technologies and digital applications have come together from different directions to meet the rising global electricity demand. Enhanced integration of wind and solar with the grid results in reliable operation of power systems, as reported by Jiang et al.[2] By 2023, it will be predicted that renewable energy sources (RES) will meet more than 70% of global electricity generation growth, led by solar and wind. As wind has been a source of clean energy, its production cost has been cheaper, and sustained evolution of wind energy has been taking part in energy transition around the globe.[3]

According to the global wind energy council report, total global installed capacity is 651 GW with 60.4 GW of new wind energy installations in 2019.[4] Figure 1 shows world-wide wind installations (in GW) chronologically from 2015 to 2019. An accurate wind speed and wind power forecasting (WF) is necessary for desired control of wind turbines, reducing uncertainty, and also for minimizing the probability of overloading as mentioned by Wang et al.[5] The main motive behind WF is to estimate as precisely as possible wind power output in very short-term (15-minutes, 30-minutes

COMPARISION OF PI AND FUZZY CONTROLLER BASED IM DRIVES FED BY FOUR-SWITCH THREE-PHASE INVERTER

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Abstract—This paper shows a speed controller utilizing a fluffy rationale controller (FLC) for backhanded field-situated control (IFOC) acceptance engine (IM) drives bolstered by a four-switch three- stage (FSTP) inverter. In proposed methodology, IM drive framework is encouraged by a FSTP inverter rather than conventional six-switch three-stage (SSTP) inverter for savvy low-control applications. The premeditated FLC improves dynamic reactions, and it is additionally structured with decreased calculation trouble. The total IFOC plot consolidating FLC for IM drives nourished by proposed FSTP inverter is worked in MATLAB/Simlink, The dynamic execution, vigor, and obtuseness proposed FLC with FSTP inverter- encouraged IM drive is inspected and contrasted with a foreseeable relative essential (PI) scrutinize under speed following, load unsettling influences, and parameters variety, especially at low speeds. It is discovered that proposed FLC is more vigorous than PI controller under burden aggravations, and parameters variety. In addition, proposed FSTP IM drive is practically identical with a customary SSTP IM drive, thinking about its great powerful execution, cost decrease, and low complete consonant bending (THD).

INTRODUCTION

Three-stage enlistment engines have been viewed as a standout amongst most usually utilized electric machines in industrial applications because their minimal effort, basic, and robust development. Three-stage inverters are viewed as a basic part in variable speed air conditioning engine drives. Beforehand, customary six-switch three-stage (SSTP) inverters have been generally utilized in various industrial applications. These inverters have a few downsides in low-power run applications, which include additional cost; six switches losses, and confused control plans. Besides, they require building interface circuits to deliver six pulse width tweak (PWM) pulses [3,1]. The advancement minimal effort engine drive systems is a vital point, especially for a low-power range.[1] Therefore, three-stage inverter with diminished part for driving an enlistment engine (IM) was introduced.

[2]Also, decreased switch tally has been reached out for a rectifier– inverter system with active information current forming. [3]Three distinctive designs IM drives encouraged from a four-change inverter to actualize ease drive systems for low-power go applications have been displayed. As late, unique research attempts to plan new power converters for limiting losses and expenses have been proposed. Four-switch three-stage (FSTP) inverters rather than SSTP inverters have been utilized in engine drives [9]– [4], sustainable power source applications [10], and active power filters [11], [12]. Control FSTP brushless dc engine drives has been displayed in [4]; [5]using direct torque control (DTC) with non sinusoidal back EMF, [7]using single current sensor [6], or utilizing DTC with decreased torque swells. [8]Compensation inverter voltage drop in DTC for FSTP PM brushless air conditioning drives has been introduced. [9]A DTC system

Faculty publications – Conference Papers

List of Conference Papers published by Faculty during A.Y. 2019-20:

S.No.	Name of the Faculty	Title of the Paper	Name of the Journal	Details of Paper
1	V. Ramaiah	Seven Level Fault tolerant inverter for Photo-Voltaic Applications	International Conference on Power Electronics Applications and Technology in Present Energy Scenario	NITK, Surathkal-Karnataka
2	V. Ramaiah	Overview of Restructured Power System	4th International Conference On Innovation in Electrical Engineering (ICIEEE-2019)	GNIT, Hyderabad
3	M.Narasimha Rao	Single Phase solar PV system with cascaded H-Bridge inverter in standalone Mode. Page No 311-319	Innovations in Electrical and Electronics Engineering	Guru Nanak Institutions
4	Dr. B. Jagadish Kumar	Improve Power Quality of Grid Connected PV System with PI Controller	XVII International Conference on Recent Trends in Engineering Science and Management (ICRTESM-19)	ISSN 978-93-87793-99-6 Pune.
5	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 ISSN 978-93-90103-04-1
6	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 organization, Gaziabad ISSN 978-93-90103-04-1
7	G. Sudheer Kumar	Electrical conductivity, dielectric and mechanical sensing properties of	National Conference on Nano/Bio-Technology 2019	JNU, New Delhi

		poly(vinylidene fluoride)/helical multi-walled carbon nanotube composites		
8	C.Pavan Kumar	Single Phase solar PV system with cascaded H-Bridge inverter in standalone Mode. Page No 311-319	Innovations in Electrical and Electronics Engineering	Guru Nanak Institutions
9	Dr.Y.Manjusree	Performance Analysis of grid Connected Hybrid Solar Photovoltaic-Wind Energy System	ICRAMCE-2020	ISSN 978-93-80831-59-6
10	Dr.Y.Manjusree	Model of Autonomous open loop Dual –Axis Solar Tracker	NCETE-2020	Geetanjali institute if Science &Technology
11	Dr.A.Madhukar Rao	Seven-level Fault Tolerant Inverter for PV applications, pp. 1-5	2019 International Conference on Power Electronics Applications and Technology in Present Energy Scenario (PETPES)	NITK,Surthkal ,Mangalore, India, India ISSN 978-1-7281-2655-5
12	Dr.A.Madhukar Rao	Multilevel Inverter Topology with Symmetrical and Asymmetrical Sources for Distributed Energy Resources, pp. 1-5	2019 8th International Conference on Power Systems (ICPS)	MNIT, Jaipur, India, India ISSN 978-1-7281-4103-9
13	Dr.A.Madhukar Rao	Seven-Level Single Phase Inverter for Multistring PhotoVoltaic Applications, pp. 1-6	2020 IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy (PESGRE2020)	Cochin, India, India 978-1-7281-4251-7
14	V.Prakash	Overview of Restructured Power System	ICIEEE-2019	GNIT Hyderabad
15	V.Prakash	Single Phase Solar system with cascaded H-Bridge inverter in standalone mode	ICIEEE-2019	GNIT Hyderabad
16	V.Srinivas	Seven-level Fault	2019 International	NITK,Surthkal

		Tolerant Inverter for PV applications, pp. 1-5	Conference on Power Electronics Applications and Technology in Present Energy Scenario (PETPES)	,Mangalore, India, India ISSN 978-1-7281-2655-5
17	V.Srinivas	Multilevel Inverter Topology with Symmetrical and Asymmetrical Sources for Distributed Energy Resources, pp. 1-5	2019 8th International Conference on Power Systems (ICPS)	MNIT, Jaipur, India, India ISSN 978-1-7281-4103-9
18	V.Srinivas	Seven-Level Single Phase Inverter for Multistring PhotoVoltaic Applications, pp. 1-6	2020 IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy (PESGRE2020)	Cochin, India, India 978-1-7281-4251-7
19	P.Mahesh	Performance Analysis of Grid Connected Hybrid Solar Photovoltaic- wind Energy System	International Conference on Recent Advances in Mechanical, Civil & Electrical Engineering	ISBN 978-93-80831-59-6

Seven Level Fault Tolerant Inverter for PhotoVoltaic Applications

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***Abstract* - This paper reveals a seven-level inverter topology for photo-voltaic (PV) power generation system. The 7- level inverter created by cascading single phase full and half bridge inverter topology sustained with three separate PV strings. The output has 7-levels: +Vdc, +2/3Vdc, +Vdc/3, 0, -Vdc/3, -2Vdc/3, -Vdc. The 7-level inverter function is possible by using seven semi conductor switches. The designed inverter configuration has able to maintain consistent operation as inverter even though there is source and semiconductor switch breakdown. The developed inverter is differentiating with conventional multilevel inverters in terms of number of components, losses and reliability. The result of a 7-level inverter topology is confirmed by using MATLAB/SIMULINK software.**

Keywords— *7-level inverter, PV generation system, reliability.*

I. INTRODUCTION

As the world is facing with shortage of fossil fuels there is an enormous amount of demand for renewable sources especially wind and solar energy. PV sources are used in wide areas as they are pollution free and easy to maintain. Cost of production of sun energy based power generation is decreasing and meeting the consumer needs. The price of production is decreased to half of the cost of production of thermal energy in developed countries like U.S.A [1].

Multilevel inverters are used in many applications due to their high voltage withstanding and high power conversion capabilities. Interest for multilevel inverters, day by day it is continuing expanding because of its superior qualities like high voltage operation capability, low switching losses, high efficiency [2]. The multilevel inverter has been used in a variety of applications ranging from intermediate to high-power levels, such as electric drives, power strengthening devices, also conventional or sustainable power generation and distribution system [3].

In the past so many variety of converters are designed to operate as multilevel inverter, those are cascaded H-bridge, diode clamped and flying capacitor multi-level inverter these all treated as conventional multi level inverters. Decrement of Total harmonic distortion (THD) in output voltage of inverter is possible with increment of number of output voltage levels. If it is done with conventional multi-level inverters need more switching components count as the number of output voltage level increases. It leads to increment of size of the inverter and also difficulty level of control increases [4].Unlike conventional multilevel inverters, different topologies which can reduce the switching losses are welcomed in [5-7]. A 5-level fault-tolerant inverter configuration with reduced number of switches and with energy balancing between sources is presented in [8]. A new multilevel inverter topology in [9] using reverse voltage component concept to overcome the drawbacks of conventional multilevel inverter proposed but, it uses more switches for lower levels.

The above issues are addressed by using a seven-level fault tolerant inverter which is superior to conventional multi-level inverters. Out of all conventional inverter topologies the planned inverter configuration has an excellent inherent feature i.e., it can able to operate as inverter with decreased number of output voltage levels in case of failure in semi conductor device and source. The paper is organised as follows: the inverter configuration and operation is discussed in segment-II and the simulation results are discussed in segment-III and the advantages of proposed topology is concluded in segment-IV.

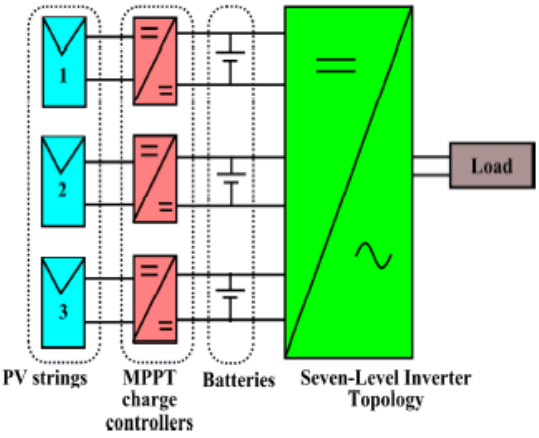

Fig. 1 Schematic diagram of seven-level inverter

II. SEVEN LEVEL FAULT TOLERANT INVERTER CONFIGURATION AND OPERATION

Multilevel inverter for multiple PV strings application concept is shown in schematic form in Figure 1.The multiple PV strings are possible for cascaded H-bridge configuration because it requires isolated sources which are not possible in case of diode clamped and flying capacitor multilevel inverters.

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.

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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

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Improve Power Quality of Grid Connected PV System with PI Controller

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ABSTRACT

In this article investigates the power quality (PQ) of Grid Connected solar energy conversation systems (SECS) based on PI Controller when non linear loads are connected in distribution network. When non linear loads such as three Phase Bridge rectifiers are connected in the network, because of its switching operation harmonics are generates in the network it may lead to generate voltage sags and swells in the network. This PQ problems are severe impact on dynamic performance of the SECS, this are solved by employing PI controller based voltage source converters. Verified simulation results in MATLAB satisfactory results are obtained.

Keywords: *SECS, PQ, PI controllers.*

I. INTRODUCTION

Since a decade power generation through renewable energy sources are rapidly growing because of its numerous features such as free from green house problems, environmental friendly, and no acid rain and doesn't create any problem to ozone layer. Various types of RES are available like solar, wind, geothermal and wind etc, in these solar is more dominant to adopt distribution power generation because it doesn't contains rotating parts to generate power. Absence of mechanical parts PV power generation, it is more economical and more efficiency. From a survey PV power production in 2013 is 40,000MW this may prove the utilization of solar.

SECS are broadly classified into Stand-alone PV systems and the grid-connected PV systems, categorises [1-5]. The major differences between these two SECS are that in stand-alone systems the PV output is equally balanced with the load demand, Grid connected SECS both PV and grid are responsible for to achieve the load demand. When non linear loads such as three phase bridge rectifier is connected in the circuit grid connected PV systems are suffered with power quality issues as harmonics, voltage sags, voltage swells etc. This power quality problems are occurred due presence of non linear loads in the distribution (load).

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INVESTIGATIONS ON MULTI INPUT INTEGRATED BUCK- SEPIC CONVERTER

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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

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

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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.*

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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.

Electrical conductivity, dielectric and mechanical sensing properties of poly(vinylidene fluoride)/helical multi-walled carbon nanotube composites

Polymer – carbon nanotube nanocomposites have been extensively studied due to their outstanding electrical, mechanical, thermal and sensing properties. In the present work, poly(vinylidene fluoride) (PVDF)/helical multi-walled carbon nanotubes (h-MWNT) composites were prepared by melt mixing method followed by compressive molding. The electrical properties were characterized by an impedance dielectric analyzer. The electrical conductivity increased significantly with h-MWNT content and was found to obey the power law with a percolation threshold of 0.5wt%. The electrical conductivity of PVDF at 1 Hz was found to increase by ~7 orders of magnitude with addition of only 1.25wt% h-MWNTs, which suggesting formation of a conducting linkage of CNTs in insulating polymer matrix. The dielectric constant increased from ~5 for PVDF to ~35 with 1.25wt% h-MWNTs at 10^{-1}Hz due to formation of micro-capacitors. Further the effect of CNT contents on mechanical sensing properties of PVDF/h-MWNT composites are studied. The electrical resistance of the composites films under tensile loading were measured by two-probe method using mechanical stretching machine interconnected with a digital multimeter.

Keywords: poly(vinylidene fluoride), helical multi-walled carbon nanotube, electrical conductivity, percolation threshold, dielectric constant, mechanical sensing

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Single-Phase PV System with Continuous H-Bridge Inverter

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PERFORMANCE ANALYSIS OF GRID CONNECTED HYBRID SOLAR PHOTOVOLTAIC - WIND ENERGY SYSTEM

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Abstract:

This paper describes the analysis of a solar photovoltaic-wind power generation system using non-conventional sources of energy such as wind and solar . The proposed model consists of wind turbine and solar panels that wired together are connected to the boost converter in which MPP technique is incorporated and then connected to the three-level inverter (VSC) that supplies AC power from inverter to the grid. Due to exponential increase in demand for electricity causes an imbalance which leads to several problems in the existing grid. The problems caused by imbalance are unbalanced voltage and load shedding which affect the end consumers. Using renewable energy sources can overcome the problems that are raised by increase in demand. When configuration of wind power or solar power used individually may lead to power fluctuations in the desired system. When combined the system provides a sustainable and reliable source of energy that is constant. The non-conventional energy sources, solar PV and wind turbine are connected in parallel to the utility grid. The hybrid system provides continuous and uninterruptable power supply compared to the individual system. The generated power by the hybrid system i.e., PV/Wind is directly fed to the grid from the grid side inverter. The results show the affect of wind speed and irradiance on system's output power. The paper presents grid connected hybrid model using MATLAB/Simulink..

Model of Autonomous Open Loop Dual-Axis solar tracker

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ABSTRACT

In this work, a dual-axis versatile PV photovoltaic open-loop sun oriented tracker is structured and reproduced utilizing MATLAB/Simulink. The outcomes are contrasted with a conventional statically positioned sun oriented tracker. The performance increase from a fixed PV solar module and an automated two-axis solar module was found to be 64% more efficient. This work presents the demonstrating results, which demonstrate the viability of the utilization of PV modules furnished with the dual-axis open-loop tracker.The created model will foresee the measure of energy that can be produced in a particular spot.The principle drawback of PV modules is the low effectiveness of the photoelectric converters, this can be dispensed by utilizing a solar tracking framework which helps in expanding the vitality productivity of solar-based batteries.The sun oriented modules track the sun dependent on the Azimuth and Zenith angles.

Keywords- Azimuth, Zenith, Dual-Axis, MATLAB/Simulink.

I.INTRODUCTION

Due to industrialization and rapid increase in modern technology the demand for supply is increasing on a large scale. To supply these demands the yearly measure of the production of new creating limits on sustainable renewable power sources has been expanding.Solar energy can be a significant piece of India's plan not exclusively to add new limit yet, in addition, to expand energy security, address ecological concerns, and lead the huge market for a sustainable power source [2]. Sustainable renewable power source assets are effectively available tohumankind around the world. The renewable energy source isn't just accessible in a wide range, yet additionally plentiful in nature. The renewable energy source division isat present providingapproximately 13.5% of the worldwide demand of energy[3].The traditional solar trackers have sensors to guide them to the direction of the sun (radiation), but these can be less accurate because of the interference of the clouds and also can be less efficient because of the constant search for radiation when there are clouds causes unnecessary waste of energy. In advancement to the traditional sensor-based solar trackers in this paper we are using an open-loop solar tracker, i.e. we are not using any feedback from the sensors instead we are calculating the Azimuth and Zenith angle of the sun, using which we can rotate the solar module. Because of quick advancements in PC innovation, we can make high-exactness numerical and recreation models in MATLAB, FEMM, and so forth. These recreation models are more affordable, adaptable, and furthermore the demonstrating is quicker. Simulation a model is more preferable than developing a real experiment as it is less expensive to simulate in software. The MATLAB created model will permit us to duplicate the attributes of genuine solar cells, foresee the measure of energy produced under specific conditions.

II.CALCULATION OF THE AZIMUTH AND ALTITUDE ANGLES

Here we are figuring the sun position whenever any area and on any day of the year. Firstly, we will figure Solar Declination Angle (δ).Azimuth is defined as the horizontal angle which is measured from clockwise tothe north base line or the meridian. δ is the point between the line drawn from the focal point of the sun to the focal point of the earth and plane of the equator.The declination angle shifts among +23.45° and - 23.45°. Since the earth turns at a tilt of 23.45°.There are various equations to locate the Solar Declination Angle (δ) however none among them can locate the perfect/ideal value since it changes every year. Beneath referenced is one of the calculations of Solar Declination Angle [1].

Seven Level Fault Tolerant Inverter for PhotoVoltaic Applications

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Multilevel inverters are used in many applications due to their high voltage withstanding and high power conversion capabilities. Interest for multilevel inverters, day by day it is continuing expanding because of its superior qualities like high voltage operation capability, low switching losses, high efficiency [2]. The multilevel inverter has been used in a variety of applications ranging from intermediate to high-power levels, such as electric drives, power strengthening devices, also conventional or sustainable power generation and distribution system [3].

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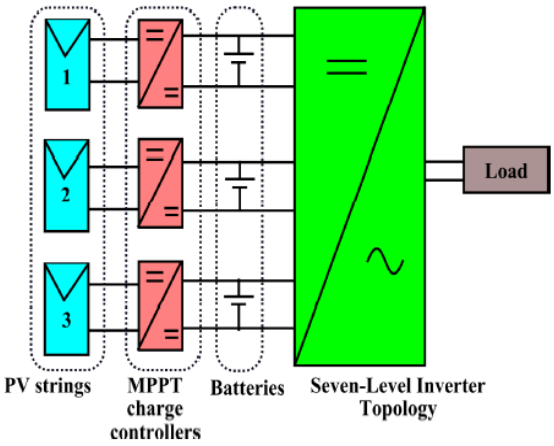

Fig. 1 Schematic diagram of seven-level inverter

II.SEVEN LEVEL FAULT TOLERANT INVERTER CONFIGURATION AND OPERATION

Multilevel inverter for multiple PV strings application concept is shown in schematic form in Figure 1.The multiple PV strings are possible for cascaded H-bridge configuration because it requires isolated sources which are not possible in case of diode clamped and flying capacitor multilevel inverters.

Multilevel Inverter Topology with Symmetrical and Asymmetrical Sources for Distributed Energy Resources

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***Abstract*—In this research paper, a 1-φ multi-level inverter configuration with the decreased number of switching components is recommended for distributed energy resource applications. The planned inverter able to generate seven and nine output voltage levels with symmetrical and asymmetrical source configuration. Due to the decreased number of semiconductor switches the topology has low power loss compared to conventional 7-level inverter. The developed topology has reliable operation in case of switch failure. The developed topology is simulated with the assistance of Matlab/Simulink software.**

Keywords*— *single phase seven-level inverter, symmetrical and asymmetrical sources, power loss, switch failure.

I.INTRODUCTION

In these modern days, the demand for electricity increasing day by day rapidly. So as to meet the load necessities effectively, in addition to conventional energy sources, there is a need to depend upon Non- conventional energy sources also. To decrease the power loss in the transmission system, the use of distributed energy sources at the load center such as solar panels, electricity storage, small natural gas, fuelled generators etc. [1], [2] .

The conventional multilevel inverters are proposed for distributed energy resources (DER's) [3-5]. However, these require more no of components (diodes, capacitors, switches) and it leads to more power loss. In the literature, many single phase topologies are presented for distributed energy resources [6-12]. The topology presented in [6], has reduced no of switching components for generating multilevel output voltages. But, this topology not having fault tolerant operation in case of switch failures. This issue addressed in [7], though it has curbed in terms of power loss. In [9] single phase 5-level inverter is projected for grid independent photo-voltaic utilization. The inherent feature of this topology is, it can work with failures of converter like switch and source failures.

To find alternative solution for the above examined points this research paper a 1-φ multi-level inverter is planned for distributed energy resources. The planned configuration has less number of switching components and also has the fault-tolerant operation in the event of switch failure. The achievement of fault-tolerance with the slight modifications in switching order will formulate the inverter system more reliable. The planned configuration also has the improvement of low power loss, since only two switches will conduct always for generating any level of output voltage

The rest of this research paper is set up as pursues, explanation and function of configuration along with modified carrier pulse width modulation (PWM) are explained in the segment –II, similarity and fault-tolerance discussed in segment-III, results are illustrated in segment-IV and working of the system is encapsulated at the end.

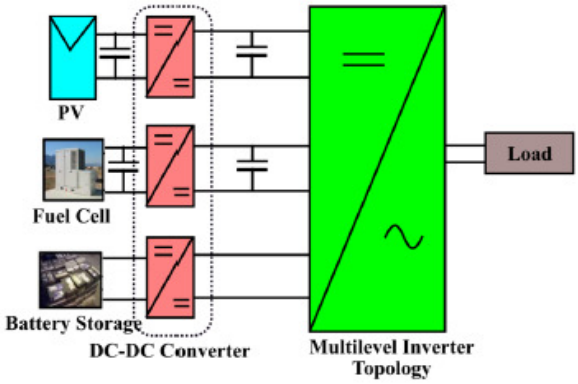

Fig.1.Schematic diagram of a multi-level inverter for distributed energy resources

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The developed inverter design consists of two H-bridges and three DC sources. One H-bridge with unidirectional switches (S1-S4, voltage rating of the each switch 3Vdc) connected to the three DC sources, whereas the other H-bridge is connected to middle DC source only, which is formed by

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Seven-Level Single Phase Inverter for Multistring PhotoVoltaic Applications

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***Abstract*—In this research paper seven-level single phase inverter (SLSPI) is designed for Multistring photo-voltaic (MPV) applications. Generally the purpose of inverters with multi-level is to generate quality AC output voltage by reducing the total harmonic distortion (THD) and also it will further decrease the filter dimension. With the help of conventional multi-level inverter, it is possible to increase the number of voltage levels but it leads to increment of inverter components like switching devices, diodes and capacitor and also creates issues on voltage balancing with capacitor. As a result switching loss and pulse width modulation (PWM) control complexity are more as consequence decay the inverter reliability. To cope with these troubles a seven-level 1-φ inverter is presented in this paper. The seven-level inverter (SLSPI) has decreased number of switches as compared to conventional 1-φ seven-level inverter. As a consequence the switching losses, PWM control complexity reduces which improves the reliability. The three separate dc sources required for the proposed topology are easily achievable using multiple PV strings. This makes the proposed topology best suitable for multi string PV applications. The topology also has the advantage of switch and source failure capability. The operation of proposed seven-level single phase inverter using phase disposition carrier PWM is simulated using MATLAB/Simulink.**

Keywords—Multistring photo voltaic applications, THD, 1-φ seven-level inverter.

I. INTRODUCTION

Demand for use of electricity going up day by day and reduction of fossil fuels (coal, oil, and natural fuel) the call for trade energy sources (photovoltaic and wind power systems) is growing day by day [1]. Due to continuous growth of semiconductor generation, incentives given by governments, reduction in value, availability of plentiful sunlight, and quick set up the demand for photovoltaic era structures is increasing. Off-grid Photovoltaic era systems are appropriate choice for electrification of rural regions and islands [2].

The off-grid photovoltaic generation system uses two stage conversions to convert dc to ac power. The primary-stage is to boost the array voltage by dc-dc converter with maximum power point tracking controller and battery. The second-stage is to convert dc power to ac power using two-level or multilevel inverter. To enhance the power quality of photovoltaic generation systems, recently the industry and academia are focused on use of multi-level inverters to overcome the drawbacks of two-level inverters [3]. The advantages of multilevel inverters are output voltage with a reduced amount of total harmonic distortion, less dv/dt stress, reduced output filter size and less electromagnetic interference. The conventional multi-level inverters are Neutral-point clamped (NPC), flying capacitor (FC) and H-bridge multi-level inverters [4]. The conventional multi-level inverters require more switching devices as the number of voltage levels increases there by the size of the inverter increases and also control difficulty increases [5].In writing many multi-level inverters are presented with decreased number of switching devices [6-9].A new multi-level inverter topology in [10] using reverse voltage component concept to overcome the drawbacks of conventional multi-level inverter proposed but, it uses more switches for lower levels. In [11] a novel PWM technique is proposed for 7-level inverter configuration with only one dc source. Though the configuration has less number of switches but, the capacitor voltage balancing is not discussed. New 7-level inverter topologies with decreased number of switches and bidirectional switches are offered for multi string photo-voltaic applications [12]-[13]. Switching loss is more because of bidirectional switches in [12]-[13].A new multi-level inverter configuration with asymmetrical sources is presented in [14] where the reverse current path for lagging loads is not possible because of diodes. The topology given in [15] mainly focused on the modified H-bridge topologies. The configuration uses decreased count of unidirectional switches. The open circuit fault analysis of five-level inverter is presented in [16].

In this research paper a 7-level 1-φ inverter topology with three dc sources is offered for PV applications. Here the three dc sources can be easily realized with three-separate Photo-Voltaic strings. The topology has fault-tolerance in the event of open–circuit fault of switching devices and/or failures of source. The topology is free from neutral-point voltage balancing troubles, capacitor voltage balancing trouble and decreased switching components count compared to conventional multi-level inverters.

The SLSPI configuration operation for generation of seven voltage levels with corresponding switching combinations is explained in segment II. The Fault analysis is mentioned in section III. The simulation effects with PV traits are mentioned in section IV and concluded in segment V.

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The circuit of 7-level single-phase inverter with more than one PV strings is proven in fig.1. The configuration have three equally rated separate PV strings with charge controller with MPPT technique and batteries fed to 7-level inverter topology as shown in fig.1.The PV string is designed by connecting number of modules in series and parallel as per the requirement. The photo-voltaic module is designed with the use of equation (1) which includes series-parallel connected

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.

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Lecture Notes in Electrical Engineering 626,
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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

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Seven Level Fault Tolerant Inverter for PhotoVoltaic Applications

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Abstract **- This paper reveals a seven-level inverter topology for photo-voltaic (PV) power generation system. The 7- level inverter created by cascading single phase full and half bridge inverter topology sustained with three separate PV strings. The output has 7-levels: +Vdc, +2/3Vdc, +Vdc/3, 0, -Vdc/3, -2Vdc/3, -Vdc. The 7-level inverter function is possible by using seven semi conductor switches. The designed inverter configuration has able to maintain consistent operation as inverter even though there is source and semiconductor switch breakdown. The developed inverter is differentiating with conventional multilevel inverters in terms of number of components, losses and reliability. The result of a 7-level inverter topology is confirmed by using MATLAB/SIMULINK software.**

Keywords— *7-level inverter, PV generation system, reliability.*

I.INTRODUCTION

As the world is facing with shortage of fossil fuels there is an enormous amount of demand for renewable sources especially wind and solar energy. PV sources are used in wide areas as they are pollution free and easy to maintain. Cost of production of sun energy based power generation is decreasing and meeting the consumer needs. The price of production is decreased to half of the cost of production of thermal energy in developed countries like U.S.A [1].

Multilevel inverters are used in many applications due to their high voltage withstanding and high power conversion capabilities. Interest for multilevel inverters, day by day it is continuing expanding because of its superior qualities like high voltage operation capability, low switching losses, high efficiency [2]. The multilevel inverter has been used in a variety of applications ranging from intermediate to high-power levels, such as electric drives, power strengthening devices, also conventional or sustainable power generation and distribution system [3].

In the past so many variety of converters are designed to operate as multilevel inverter, those are cascaded H-bridge, diode clamped and flying capacitor multi-level inverter these all treated as conventional multi level inverters. Decrement of Total harmonic distortion (THD) in output voltage of inverter is possible with increment of number of output voltage levels. If it is done with conventional multi-level inverters need more switching components count as the number of output voltage level increases. It leads to increment of size of the inverter and also difficulty level of control increases [4].Unlike conventional multilevel inverters, different topologies which can reduce the switching losses are welcomed in [5-7]. A 5-level fault-tolerant inverter configuration with reduced number of switches and with energy balancing between sources is presented in [8]. A new multilevel inverter topology in [9] using reverse voltage component concept to overcome the drawbacks of conventional multilevel inverter proposed but, it uses more switches for lower levels.

The above issues are addressed by using a seven-level fault tolerant inverter which is superior to conventional multi-level inverters. Out of all conventional inverter topologies the planned inverter configuration has an excellent inherent feature i.e., it can able to operate as inverter with decreased number of output voltage levels in case of failure in semi conductor device and source. The paper is organised as follows: the inverter configuration and operation is discussed in segment-II and the simulation results are discussed in segment-III and the advantages of proposed topology is concluded in segment-IV.

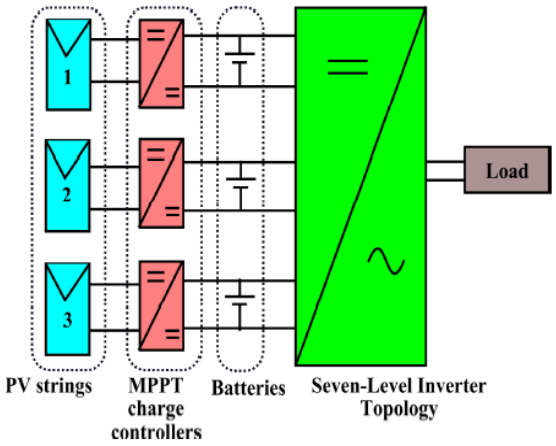

Fig. 1 Schematic diagram of seven-level inverter

II.SEVEN LEVEL FAULT TOLERANT INVERTER CONFIGURATION AND OPERATION

Multilevel inverter for multiple PV strings application concept is shown in schematic form in Figure 1.The multiple PV strings are possible for cascaded H-bridge configuration because it requires isolated sources which are not possible in case of diode clamped and flying capacitor multilevel inverters.

Multilevel Inverter Topology with Symmetrical and Asymmetrical Sources for Distributed Energy Resources

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***Abstract*—In this research paper, a 1-φ multi-level inverter configuration with the decreased number of switching components is recommended for distributed energy resource applications. The planned inverter able to generate seven and nine output voltage levels with symmetrical and asymmetrical source configuration. Due to the decreased number of semiconductor switches the topology has low power loss compared to conventional 7-level inverter. The developed topology has reliable operation in case of switch failure. The developed topology is simulated with the assistance of Matlab/Simulink software.**

Keywords*— *single phase seven-level inverter, symmetrical and asymmetrical sources, power loss, switch failure.

I.INTRODUCTION

In these modern days, the demand for electricity increasing day by day rapidly. So as to meet the load necessities effectively, in addition to conventional energy sources, there is a need to depend upon Non- conventional energy sources also. To decrease the power loss in the transmission system, the use of distributed energy sources at the load center such as solar panels, electricity storage, small natural gas, fuelled generators etc. [1], [2] .

The conventional multilevel inverters are proposed for distributed energy resources (DER's) [3-5]. However, these require more no of components (diodes, capacitors, switches) and it leads to more power loss. In the literature, many single phase topologies are presented for distributed energy resources [6-12]. The topology presented in [6], has reduced no of switching components for generating multilevel output voltages. But, this topology not having fault tolerant operation in case of switch failures. This issue addressed in [7], though it has curbed in terms of power loss. In [9] single phase 5-level inverter is projected for grid independent photo-voltaic utilization. The inherent feature of this topology is, it can work with failures of converter like switch and source failures.

To find alternative solution for the above examined points this research paper a 1-φ multi-level inverter is planned for distributed energy resources. The planned configuration has less number of switching components and also has the fault-tolerant operation in the event of switch failure. The achievement of fault-tolerance with the slight modifications in switching order will formulate the inverter system more reliable. The planned configuration also has the improvement of low power loss, since only two switches will conduct always for generating any level of output voltage

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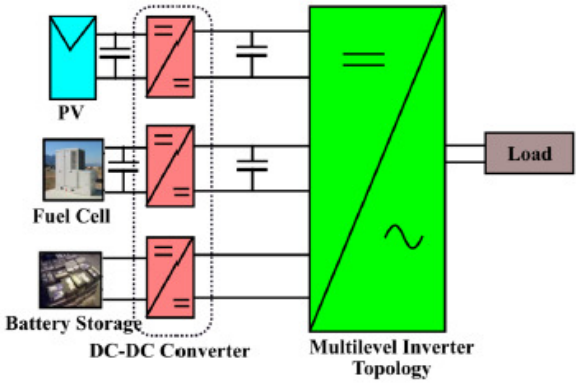

Fig.1.Schematic diagram of a multi-level inverter for distributed energy resources

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PERFORMANCE ANALYSIS OF GRID CONNECTED HYBRID SOLAR PHOTOVOLTAIC - WIND ENERGY SYSTEM

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Abstract:

This paper describes the analysis of a solar photovoltaic-wind power generation system using non-conventional sources of energy such as wind and solar . The proposed model consists of wind turbine and solar panels that wired together are connected to the boost converter in which MPP technique is incorporated and then connected to the three-level inverter (VSC) that supplies AC power from inverter to the grid. Due to exponential increase in demand for electricity causes an imbalance which leads to several problems in the existing grid. The problems caused by imbalance are unbalanced voltage and load shedding which affect the end consumers. Using renewable energy sources can overcome the problems that are raised by increase in demand. When configuration of wind power or solar power used individually may lead to power fluctuations in the desired system. When combined the system provides a sustainable and reliable source of energy that is constant. The non-conventional energy sources, solar PV and wind turbine are connected in parallel to the utility grid. The hybrid system provides continuous and uninterruptable power supply compared to the individual system. The generated power by the hybrid system i.e., PV/Wind is directly fed to the grid from the grid side inverter. The results show the affect of wind speed and irradiance on system's output power. The paper presents grid connected hybrid model using MATLAB/Simulink..

Students' Articles

List of Students' Articles submitted to Technical Magazine:

S.No.	Name of the Students	Semester & Section	Title of the Article
1	B. Srilatha	B.Tech EEE	Electric Vehicle With Application of Hydropower
2	N.Kushal Reddy	V Sem EEE	Analysis of Ground Based Detectors For Gravitational Waves
3	Ch. Sheetal	B.Tech EEE	Light-Fedility
4	Koushik Kamal	B.Tech EEE	Vehicle Monitoring and Security System
5	R. Vamshi Krishna	B.Tech EEE	Robotics
6	Supriya Valaboju	B.Tech EEE	Deep Learning For Computer Vision
7	R. Aadarsh Kumar	B.Tech EEE	Ethical Hacking: The Future Boom
8	G. Harini	B.Tech EEE	Wireless Integrated Network Sensors
9	P. Giridhar Naidu	IV Sem EEE	The Future Is Graphene
10	Roshan	B.Tech EEE	Artificial Intelligence Vs Machine Learning Vs Deep Learning Vs Data Science

ELECTRIC VEHICLE WITH APPLICATION OF HYDROPOWER

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KEYWORDS: *Electric vehicle, kinetic energy and mechanical energy*

ABSTRACT: In these days every country in the universe is competing to find an alternative Energy sources to build a technical world and a pollution free world. The electric vehicle is one of the alternate application of alternative energy source which is renewable and pollution free. This work presents the basic working principle of the hydropower electrical vehicle and about their components. The hydropower generations via mechanical and electrical energy were discussed. The pros of hydropower electric vehicles specifically in terms of energy saving and cost effective were discussed and compared with classical rechargeable electric vehicles. Further, the use/reuse of water sources for generation of hydropower in the electric vehicle and their energy conservations were also explored in this presentation.

PROPOSED METHOD FOR HYDROPOWER ELECTRIC VEHICLE:

- Generally electrical vehicles use a large traction battery pack to power the electric motor and must be plugged into a charging station to charge but in hydro power electric vehicles the electricity generation is done internally by the process of hydropower generation.
- The hydro power generation is done on the principle of conversion of mechanical energy to electrical energy. Here we convert the kinetic energy in flowing water into electrical energy.
- As we fill fuels like diesel and petrol in cars, here we fill water in tanks and this water is pushed by the piston (to increase the pressure of flowing water) to the turbine.
- A turbine is a rotary mechanical device that extracts energy from fluid flow to convert into electrical power when combined with a generator.
- Here we use dc generator to convert this mechanical energy to electrical energy. Such that the output is dc electrical energy.
- This generated electrical energy will be stored in batteries. This electrical energy is converted into mechanical energy by using motors. Thus the mechanical energy drives the wheels of the vehicle.

MAIN COMPONENTS USED IN HYDROPOWER ELECTRIC VEHICLE:

- Materials used in hydropower electric vehicle are piston, turbine, generator, battery and motor.
- Turbines converts the flow of water to mechanical energy which in turn rotates the generator.
- Generator converts mechanical to electrical energy.
- Battery stores the electrical energy to power the motor.
- An electric motor convert electricity into mechanical energy which drives the vehicle.

BACKGROUND:

Transportation systems are very important to the entire world today. Many inventions are being done on vehicles by using alternative sources instead of fossil fuels in order to decrease pollution. HYDRO POWER ELECTRIC VEHICLE is one type of electric vehicle which have internal hydro power electrical energy generation. The methods include in hydro power electric vehicle are conversion of mechanical to electrical energy.

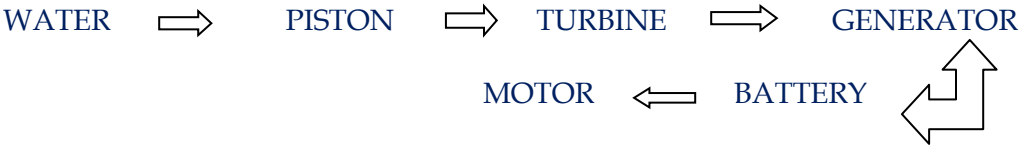
STATEMENT OF PROBLEM:

In hydro power electric vehicle we use water (renewable energy source) as an alternative to fossil fuels to reduce pollution. Compare to normal electric vehicle hydro vehicle does not cause any pollution in generation of electricity since water is pollution free.

RESEARCH:

In the process of generation of electricity for electric vehicle causes pollution as an alternative solution for this is hydro power electric vehicle in which generation of electricity is done internally by hydro power generation.

TECHNICAL REPORT:



CONCLUSION:

- The concept of hydropower electric vehicle make a lot of development in transportation system.
- If this concept is introduced it will creates a new era in the field of an automobile industries.
- It restores the balance ecosystem to some extent.
- Environmental friendly system-Green technology.

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ANALYSIS OF GROUND BASED DETECTORS FOR GRAVITATIONAL WAVES

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Keywords: Gravitational waves, General Relativity, Black Hole merger, pulsar, Hulse- Taylor Binary System, weber bars, LIGO, Interferometry, Advanced LIGO.

Abstract: Gravitational waves became a challenging area when a race begun among the scientists from different parts of the world to construct an instrument which could detect these invisible gravitational waves. A black hole merger was first detected by LIGO though there were many unsuccessful attempts before. This material includes the first unsuccessful and successful instrument built on ground to detect gravitational waves i.e. the analysis of the instruments like Weber bars and LIGO. These ground based detectors have their own advantages and disadvantages which have been included and the reasons which led to the failure of Weber Bars. A description on the construction of LIGO and its trajectory has been provided. Though LIGO was known to detect gravitational waves, it had some limitations which disabled it to gather the precise information of these gravitational waves. I have also included the main advancement in LIGO which led to Advanced LIGO. With the detection of these gravitational waves, a whole new era for physicists has begun which is still an area of interest for many young enthusiasts coming up with new ideas to detect gravitational waves.

Introduction

Gravitational waves are very elegant manifestations of gravity as predicted by the path breaking work of Einstein, the General Theory of Relativity. With his theory, Einstein stated that the universe can, as a matter of fact, be considered as a four dimensional spacetime which curves in the presence of mass. And any changes in the mass (qualitative and quantitative) produce ripple like effect in the space time and the changes are carried through these ripples originating at the mass and these ripples are what we call gravitational waves.

To detect these meek waves, the race to construct the first instrument to detect gravitational waves began in 1960. From then, many instruments have come into the scenario. Many of them failed but led to many advanced instruments avoiding the mistakes done earlier in constructing them. One such scientist was Joseph Weber bars who devised Weber bars which couldn't acquire that efficiency of detecting such low weak waves.

Though Weber claimed to have detected gravitational waves, the instrument was later declared to be inefficient and not that sensitive to capture a gravitational wave passing by. In 1960, Hulse-Taylor could demonstrate the be gravitational waves through binary system consisting of a pulsar around a neutron star. Later, LIGO(), a ground- based detector was then constructed in United States to detect the gravitational waves. Although LIGO could detect the waves, it's sensitivity was enhanced to improve its efficiency and was later known as Advanced LIGO.

After LIGO, European Space Agency has started a mission where a gravitational wave detector is built in space, far away from disturbances on earth known as LISA (Laser Interferometer Space Agency) which is set to launch in the year, 2034. We arein such an era where foundation has been laid and all we need to do is to research to know the latest trends and technologies to built such gravitational wave detectors to know the

science behind this universe.

Weber bars

Weber bars constructed by physicist Joseph Weber is a device to detect gravitational waves. It consisted of massive aluminum cylinders (length- 2m, diameter-1m) of 1660Hzresonant frequency and set into vibration by gravitational waves and antennae for detecting gravitational waves.

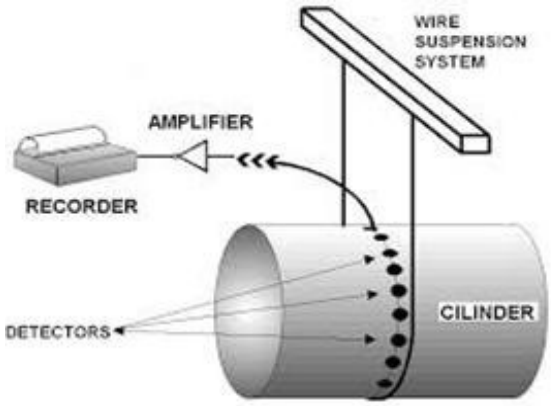

Figure 16: Weber Bars Arrangement (Source-mdpi.com)

Piezoelectric sensors used can detect a change in the cylinders' lengths by about 10^{-16} meters as the waves were too weak. Initially, the instrument reacted to all types of vibrations like seismic ,cosmic etc making it difficult to detect a gravitational wave. So, two large detectors of such kind were constructed at the University of Maryland and the other at Argonne National Laboratory near Chicago which is 600 miles away.

The idea was that a gravitational wave can be detected when both cylinders undergo change at the same time. After few experiments, it was concluded that there were many disturbances from external sources due to some other events like earthquake waves, cosmic waves and electromagnetic disturbances. These were eliminated by using special electromagnetic receiver and cosmic ray counters. After the whole setup, a coincident signal from both the detectors was found and it was strongly assumed that it was due to the gravitational waves as the possibilities of all other events disturbing the instrument were ruled out. The location of those gravitational waves was also found by changing the position of the horizontal cylinders. The long axis of the cylinder is more sensitive to incoming wave fronts than perpendicular to the axis. Two peaks in intensity were correlated with sidereal day and it was found that the source was relative to stars but no exact source was found.[1]

Figure 17: The antenna NAUTILUS at Frascati, showing the bar and its cryogenic shields. (Source https://malagabay.wordpress.com/2015/07/23/the-syncopated-sidereal-shake)

Limitations

Instrument couldn't detect the gravitational waves accurately due to lack of technology which made it difficult for the gravitational waves to be detected. The waves were so weak that they couldn't be detected in the normal experiments in the laboratory and needed a detector outside the laboratory.

The construction of the instrument was very poor that the events such as earthquake vibrations, electromagnetic disturbances, cosmic ways etc could affect the instrument's sensitivity even though the detector was isolated and shielded in the metal vacuum chambers. Even the electromagnetic radiation would enter the electronic amplifiers.

The location of the source couldn't be found

with this instrument as it only points out to the direction of the incoming wave fronts of gravitational waves in the sky but cannot precise the location of the sources.

The first binary black hole merger On 14 September 2015, at 09:50 UTC, two massive black holes (36 and 29 times that of the Sun) circled each other in a spiral fashion moving faster and faster towards each other as the distance between them decreased and merged into a single black hole (size-62 solar masses) 1.3 billion light years away from the earth. This was the first observation of stellar mass binary black holes merging detected by LIGO which spun into each other and merged to form a 62 solar mass black hole (approximate). The amount of energy released is approximately equal to three solar masses which were converted to gravitational radiation in the final fraction of a second (200 solar masses persecond).[2]

Figure13: Binary black holes which were detected by LIGO(Source-phys.org)

LIGO has two observatories namely the LIGO Livingston Observatory (30°33′46.42″N 90°46′27.27″W) in Livingston, Louisiana, and the LIGO Hanford Observatory (46°27′18.52″N119°24′27.56″W), located near Richland,Washington. The distance between these two sites when measured straight is 1,883 miles and over the surface is 1,865 miles. This distance corresponds to a difference in gravitational wave arrival times of up to ten milliseconds as these waves travel at the speed of light. This difference in the time helps us locate the source of wave with the help of trilateration especially when a third similar instrument like Virgo, located at an even greater distance in Europe, is added.[3]

Construction and trajectory of LIGO Interferometry is the phenomenon of superposition of light waves causing interference. When these two light waves interfere, they form patterns which will be recorded to study the waves.

Construction

The primary interferometer of LIGO has L-shaped arms of vacuum chamber which are in 4 km length in similar to a power-recycled Michelson interferometer with Gires–Tournoisetalon arms. The pressure inside this ultra-high vacuum chambers is one- trillionth of an atmosphere. The end mirror of each arm weighs 4kg in this 4- stage of compound pendulum which provides both active and passive isolation from seismic noise. These arms are designed in such a way that it can measure a motion which is 10,000 times smaller than an atomic nucleus. A pre-stabilized 1064 nm Nd:YAG laser is used to emit a light of 20W.[4] As the power of light produced by this laser isn't sufficient for LIGO to operate at its full sensitivity, a power recycling mirror is used to increase the power of light field by adding photons to the light which gets eflected from end mirrors.

Fabry Perot cavities are introduced in the arms to control and measure the wavelength of light to measure exact distances. It increases the effective path length of laser light and the light field in the cavity is of power-100 kW.

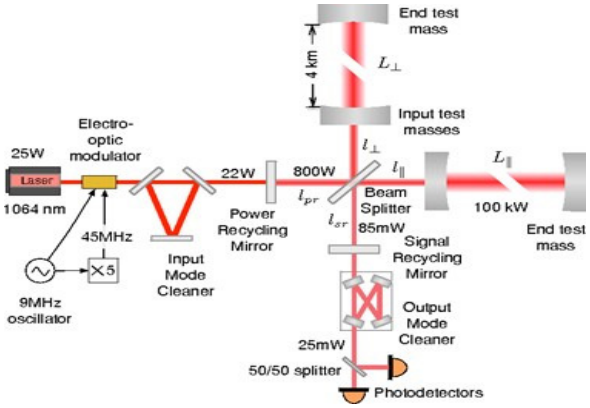

Figure 14: Path travelled by the laser in the interferometer(Source-spiff.rit.edu)

The laser travels for 280 times between fabry-perot cavities and end mirror and a total of 1120km before actually merging out of phase with its other half to produce a pattern at the photodetector.

When the gravitational waves strike the arms, it shortens and lengthens it which changes the distance travelled by the laser in the arms and makes the light to go out of phase. But their light waves will subtract when there are no waves and no light will arrive at hephotodiode.

The beams then come in phase to create resonance and allowing some light to reach the photodiode indicating a signal. Light that does not contain a signal is returned to the interferometer using a power recycling mirror, thus increasing the power of the light in the arms. The light from each arm combines at the beam splitter and sent to the output mode cleaner to filter out stray light and refine the frequency of the detected light. The laser beam reaches its final destination at the output photodetector where detected gravitational waves are recorded. The astrophysics of these distant sources are encoded as the fluctuations in light at thesephotodetectors.[5]

Advanced LIGO

To record such small variations, the instrument (LIGO) must be very sensitive that it can detect a change in distance of 1/10,000 the width of a proton. Noises which affect the sensitivity are seismic noise(changes in the surroundings), thermal noise in the mirrors, suspensions, quantum noise caused by photon detectors, gas noise due to interactions of the residual gas particles in the vacuum enclosure with the mirrors and the laser, charging noise due to interaction of static electric charges on the glass mirrors with the metal of the vacuum enclosures and the mirror support and noises due to the control of the position, alignment of the mirrors and light generated by tiny imperfections scatters.

All the other vibrations were reduced in different ways to increase the sensitivity of the instrument. The motion of test masses were reduced by suspending them within a 360kg quadruple- pendulum system. Each suspension system contains the Main Chain and the Reaction Chain which contains four masses each. The test-mass (which measures 34 cm x 20 cm and weighs 40 kg) is located in the main chain which is suspended by glass threads 0.4 mm (400 microns) thick to isolate the mirrors from thermal noise by neglecting the temperature variations.

The active damping system of LIGO reduces the vibrations due to ground movements, hold the components of the interferometer in their position with the help of Internal seismic isolation platforms and vibration sensors. The active and passive damping systems help isolate noises and provide a great sensitivity to the instrument.[6]

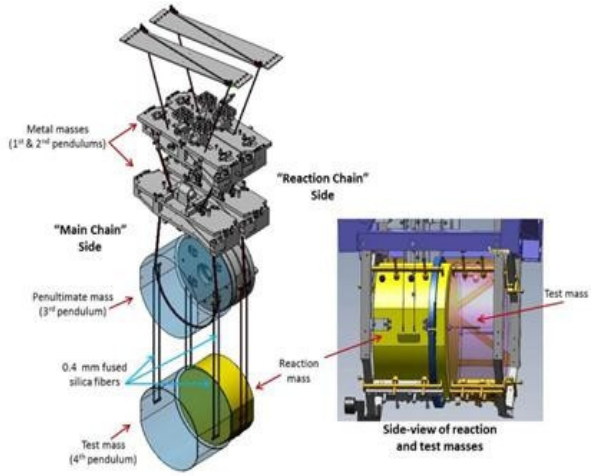

Figure 15: Optics Suspension
(Passive Vibration Isolation)
(Source-
https://www.ligo.caltech.edu/page/vibration-isolation)

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[4]https://www.ligo.caltech.edu/page/ligos-if[5]https://www.nature.com/articles/nphoton.2013.177
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LIGHT- FEDILITY (LI-FI)

- Ch. SHEETAL

The term Li-Fi was invented by German Professor at the University of Edinburgh, Harald Hass and it refers to light based communications technology that delivers a high-speed, bi-directional networked mobile communication which is similar to

Wi-Fi.

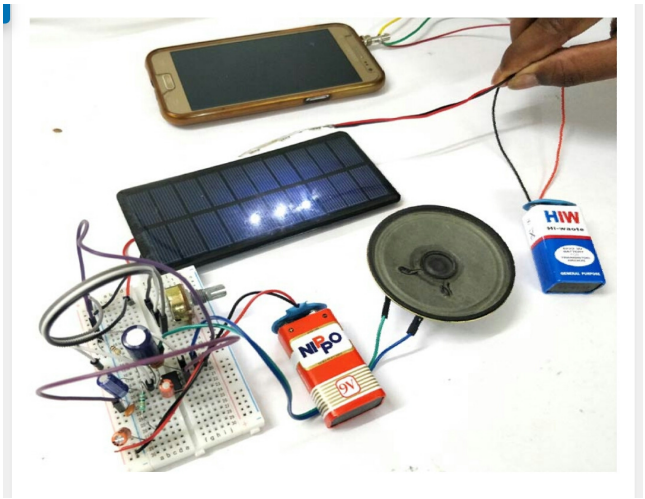
Li-Fi is the transmission of data using visible light. This Li-Fi system can be used to produce data rates higher than 1 Giga bits per second which is much faster than our average broadband connection or Wi-Fi. The data rate will be higher in Li-Fi and higher speed can be achieved.

In this, the audio signal is modulated and is transmitted to the light source. This signal is captured by the photo detector and demodulated to give the output.

Visible light is a new technique of data transmission method. Li-Fi data is transmitted by modulating the intensity of light, which is then received bye photo-sensitive detector, and the light signal is demodulated into electronic form. This modulation is performed in such a way that it is not perceptible to human eye. VLC consists of a light source as a transmitter and detector as a receiver. This electric signal is amplified by amplifier circuits and fed into power LED. The light signal from LED varies according to the intensity of voice signal.

Louder the voice, the glow of LED will be more. At the receiver side, Avalanche photo detector will receive the light signal and correspondingly generate an electrical signal proportion to it. This electric signal is processed by a demodulator circuit, which is then fed to a speaker and it produces the audio signal which was at input of transmitter side.

Voice is recorded through a microphone and play back module. Analog audio signals are converted into digital signals using ADC. Modulation happens in the Li-Fi drive and a high beam light is transmitted. In this receiving side, there is a programme which gives a particular range of light which is transmitted. The output is given to audio amplier and then received by the speaker through the relay.



Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. The increasing number of people and their devices access wireless Internet, the air waves are becoming gradually more crammed, making it more difficult to get a consistent, high-speed signal. The concept of Li-Fi is currently attracting a great deal of interest and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless internet.

Li-Fi technology is faster, cheaper and secure communication as compared with Wi-Fi. This technology will implement for industrial equipment controls, internet communication, patient monitoring systems etc. Li-Fi technology can be put into practical use, every LED can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed towards the greener, safer and brighter future. Since Wi-Fi uses the radio waves which is harmful but here we are using the visible light and its speed is higher than Wi-Fi.

VEHICLE MONITORING AND SECURITY SYSTEM

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Abstract: The VMSS (Vehicle Monitoring and Security System) is a GPS based vehicle tracking system that is used for security applications. The project uses two main underlying concepts. These are GPS (Global Positioning System) and GSM (Global System for Mobile Communication). The main application of this system in this context is tracking the vehicle to which the GPS is connected, giving the information about its position whenever required and for the security of each person travelling by the vehicle. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The GPS antenna present in the GPS module receives the information from the GPS satellite in NMEA (National Marine Electronics Association) format and thus it reveals the position information. This information got from the GPS antenna has to be sent to the Base station wherein it is decoded. For this we use GSM module which has an antenna too. Thus we have at the Base station; the complete data about the vehicle

Along with tracking the vehicle, the system is used for security applications as well. Each passenger will have an ID of their own and will be using a remote containing key for Entry, Exit and Panic. The Panic button is used by the driver or the passenger so as to alert the concerned of emergency conditions. On pressing this button, an alarm will be activated which will help the passenger/employee in emergencies and keep them secure throughout the journey. The vehicle can also be immobilized remotely.

Introduction to Vehicle Monitoring and Security System:

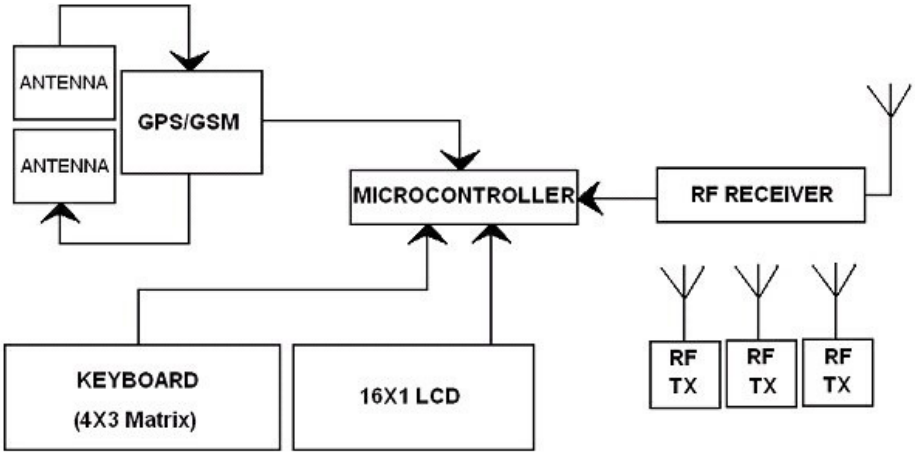
Of all the applications of GPS, Vehicle tracking and navigational systems have brought this technology to the day-to-day life of common man. Today GPS fitted cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. Known by many names such as Automatic Vehicle Locating System (AVLS), Vehicle Tracking and Information System (VTIS), Mobile Asset Management System (MAMS), these systems offer an effective tool for improving the operational efficiency
and utilization of the vehicles.

GPS is used in the vehicles for both tracking and navigation. Tracking systems enable a base station to keep track of the vehicles without the intervention of the driver whereas navigation system helps the driver to reach the destination. Whether navigation system or tracking system, the architecture is more or less similar. The navigation system will have convenient, usually a graphic display for the driver which is not needed for the tracking system. Vehicle tracking systems combine a number of well-developed technologies.

To design the VMSS system, we combined the GPSs ability to pin-point location along with the ability of the Global System for Mobile Communications (GSM) to communicate with a control center in a wireless fashion. The system includes GPS-GSM modules and a base station called the control center.

GPS-GSM VMSS system. It receives GPS signals from satellites, computes the location information, and then sends it to the control center. With the vehicle location information, the control center displays all of the vehicle positions on an electronic map in order to easily monitor and control their routes. Besides tracking control, the control center can also maintain wireless communication with the GPS units to provide other services such as alarms, status control, and system updates.

The design takes into consideration important factors regarding both position and data communication. Thus, the project integrates location determination (GPS) and cellular (GSM) two distinct and powerful technologies in a single system.



Vehicle Monitoring and Security System design

VMSS is based on a PIC microcontroller-based system equipped with a GPS receiver and a GSM Module operating in the 900 MHz band. We housed the parts in one small plastic unit, which was then mounted on the vehicle and connected to GPS and GSM antennas. The position, identity, heading, and speed are transmitted either automatically at user-defined time intervals or when a certain event occurs with an assigned message (e.g.; accident, alert, or leaving/entering an admissible geographical area).

The GPS Module outputs the vehicle location information such as longitude, latitude, direction, and Greenwich Time every five minutes. The GSM wireless communications function is based on a GSM network established in a valid region and with a valid service provider. Via the SMS provided by the GSM network, the location information and the status of the GPS-GSM VMSS are sent to the control center. Meanwhile, the VMSS receives the control information from the control center via the same SMS. Next, the GPS-GSM VMSS sends the information stored in the microcontroller via an RS-232 interface.

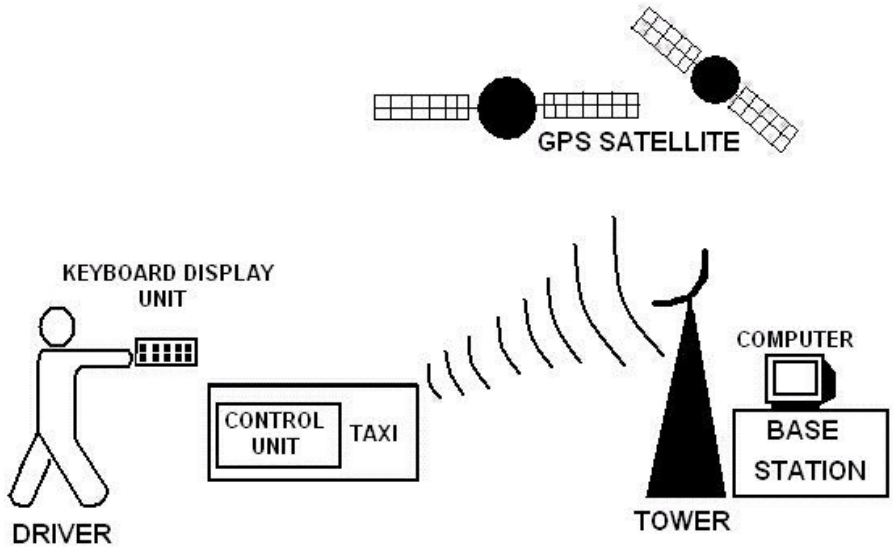
There are two ways to use the VMSS alarm function, which can be signified by either a buzzer or presented on LCD. The first way is to receive the command from the control center; second way is to manually send the alarm information to the control center with the push of a button.The base station consists of landline modem(s) and GIS workstation. The information about the vehicle is received at a base station and is then displayed on a PC based map. Vehicle information can be viewed on electronic maps via the Internet or specialized software.

Geographic Information Systems (GIS) provides a current, spatial, visual representation of transit operations. It is a special type of computerized database management system in which geographic databases are related to one via a common set of location coordinates.

Stages of Vehicle Monitoring and Security System:

STAGE-1:

Driver starts his trip from the transport office. VMSS transmits the Driver I.D and the Vehicle I.D along with the position of the vehicle to the base station.



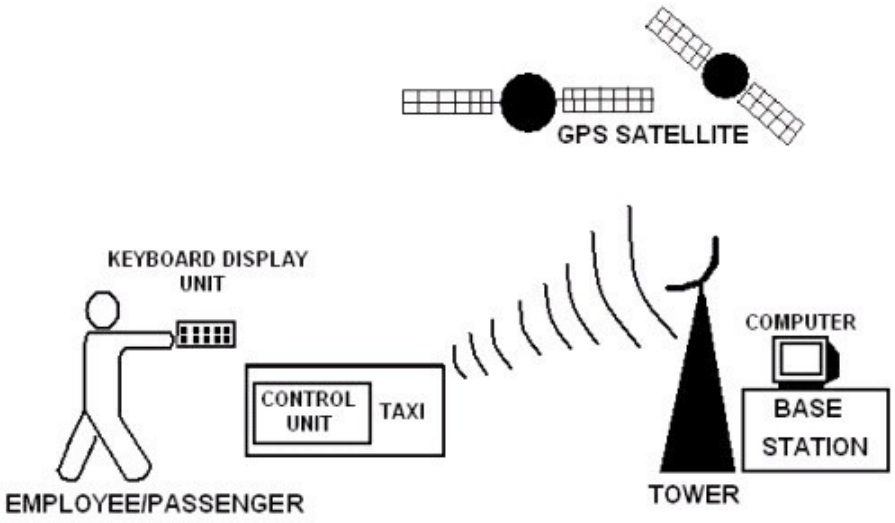
S1 of Vehicle Monitoring and Security System

STAGE-2:

Taxi picks up the employee/passenger from their residence. VMSS transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station. Therefore base station will be able to keep a track of the vehicle and thus the employee/passenger.

STAGE-3:

Taxi drops the employee/passenger to the workplace. VMSS transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station.



S3 of Vehicle Monitoring and Security System

STAGE-4:

Taxi picks the employee/passenger from the workplace. VMSS transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station. Therefore this enables the base station to estimate the time if required and also keep a track of the vehicle, passenger and the driver.

STAGE-5:

Taxi drops the employee/passenger to their residence VMSS transmits the Passenger I.D and the vehicle I.D along with the position of the vehicle to the base station and makes sure that the job is 100% complete.

Conclusion:

In this modern, fast moving and insecure world, it has become a basic necessity to be aware of one's safety. Maximum risks occur in situations wherein an employee travels for money transactions. Also the Company to which he belongs should be aware if there is some problem. What if the person traveling can be tracked and also secured in the case of an emergency?! Fantastic, isnt it? Of course it is and here a system that functions as a tracking and a security system. It's the VMSS. This system can deal with both pace and security.

Reference:

https://krazytech.com/

ROBOTICS

Ramula Vamshi Krishna EEE (II YEAR)

ABSTRACT:

In the Industrial Age that humanity has entered long time ago with steam series has caused to primitive mechanization in production. With the development of internet and mobile technologies, electronics, nanotechnology, advances in medicine , health and digital applications and so on speed up mechatronics studies now –a-days. Last world Economic forum holds an important place on the agenda of robotics and artificial in intelligence and the economics like Roubini, stiglitz also entered in the discussion of robotics and artificial in intelligence impacts on economics and business.

Introduction -

Robotics is a branch of engineering and science that includes electronics engineering, mechanical engineering and computer science so on. This branch deals with the design, construction, use to controls robots, sensory feedback and information processing. These are some technologies which will replace human's activities in coming years. These robots are designed to be used for any these are using in sensitive environments like bomb detection, deactivation of various bombs etc. The 21st century is a century for a robotics. Robotics have long borne the potential to bridge the gap between the cybernetic world (the internet of things) and the physical world. As the most promising candidate to theme the next major industrial revolution, robotics is set to play an ever aspect of life in Hong Kong, including medicine and health care, building service ,manufacturing, food production, logistics and transportation.

MATERIALS OF METHODS:

Design basic; building materials: There are three groups of materials. Each of three groups of materials. Each these three groups have their own characteristics, possibilities and difficulties.

NOTE; There is a fourth group of materials is called ceramics. However this only marginally useful for robotics Ex: Wood, metal, synthetic materials, composite materials, other materials Ex: foam core, card board

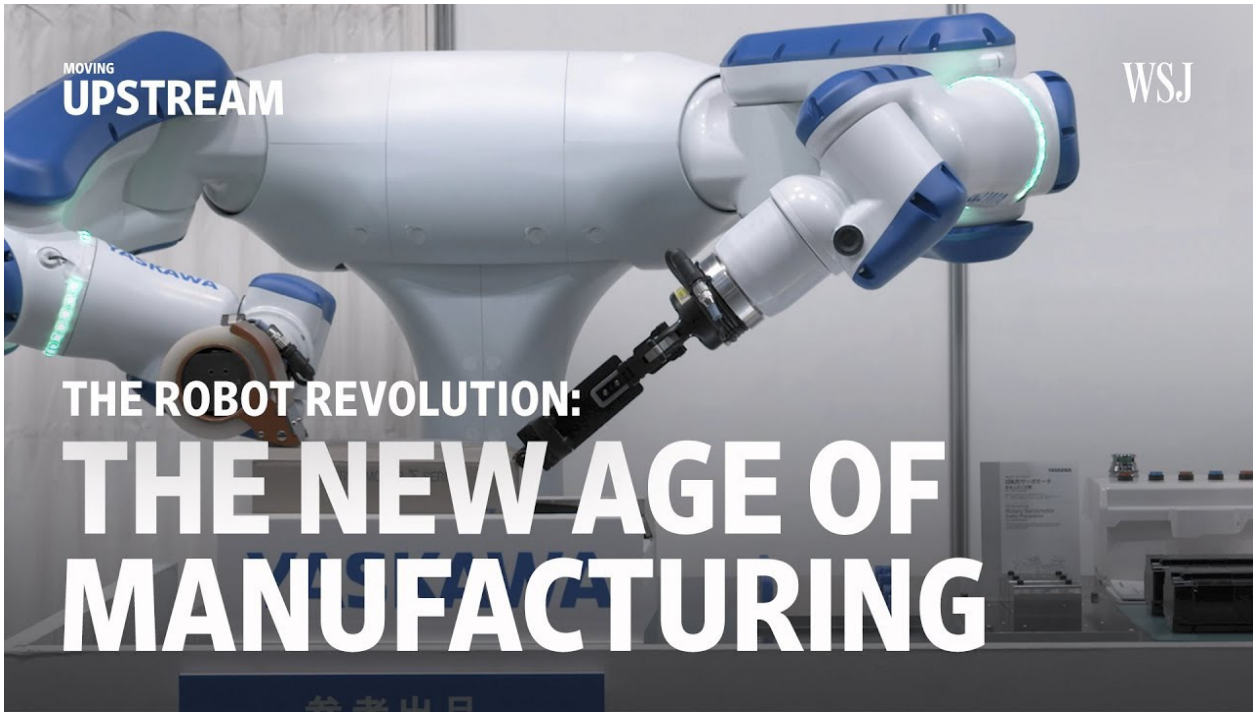
RESUITS:

The impact of robotics has positive and negative impacts on the employments and motivation of employees in the retail sector. Robotics, smart materials, and their future impact for humans robots produces more accurate and high quality works they can work in hazardous. Increased productivity can lead to increased demands, creating new job opportunities smart robotics. It is used modern culture in especially robots usefully. Now-a-days robotics has great future including mechanical also.

TITLE: THE REVOLUTION OF ROBOTICS:

In the future we will together with all kinds of drones, robots autonomous cars and other electronics entities. But how long until this science friction is truly part of our daily lives the winner this year was DRC-HUBO, designed by team from Korea advanced Institute of Science and Technology (KAITST).

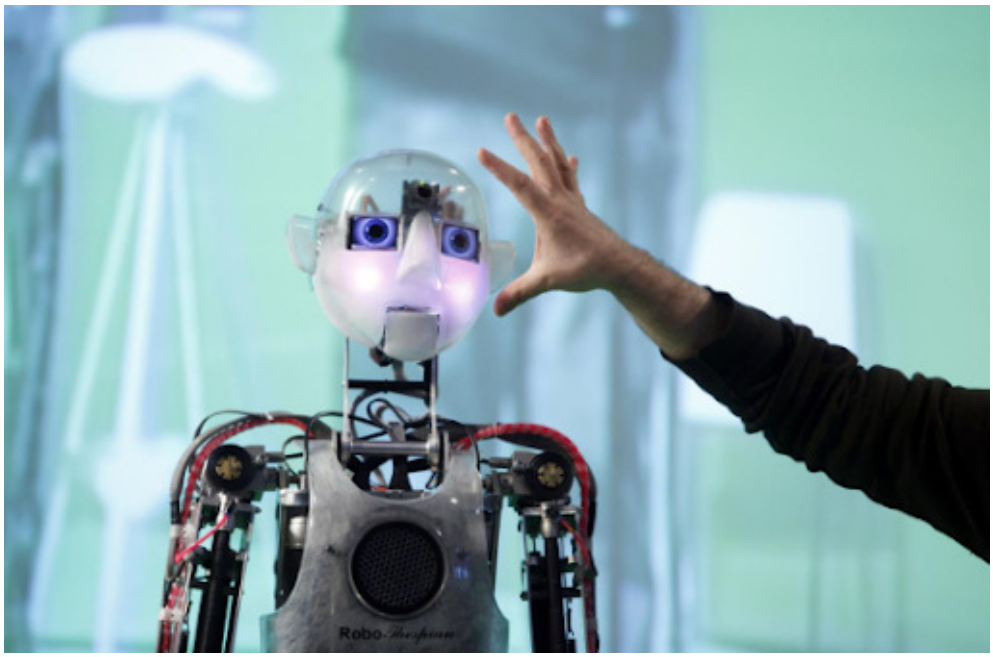
HUMANOIDS: Despite the huge advance in autonomy and capabilities in recent years, much remains before we will be seeing a real terminator or C3PO WALKING our streets. Robots designed to move like us or use our tools are much more complicated than those created for specific tasks, such as robots on an assembly line. To stimulate the development of these humanoids. The agency in charge of technological development for US military use (DARPA) has created an annual composition endowed with 3.5 million in prizes.



KEY WORDS:

1. Aerial systems; Applications
2. Aerial systems; mechanical and control
3. Aerial systems; perception and autonomy
4. Demining systems
5. Marine Robotics
6. Mining Robotics

7. Space Robotics and automation
8. Assistive Robotics
9. Assistive Robotics - home robots
10. Cognitive Robotics in rehabilitation
11. Design and development in rehabilitation
12. Control strategies in rehabilitation robotics



DISCUSSIONS & CONCLUSIONS

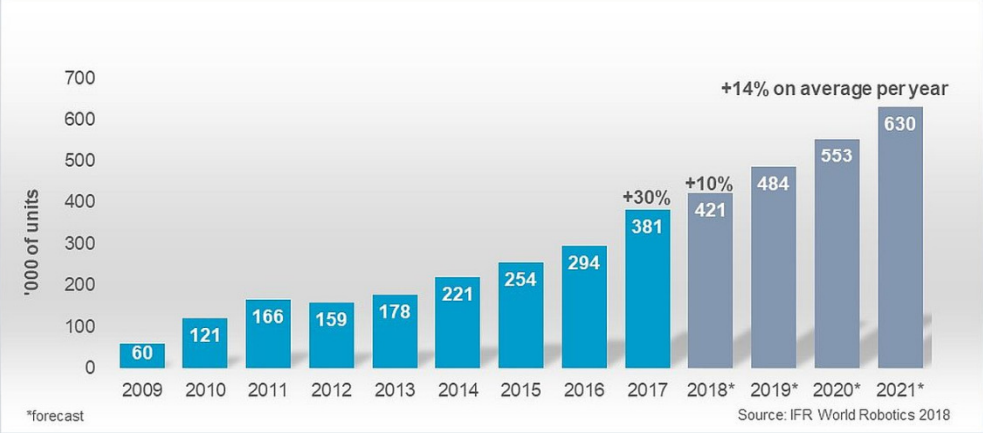
The most interesting and challenging aspect of robotics is designing humanoid robots. Building a machine in the image of a man is a fundamental change in which we see the relationship between human and machines. Having a human – looking about to do tasks for us, will have a big impact and change our lives and our society, like the computers had. Computer had economy and our everyday life and will continue to do so through the process of technology. Examples of human-looking robots are the C-3PO and terminator However these robots.

CONCLUSION

- Some people are concerned that robots will reduce the number of jobs and kick people out of their jobs.
- This is almost never the case. The net affect of advanced technology such as robots is that humans become more productive.
- Robotics uses AI techniques to build intelligent robots for the purpose of efficiency.
- The research of Robotics and AI would lead to a manufacturing of Robots that will be used in every industry.
- In future, it is better to use robotics in a appropriate and useful way,with this we can get peaceful & effective world .

Estimated annual worldwide supply of industrial robots 2009-2017 and 2018*-2021*

IFR International Federation of Robotics



DEEP LEARNING FOR COMPUTER VISION

-SUPRIYAVALABOJU

Abstract:

Over the last years deep learning methods have been shown to outperform previous state-of-the-art machine learning techniques in several fields, with computer vision being one of the most prominent cases. This review paper provides a brief overview of some of the most significant deep learning schemes used in computer vision problems, that is, Convolutional Neural Networks, Deep Boltzmann Machines and Deep Belief Networks, and Stacked Denoising Autoencoders. A brief account of their history, structure, advantages, and limitations is given, followed by a description of their applications in various computer vision tasks, such as object detection, face recognition, action and activity recognition, and human pose estimation. Finally, a brief overview is given of future directions in designing deep learning schemes for computer vision problems and the challenges involved.

1. Introduction:

Deep learning allows computational models of multiple processing layers to learn and represent data with multiple levels of abstraction mimicking how the brain perceives and understands multimodal information, thus implicitly capturing intricate structures of large-scale data. Deep learning is a rich family of methods, encompassing neural networks, hierarchical probabilistic models, and a variety of unsupervised and supervised feature learning algorithms. The recent surge of interest in deep learning methods is due to the fact that they have been shown to outperform previous state-of-the-art techniques in several tasks, as well as the abundance of complex data from different sources (e.g., visual, audio, medical, social, and sensor).

The ambition to create a system that simulates the human brain fueled the initial development of neural networks. In 1943, Mcculloch and Pitts tried to understand how the brain could produce highly complex patterns by using interconnected basic cells, called neurons. The McCulloch and Pitts model of a neuron, called a MCP model, has made an important contribution to the development of artificial neural networks. A series of major contributions in the field is presented in Table 1, including LeNetand Long Short-Term Memory , leading up to todays "era of deep learning." One of the most substantial breakthroughs in deep learning came in 2006, when Hinton et al. Introduced the Deep Belief Network, with multiple layers of Restricted Boltzmann Machines, greedily training one layer at a time in an unsupervised way. Guiding the training of intermediate levels of representation using unsupervised learning, performed locally at each level, was the main principle behind a series of developments that brought about the last decades surge in deep architectures and deep learning algorithms.

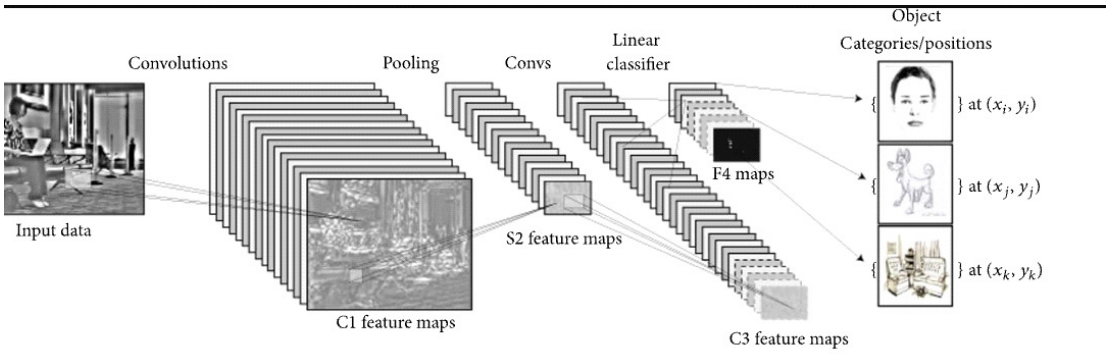
2. Deep Learning Methods and Developments

2.1. Convolutional Neural Networks

Convolutional Neural Networks (CNNs) were inspired by the visual systems structure, and in particular by the models of it proposed in . The first computational models based on these local connectivity between neurons and on hierarchically organized transformations of the

image are found in Neocognitron , which describes that when neurons with the same parameters are applied on patches of the previous layer at different locations, a form of translational invariance is acquired. Yann LeCun and his collaborators later designed Convolutional Neural Networks employing the error gradient and attaining very good results in a variety of pattern recognition tasks.

A CNN comprises three main types of neural layers, namely, (i) convolutional layers, (ii) pooling layers, and (iii) fully connected layers. Each type of layer plays a different role. A CNN architecture for an object detection in image task. Every layer of a CNN transforms the input volume to an output volume of neuron activation, eventually leading to the final fully connected layers, resulting in a mapping of the input data to a 1D feature vector. CNNs have been extremely successful in computer vision applications, such as face recognition, object detection, powering vision in robotics, and self-driving cars.



(i) Convolutional Layers: In the convolutional layers, a CNN utilizes various kernels to convolve the whole image as well as the intermediate feature maps, generating various feature maps. Because of the advantages of the convolution operation, several works have proposed it as a substitute for fully connected layers with a view to attaining faster learning times.

(ii) Pooling Layers: Pooling layers are in charge of reducing the spatial dimensions (width height) of the input volume for the next convolutional layer. The pooling layer does not affect the depth dimension of the volume. The operation performed by this layer is also called sub sampling or down sampling, as the reduction of size leads to a simultaneous loss of information. However, such a loss is beneficial for the network because the decrease in size leads to less computational overhead for the upcoming layers of the network, and also it works against overfitting. Average pooling and max pooling are the most commonly used strategies. In a detailed theoretical analysis of max pooling and average pooling performances is given, whereas in it was shown that max pooling can lead to faster convergence, select superior invariant features, and improve generalization. Also there are a number of other variations of the pooling layer in the literature, each inspired by different motivations and serving distinct needs, for example, stochastic pooling, spatial pyramid pooling , and def-pooling.

(iii) Fully Connected Layers: Following several convolutional and pooling layers, the high-level reasoning in the neural network is performed via fully connected layers. Neurons in a fully connected layer have full connections to all activation in the previous layer, as their name implies. Their activation can hence be computed with a matrix multiplication followed by a bias offset. Fully connected layers eventually convert the 2D feature maps into a 1D feature vector.

The derived vector either could be fed forward into a certain number of categories for classification or could be considered as a feature vector for further processing.

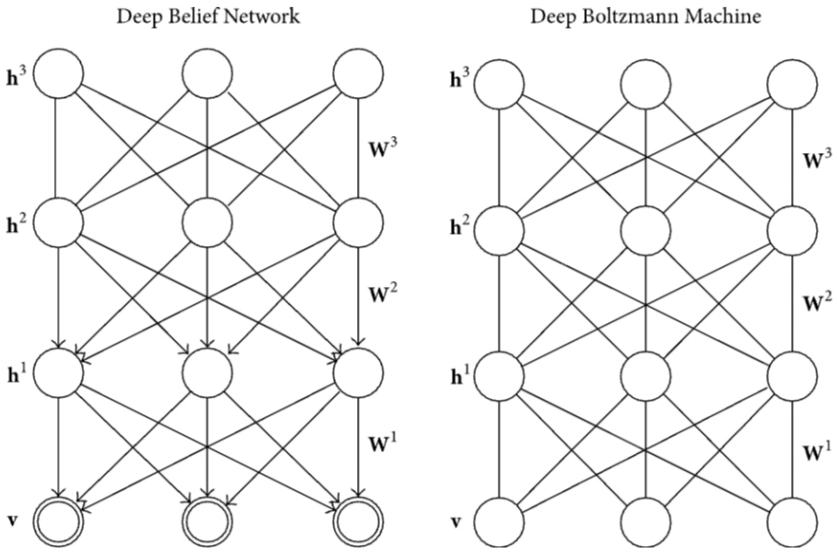
The architecture of CNNs employs three concrete ideas: (a) local receptive fields, (b) tied weights, and (c) spatial subsampling. Based on local receptive field, each unit in a convolutional layer receives inputs from a set of neighboring units belonging to the previous layer. This way neurons are capable of extracting elementary visual features such as edges or corners. These features are then combined by the subsequent convolutional layers in order to detect higher order features. Furthermore, the idea that elementary feature detectors, which are useful on a part of an image, are likely to be useful across the entire image is implemented by the concept of tied weights. The concept of tied weights constraints a set of units to have identical weights. Concretely, the units of a convolutional layer are organized in planes. All units of a plane share the same set of weights. Thus, each plane is responsible for constructing a specific feature. The outputs of planes are called feature maps. Each convolutional layer consists of several planes, so that multiple feature maps can be constructed at each location.

One of the difficulties that may arise with training of CNNs has to do with the large number of parameters that have to be learned, which may lead to the problem of overfitting. To this end, techniques such as stochastic pooling, dropout, and data augmentation have been proposed. Furthermore, CNNs are often subjected to pretraining, that is, to a process that initializes the network with pretrained parameters instead of randomly set ones. Pretraining can accelerate the learning process and also enhance the generalization capability of the network.

Overall, CNNs were shown to significantly outperform traditional machine learning approaches in a wide range of computer vision and pattern recognition tasks. Their exceptional performance combined with the relative easiness in training are the main reasons that explain the great surge in their popularity over the last few years.

2.2. Deep Belief Networks and Deep Boltzmann Machines

Deep Belief Networks and Deep Boltzmann Machines are deep learning models that belong in the "Boltzmann family," in the sense that they utilize the Restricted Boltzmann Machine (RBM) as learning module. The Restricted Boltzmann Machine (RBM) is a generative stochastic neural network. DBNs have undirected connections at the top two layers which form an RBM and directed connections to the lower layers. DBMs have undirected connections between all layers of the network. A graphic depiction of DBNs and DBMs can be found in Figure. In the following subsections, we will describe the basic characteristics of DBNs and DBMs, after presenting their basic building block, the RBM.



2.2.3.

Deep Boltzmann Machines

Deep Boltzmann Machines (DBMs) are another type of deep model using RBM as their building block. The difference in architecture of DBNs is that, in the latter, the top two layers form an undirected graphical model and the lower layers form a directed generative model, whereas in the DBM all the connections are undirected. DBMs have multiple layers of hidden units, where units in odd-numbered layers are conditionally independent of even-numbered layers, and vice versa. As a result, inference in the DBM is generally intractable. Nonetheless, an appropriate selection of interactions between visible and hidden units can lead to more tractable versions of the model. During network training, a DBM jointly trains all layers of a specific unsupervised model, and instead of maximizing the likelihood directly, the DBM uses a stochastic maximum likelihood (SML) based algorithm to maximize the lower bound on the likelihood. Such a process would seem vulnerable to falling in poor local minima, leaving several units effectively dead. Instead, a greedy layer-wise training strategy was proposed, which essentially consists in pretraining the layers of the DBM, similarly to DBN, namely, by stacking RBMs and training each layer to independently model the output of the previous layer, followed by a final joint fine-tuning.

Regarding the advantages of DBMs, they can capture many layers of complex representations of input data and they are appropriate for unsupervised learning since they can be trained on unlabeled data, but they can also be fine-tuned for a particular task in a supervised fashion. One of the attributes that sets DBMs apart from other deep models is that the approximate inference process of DBMs includes, apart from the usual bottom-up process, a top-down feedback, thus incorporating uncertainty about inputs in a more effective manner. Furthermore, in DBMs, by following the approximate gradient of a variational lower bound on the likelihood objective, one can jointly optimize the parameters of all layers, which is very beneficial especially in cases of learning models from heterogeneous data originating from different modalities.

As far as the drawbacks of DBMs are concerned, one of the most important ones is, as mentioned above, the high computational cost of inference, which is almost prohibitive when it comes to joint optimization in sizeable datasets. Several methods have been proposed to improve the effectiveness of DBMs. These include accelerating inference by using separate models to initialize the values of the hidden units in all layers , or other improvements at the pretraining stage or at the training stage.

2.3. Stacked (Denoising) Autoencoders

Stacked Autoencoders use the autoencoder as their main building block, similarly to the way that Deep Belief Networks use Restricted Boltzmann Machines as component. It is therefore important to briefly present the basics of the autoencoder and its denoising version, before describing the deep learning architecture of Stacked (Denoising) Autoencoders.

2.3.1 Autoencoders

An autoencoder is trained to encode the input into a representation in a way that input can be reconstructed from. The target output of the autoencoder is thus the autoencoder input itself. Hence, the output vectors have the same dimensionality as the input vector. In the course of this process, the reconstruction error is being minimized, and the corresponding code is the learned feature. If there is one linear hidden layer and the mean squared error criterion is used to train the network, then the hidden units learn to project the input in the span of the first principal components of the data. If the hidden layer is nonlinear, the autoencoder behaves differently from PCA, with the ability to capture multimodal aspects of the input distribution. The parameters of the model are optimized so that the average reconstruction error is minimized. There are many alternatives to measure the reconstruction error, including the traditional squared error:

$$L = ||x-f(r(x))||^2,$$

where function is the decoder and is the reconstruction produced by the model.

If the input is interpreted as bit vectors or vectors of bit probabilities, then the loss function of the reconstruction could be represented by cross-entropy; that is,

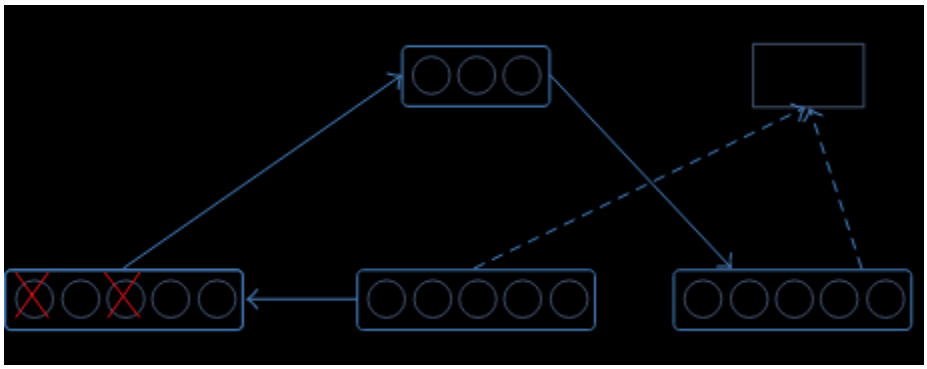
$$L = -\Sigma x_i \log f_i(r(x)) + (1-x_i)\log(1-f_i(r(x)))$$

The goal is for the representation (or code) r(x) to be a distributed representation that manages to capture the coordinates along the main variations of the data, similarly to the principle of Principal Components Analysis (PCA). Given that r(x) is not lossless, it is impossible for it to constitute a successful compression for all input x. The aforementioned optimization process results in low reconstruction error on test examples from the same distribution as the training examples but generally high reconstruction error on samples arbitrarily chosen from the input space.

2.3.2. Denoising Autoencoders

The denoising autoencoder is a stochastic version of the autoencoder where the input is stochastically corrupted, but the uncorrupted input is still used as target for the reconstruction. In simple terms, there are two main aspects in the function of a denoising autoencoder: first it tries to encode the input (namely, preserve the information about the input), and second it tries to undo the effect of a corruption process stochastically applied to the input of the autoencoder.

The latter can only be done by capturing the statistical dependencies between the inputs. It can be shown that the denoising autoencoder maximizes a lower bound on the log-likelihood of a generative model.



In, the stochastic corruption process arbitrarily sets a number of inputs to zero. Then the denoising autoencoder is trying to predict the corrupted values from the uncorrupted ones, for randomly selected subsets of missing patterns. In essence, the ability to predict any subset of variables from the remaining ones is a sufficient condition for completely capturing the joint distribution between a set of variables. It should be mentioned that using autoencoders for denoising was introduced in earlier works, but the substantial contribution of lies in the demonstration of the successful use of the method for unsupervised pretraining of a deep architecture and in linking the denoising autoencoder to a generative model.

2.3.3. Stacked (Denoising) Autoencoders

It is possible to stack denoising autoencoders in order to form a deep network by feeding the latent representation (output code) of the denoising autoencoder of the layer below as input to the current layer. The unsupervised pretraining of such an architecture is done one layer at a time. Each layer is trained as a denoising autoencoder by minimizing the error in reconstructing its input (which is the output code of the previous layer). When the first layers are trained, we can train the th layer since it will then be possible compute the latent representation from the layer underneath.

When pretraining of all layers is completed, the network goes through a second stage of training called fine-tuning. Here supervised fine-tuning is considered when the goal is to optimize prediction error on a supervised task. To this end, a logistic regression layer is added on the output code of the output layer of the network. The derived network is then trained like a multilayer perceptron, considering only the encoding parts of each autoencoder at this point. This stage is supervised, since the target class is taken into account during training.

As is easily seen, the principle for training stacked autoencoders is the same as the one previously described for Deep Belief Networks, but using autoencoders instead of Restricted Boltzmann Machines. A number of comparative experimental studies show that Deep Belief Networks tend to outperform stacked autoencoders, but this is not always the case, especially when DBNs are compared to Stacked Denoising Autoencoders.

One strength of autoencoders as the basic unsupervised component of a deep architecture is that, unlike with RBMs, they allow almost any parametrization of the layers, on condition that the training criterion is continuous in the parameters. In contrast, one of the shortcomings of SAs is that they do not correspond to a generative model, when with generative models like RBMs and DBNs, samples can be drawn to check the outputs of the learning process.

2.4. Discussion

Some of the strengths and limitations of the presented deep learning models were already discussed in the respective subsections. In an attempt to compare these models, we can say that CNNs have generally performed better than DBNs in current literature on benchmark computer vision datasets such as MNIST. In cases where the input is nonvisual, DBNs often outperform other models, but the difficulty in accurately estimating joint probabilities as well as the computational cost in creating a DBN constitutes drawbacks. A major positive aspect of CNNs is "feature learning," that is, the bypassing of handcrafted features, which are necessary for other types of networks; however, in CNNs features are automatically learned. On the other hand, CNNs rely on the availability of ground truth, that is, labelled training data, whereas DBNs/DBMs and SAs do not have this limitation and can work in an unsupervised manner. On a different note, one of the disadvantages of autoencoders lies in the fact that they could become ineffective if errors are present in the first layers. Such errors may cause the network to learn to reconstruct the average of the training data. Denoising autoencoders, however, can retrieve the correct input from a corrupted version, thus leading the network to grasp the structure of the input distribution. In terms of the efficiency of the training process, only in the case of SAs is real-time training possible, whereas CNNs and DBNs/DBMs training processes are time-consuming. Finally, one of the strengths of CNNs is the fact that they can be invariant to transformations such as translation, scale, and rotation. Invariance to translation, rotation, and scale is one of the most important assets of CNNs, especially in computer vision problems, such as object detection, because it allows abstracting an objects identity or category from the specifics of the visual input (e.g., relative positions/orientation of the camera and the object).

3. Applications in Computer Vision

In this section, we survey works that have leveraged deep learning methods to address key tasks in computer vision, such as object detection, face recognition, action and activity recognition, and human pose estimation.

3.1. Object Detection

Object detection is the process of detecting instances of semantic objects of a certain class (such as humans, airplanes, or birds) in digital images and video. A common approach for object detection frameworks includes the creation of a large set of candidate windows that are in the sequel classified using CNN features. For example, the method described in employs selective search to derive object proposals, extracts CNN features for each proposal, and then feeds the features to an SVM classifier to decide whether the windows include the object or not. A large number of works is based on the concept of Regions with CNN features proposed in . Approaches following the Regions with CNN paradigm usually have good detection

accuracies ; however, there is a significant number of methods trying to further improve the performance of Regions with CNN approaches, some of which succeed in finding approximate object positions but often cannot precisely determine the exact position of the object. To this end, such methods often follow a joint object detection—semantic segmentation approach, usually attaining good results.A vast majority of works on object detection using deep learning apply a variation of CNNs, for example(in which a new def-pooling layer and new learning strategy are proposed),(weakly supervised cascaded CNNs), and (subcategory-aware CNNs). However, there does exist a relatively small number of object detection attempts using other deep models. For example, proposes a coarse object locating method based on a saliency mechanism in conjunction with a DBN for object detection in remote sensing images; presents a new DBN for 3D object recognition, in which the top-level model is a third-order Boltzmann machine, trained using a hybrid algorithm that combines both generative and discriminative gradients; employs a fused deep learning approach, while explores the representation capabilities of a deep model in a semisupervised paradigm. Finally, leverages stacked autoencoders for multiple organ detection in medical images, while exploits saliency-guided stacked autoencoders for video-based salient object detection.

3.2. Face Recognition

Face recognition is one of the hottest computer vision applications with great commercial interest as well. A variety of face recognition systems based on the extraction of handcrafted features have been proposed ; in such cases, a feature extractor extracts features from an aligned face to obtain a low-dimensional representation, based on which a classifier makes predictions. CNNs brought about a change in the face recognition field, thanks to their feature learning and transformation invariance properties. The first work employing CNNs for face recognition was; today light CNNs and VGG Face Descriptor are among the state of the art. A Convolutional DBN achieved a great performance in face verification.

Moreover, Googles FaceNet and Facebooks DeepFace are both based on CNNs. DeepFace models a face in 3D and aligns it to appear as a frontal face. Then, the normalized input is fed to a single convolution-pooling-convolution filter, followed by three locally connected layers and two fully connected layers used to make final predictions. Although DeepFace attains great performance rates, its representation is not easy to interpret because the faces of the same person are not necessarily clustered during the training process. On the other hand, FaceNet defines a triplet loss function on the representation, which makes the training process learn to cluster the face representation of the same person. Furthermore, CNNs constitute the core of OpenFace, an open-source face recognition tool, which is of comparable (albeit a little lower) accuracy, is open-source, and is suitable for mobile computing, because of its smaller size and fast execution time.

3.3. Action and Activity Recognition

Human action and activity recognition is a research issue that has received a lot of attention from researchers. Many works on human activity recognition based on deep learning techniques have been proposed in the literature in the last few years . Deep learning was used for complex event detection and recognition in video sequences: first, saliency maps were used

for detecting and localizing events, and then deep learning was applied to the pretrained features for identifying the most important frames that correspond to the underlying event. The authors successfully employ a CNN-based approach for activity recognition in beach volleyball, similarly to the approach for event classification from large-scale video datasets; a CNN model is used for activity recognition based on smartphone sensor data. The authors of incorporate a radius—margin bound as a regularization term into the deep CNN model, which effectively improves the generalization performance of the CNN for activity classification. The authors scrutinize the applicability of CNN as joint feature extraction and classification model for fine-grained activities; they find that due to the challenges of large intraclass variances, small interclass variances, and limited training samples per activity, an approach that directly uses deep features learned from ImageNet in an SVM classifier is preferable.

Driven by the adaptability of the models and by the availability of a variety of different sensors, an increasingly popular strategy for human activity recognition consists in fusing multimodal features and/or data. The authors mixed appearance and motion features for recognizing group activities in crowded scenes collected from the web. For the combination of the different modalities, the authors applied multitask deep learning. The work of explores combination of heterogeneous features for complex event recognition. The problem is viewed as two different tasks: first, the most informative features for recognizing events are estimated, and then the different features are combined using an AND/OR graph structure. There is also a number of works combining more than one type of model, apart from several data modalities. The authors propose a multimodal multistream deep learning framework to tackle the egocentric activity recognition problem, using both the video and sensor data and employing a dual CNNs and Long Short-Term Memory architecture. Multimodal fusion with a combined CNN and LSTM architecture is also proposed in. Finally, uses DBNs for activity recognition using input video sequences that also include depth information.

3.4. Human Pose Estimation

The goal of human pose estimation is to determine the position of human joints from images, image sequences, depth images, or skeleton data as provided by motion capturing hardware. Human pose estimation is a very challenging task owing to the vast range of human silhouettes and appearances, difficult illumination, and cluttered background. Before the era of deep learning, pose estimation was based on detection of body parts, for example, through pictorial structures.

Moving on to deep learning methods in human pose estimation, we can group them into holistic and part-based methods, depending on the way the input images are processed. The holistic processing methods tend to accomplish their task in a global fashion and do not explicitly define a model for each individual part and their spatial relationships. DeepPose is a holistic model that formulates the human pose estimation method as a joint regression problem and does not explicitly define the graphical model or part detectors for the human pose estimation. Nevertheless, holistic-based methods tend to be plagued by inaccuracy in the high-precision region due to the difficulty in learning direct regression of complex pose vectors from images.

On the other hand, the part-based processing methods focus on detecting the human body parts individually, followed by a graphic model to incorporate the spatial information. In, the authors, instead of training the network using the whole image, use the local part patches and background patches to train a CNN, in order to learn conditional probabilities of the part presence and spatial relationships. In the approach trains multiple smaller CNNs to perform independent binary body-part classification, followed with a higher-level weak spatial model to remove strong outliers and to enforce global pose consistency. Finally, in, a multiresolution CNN is designed to perform heat-map likelihood regression for each body part, followed with an implicit graphic model to further promote joint consistency.

3.5. Datasets

The applicability of deep learning approaches has been evaluated on numerous datasets, whose content varied greatly, according the application scenario. Regardless of the investigated case, the main application domain is (natural) images. A brief description of utilized datasets (traditional and new ones) for benchmarking purposes is provided below.

(1) Gray scale Images. The most used grayscale images dataset is MNIST and its variations, that is, NIST and perturbed NIST. The application scenario is the recognition of handwritten digits.

(2) RGB Natural Images. Caltech RGB image datasets, for example, Caltech 101/Caltech 256 and the Caltech Silhouettes, contain pictures of objects belonging to 101/256 categories. CIFAR datasets consist of thousands of color images in various classes. COIL datasets consist of different objects imaged at every angle in a 360 rotation.

(3) Hyperspectral Images. SCIEN hyperspectral image data and AVIRIS sensor based datasets , for example, contain hyper spectral images.

(4) Facial Characteristics Images. Adience benchmark dataset can be used for facial attributes identification, that is, age and gender, from images of faces. Face recognition in unconstrained environments is another commonly used dataset.

(5) Medical Images. Chest X-ray dataset comprises 112120 frontal-view X-ray images of 30805 unique patients with the text-mined fourteen disease image labels (where each image can have multilabels). Lymph Node Detection and Segmentation datasets consist of Computed Tomography images of the mediastinum and abdomen.

(6) Video Streams. The WR datasets can be used for video-based activity recognition in assembly lines , containing sequences of 7 categories of industrial tasks. YouTube-8M is a dataset of 8 million YouTube video URLs, along with video-level labels from a diverse set of 4800 Knowledge Graph entities.

4. Conclusions

The surge of deep learning over the last years is to a great extent due to the strides it has enabled in the field of computer vision. The three key categories of deep learning for computer vision that have been reviewed in this paper, namely, CNNs, the “Boltzmann family” including DBNs and DBMs, and SdAs, have been employed to achieve significant performance rates in a

variety of visual understanding tasks, such as object detection, face recognition, action and activity recognition, human pose estimation, image retrieval, and semantic segmentation. However, each category has distinct advantages and disadvantages. CNNs have the unique capability of feature learning, that is, of automatically learning features based on the given dataset. CNNs are also invariant to transformations, which is a great asset for certain computer vision applications. On the other hand, they heavily rely on the existence of labelled data, in contrast to DBNs/DBMs and SdAs, which can work in an unsupervised fashion. Of the models investigated, both CNNs and DBNs/DBMs are computationally demanding when it comes to training, whereas SdAs can be trained in real time under certain circumstances.

As a closing note, in spite of the promising—in some cases impressive—results that have been documented in the literature, significant challenges do remain, especially as far as the theoretical groundwork that would clearly explain the ways to define the optimal selection of model type and structure for a given task or to profoundly comprehend the reasons for which a specific architecture or algorithm is effective in a given task or not. These are among the most important issues that will continue to attract the interest of the machine learning research community in the years to come.

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ETHICAL HACKING: THE FUTURE BOOM

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Abstract:

Hacking is basically expertise in any field. Hackers are classified as per working and as per knowledge. The ethical hackers come under white hat hackers. Ethical hackers use hacking techniques in order to provide security. They are legally authorized hackers. Various tools are used in order to carry out hacking. The Most common thing that a hacker has to do is penetration testing over a website. Since, there is a rapid growth in the number of attack; there is a need for people to learn ethical hacking concepts to secure themselves. And we need more certified ethical hackers to minimize the cyber attacks.

Keywords:

Hacking; White hat hackers; Vulnerability; Penetration test and types:

Introduction:

Under the big tree of data science. In which cyber security has a branch of it. On further we deal with this separate course called ethical hacking. Ethical hacking also known as penetration testing or white hat hacking, involves the same tools, tricks, and techniques that hackers use, but with one major difference that Ethical hacking is legal. Ethical hacking is performed with the target's authorization. The intent of ethical hacking is to find out vulnerabilities from a hacker's view point so systems can be better secured. It's part of an overall information risk management program that gives the permission for ongoing security enhancements.

Who is called to be ethical hacker?

Ethical hacker—An ethical hacker is as a person who is hired and permitted by an organization to attack its systems for the purpose of identifying vulnerabilities, which an attacker might take advantage of. The sole difference between the terms "hacking" and "ethical hacking" is the permission.

History:

In the early 1990s, the word "hacker" was used to describe a great programmer, someone who was able to build complex logics. Unfortunately, over time the word gained negative hype, and the media started referring to a hacker as someone who discovers new ways of hacking into a system, be it a computer system or a programmable logic controller, someone who is capable of hacking into banks, stealing credit card information, etc. This is the picture that is created by themediaandthisisuntruebecauseeverythinghasapositiveandanegativeaspecttoit.What the media has been highlighting is only the negative aspect; the people that have been protecting organizations by responsibly disclosing vulnerabilities are not highlighted. However, if you look at the media's definition of a hacker in the 1990s, you would find a few common

characteristics, such as creativity, the ability to solve complex problems, and new ways of compromising targets. Therefore, the term has been broken down into following types:

Types of Hackers:

1. As per working

- ✓ White Hat Hackers
- ✓ Black Hat Hackers
- ✓ Gray Hat Hackers
- ✓ Script kiddie
- ✓ Hacktivist

1. White hat hacker—This kind of hacker is often referred to as a security professional or security researcher. Such hackers are employed by an organization and are permitted to attack an organization to find vulnerabilities that an attacker might be able to exploit.

2. Blackhathacker—Also known as a cracker, this kind of hacker is referred to as a bad guy, who uses his or her knowledge for negative purposes. They are often referred to by the media ashackers.

3. Grayhathacker—This kind of hacker is an intermediate between a white hat and a black hat hacker. For instance, a gray hat hacker would work as a security professional for an organization and responsibly disclose very thing to them; however, he or she might leave a back door to access it later and might also sell the confidential information, obtained after the compromise of a company's targets ever, to competitors. Similarly, we have categories of hackers about whom you might hear of ten times. Some of them are as follows:

4. Scriptkiddie—Also known as skid, this kind of hacker is someone who lacks knowledge on how an exploit works and relies upon using exploits that someone else created. A script kiddie may be able to compromise a target but certainly cannot debug or modify an exploit incase it does not work.

5. Hacktivist—Hacktivists are defined as group of hackers that hack into computer systems for a cause or purpose. The purpose may be political gain, freedom of speech, human rights, and soon.

2. Vulnerability

Vulnerability is defined as a flaw or a weakness inside the asset that could be used to gain unauthorized access to it. The successful compromise of vulnerability may result in data manipulation, privilege elevation, etc.

2. What Is a PenetrationTest?

A penetration test is a subclass of ethical hacking; it comprises a set of methods and procedures that aim at testing/protecting an organization's security. The penetration tests prove helpful in finding vulnerabilities in an organization and check whether an attacker will be able to exploit them to gain unauthorized access to an asset.

Types of Penetration Tests:

There are several types of penetration tests; however, the following are the one most commonly performed:

1. Network Penetration Test: In a network penetration test, you would be testing a network environment for potential security vulnerabilities and threats. This test is divided into two categories: external and internal penetration tests. An external penetration test would involve testing the public IP addresses, whereas in an internal test, you can become part of an internal network and test that network. You may be provided VPN access to the network or would have to physically go to the work environment for the penetration test depending upon the engagement rules that were defined prior to conducting the test.

2. Web Application Penetration Test

Web application penetration test is very common nowadays, since your application hosts critical data such as credit card numbers, usernames, and passwords; therefore this type of penetration test has become more common than the network penetration test.

3. Mobile Application PenetrationTest

The mobile application penetration test is the newest type of penetration test that has become common since almost every organization uses Android- and iOS- based mobile applications to provide services to its customers. Therefore, organizations want to make sure that their mobile applications are secure enough for users to rely on when providing personal information when using such applications.

4. Social Engineering Penetration Test

A social engineering penetration test can be part of a network penetration test. In a social engineering penetration test the organization may ask you to attack its users. This is where you use speared phishing attacks and browser exploits to trick a user into doing things they did not intend to do.

5. Physical PenetrationTest

A physical penetration test is what you would rarely be doing in your career as a penetration tester. In a physical penetration test, you would be asked to walk into the organization's building physically and test physical security controls such as locks and RFID mechanisms.

3. Outlook of hacking

The steps for carrying out ethical hacking which consists of 5 blocks–

1) Reconnaissance
2) Scanning and Enumeration
3) Gaining Access
4) Maintaining Access
5) Clearing Tracks

1. Reconnaissance

Reconnaissance is a set of processes and techniques used to secretly discover and collect information about a target system.

During reconnaissance, an ethical hacker attempts to collect as much information about a target system as possible, following the seven steps listed below −

- ✓ *Gather preliminary information*
- ✓ *Identifying active machines*
- ✓ *Determine open ports and accesspoints*
- ✓ *OS fingerprinting*
- ✓ *Reveal all the services on ports*
- ✓ *Network mapping*

2. Scanning and Enumeration

The second step of ethical hacking and penetration testing involves two terms that is scanning and enumeration. Scanning is a common technique used by a pen tester to discover the open doors. Scanning is used to find out the vulnerabilities in the services running on a port. During this process you have to find out the alive host, operating systems involved, firewalls, intrusion detection systems, servers/services, perimeter devices, routing and general network topology (physical layout of network), that are part of the target organization. Enumeration is the initial attack on target network. Enumeration is the process to gather the information about a target machine by actively connecting to it.

3. GainingAccess

Once the reconnaissance is done and all the vulnerabilities are scanned, the hacker then tries to gain the access with the help of certain tools and techniques. It basically focuses on the password retrieval. For this hacker can either use by passing techniques (like using kon boot) or password cracking techniques.

4. Maintaining access

Once an attacker has gained the access of the targeted system, he/she can exploit both the system and its resources and further more use the system as a launch pad to scan and harm other systems, or he/she can keep a low profile and continue exploiting the system without the actual user noticing all these acts. Both these actions can destroy the organization leading to a catastrophe. Root kits gain access at the operating system level while a Trojan horse gains access at 3 level. Attackers can use Trojan horses to transfer usernames, passwords, and even credit card information stored on the system.

5 Clearing Tracks

An attacker needs to destroy evidence of his presence and activities for several reasons like evading detection and further punishment for the intrusion. Erasing evidence often known as 'clearing tracks' is a requirement for any attacker who wants to remain obscure and evade trace back. This step usually starts by erasing the contaminated logins or any other possible error messages that may have been generated on the victims system from the attack process. For instance, a buffer over flow attack usually leaves a message in the system logs which needs to be cleared. Next, attention is turned to affecting changes so that future logins are not logged.

4. NEED FOR ETHICAL HACKING:

The technology of internet of things is growing at rapid rate. Things are getting connected to internet and the only way to secure the miskeeping secret password for each. The users feel once they have set a strong password, they are completely secured where as they are aware of the darker part of this internet. People with intentions to hurt, steal or

harminany of the way called as the Hackers (crackers) constitute the darker part of this web. They intrude into the system using certain techniques. So, here comes the role of Ethical Hacker, the good ones. To stay secure from getting hacked most basic strategy would be to learn to think like a hacker. How the hacker carryout hacking, what tools and techniques are used by them. An ethical hacker does the same. He/She knows how a hacker can intrude into his/her system, so all the existing vulnerabilities in his/her system are scanned and removed.

5. Growth in the ethical hacking

From the above graph we can observe there is a tremendous growth in the cyber security in the year 2019. So we have to take advantage of it and utilize it. Currently we need more ethical hackers for our security of privacy and data.

6. Conclusion:

Ethical hacking must be practiced. It requires basic knowledge of networks and cyber security. It gives a brief information about who an ethical hacker is, and why there's a need for world to learn it. It may be hard in learning but once we get command on course we can do wonders.

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WIRELESS INTEGRATED NETWORK SENSORS

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Keywords:

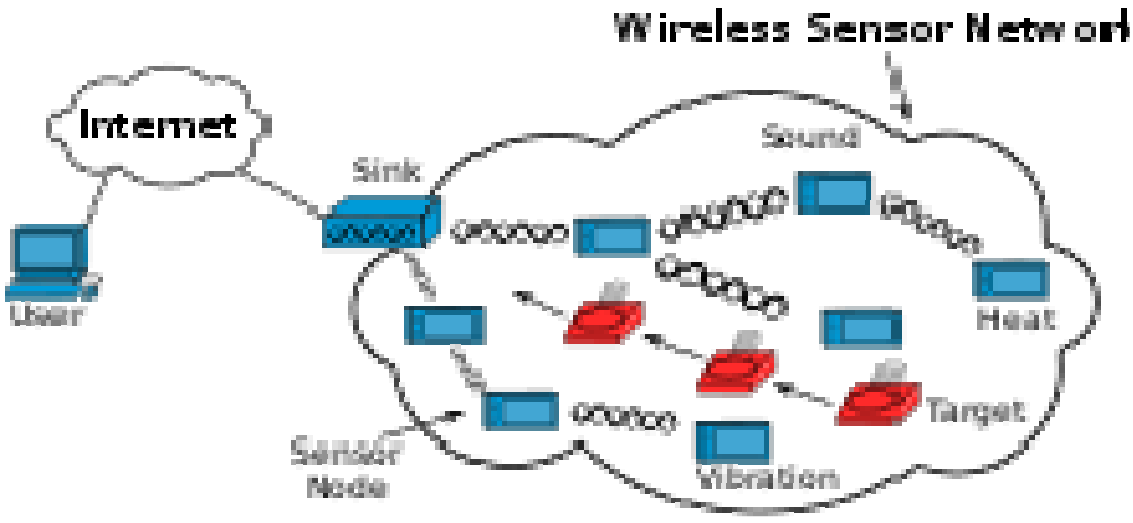
Spectrum Analyzer, Event Detection, Microcontroller, Micro Electro Mechanical Systems (Mems), Sensors rate.

Abstract:

Wireless integrated network sensors (WINS) is provided with sensor network which can be access by internet and it can be used in different fields as it is having capable of sensing, signal processing , and wireless networking capability in a compact.

Introduction:

Innovation in industries, homes and automation in transportation represents smart environment and the data for these smart environment is obtained from WINS. And it is a distribution of sensor network which are embedded in the equipment. It is built of nodes where each node is connected to one sensor or more than one sensor. And this node contains several parts like radio transceiver, antenna, micro controller, battery, an electronic circuit. A sensor node is also called as mote, where every node is capable of sensing, gathering information, and communicating with each other connected nodes in the network.



WINS is a wireless connectivity where it is a full of formation networks which helps the sensors to transmit the information or data.

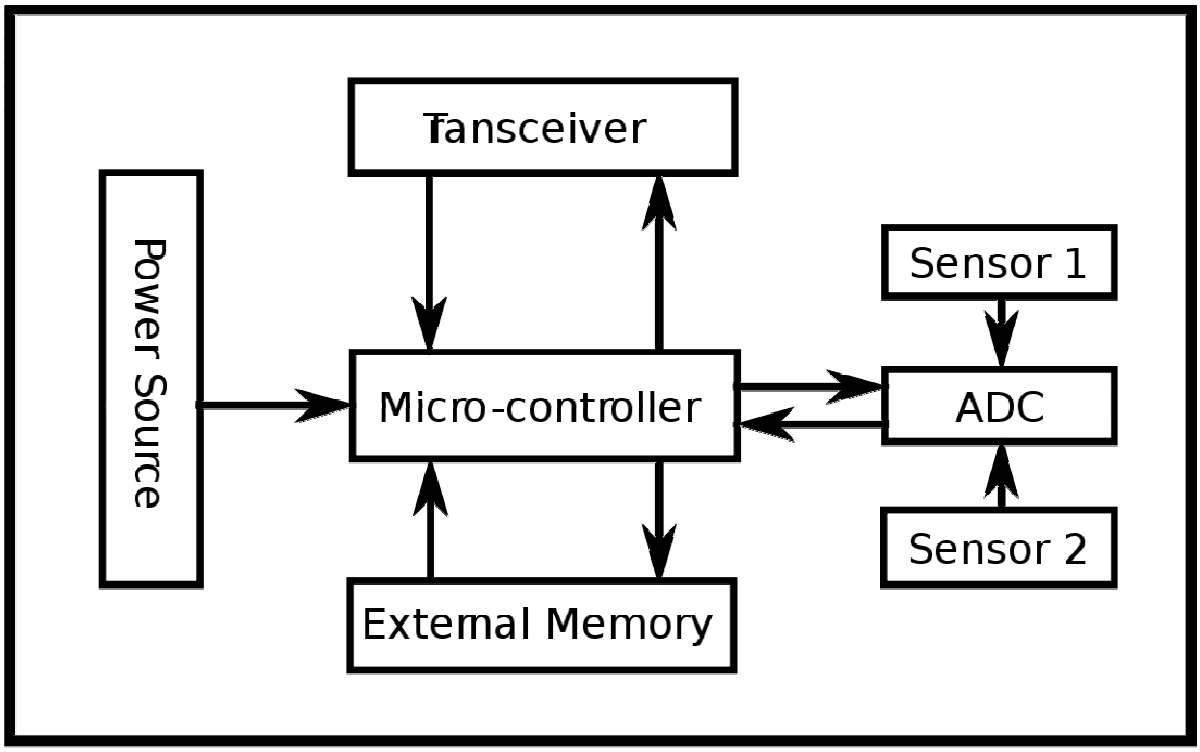
The development of wireless sensor networks is motivated by military applications such as battlefield. So, by using WINS in the border area we can easily identify the stranger who stepped in that area.As the border area is divided into number of nodes where each node is

connected with each other and with the main node also.

The noise produced by the footsteps of the stranger can be collected using sensor and these sensor signals are converted into power spectral density and compared with reference value of our convenience. And compared value is processed using microprocessor, which sends signals to the main node. Thus, we can identify the stranger at the main node. Not only in military application can it be used in different fields.

Wireless Integrated Network Sensors Node Architecture

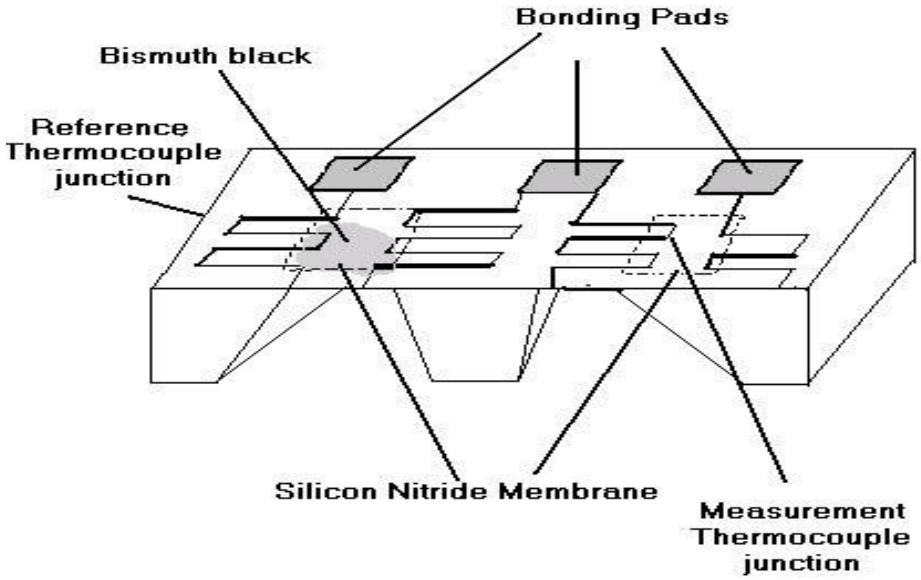
WINS node architecture is developed for sensing and event detection (collection of processes that notify the adapter of SAP application object events) at low power. As the detection process must be continuous, the sensor, data converter, data buffer, must be operate at micro power level. In the event that an event detected, the spectrum analyzer (analyzing a system oscillations) output may cause the micro controller to function. Then the micro controller commands for the additional signals operations for the identification of theevent signal. Particular for the military use the WINS sensor system must be operate at low power, sampling at low frequency. The micro power interface circuits must sample at dc or low frequencywhere1/f•noise in these CMOS interfaces is large. And also WINS applications are generally tolerant to latency.



WINS MICROSENSORS

Some of the source signals like acoustic, infrared and others are decay in their amplitude due to the radial distance from the source. So, the sensor sensitivity must be optimized to maximize the detection range and also for the limit of background noise the sensor must have maximum detection range. Thus, to obtain this sensitivity the compact sensors should be

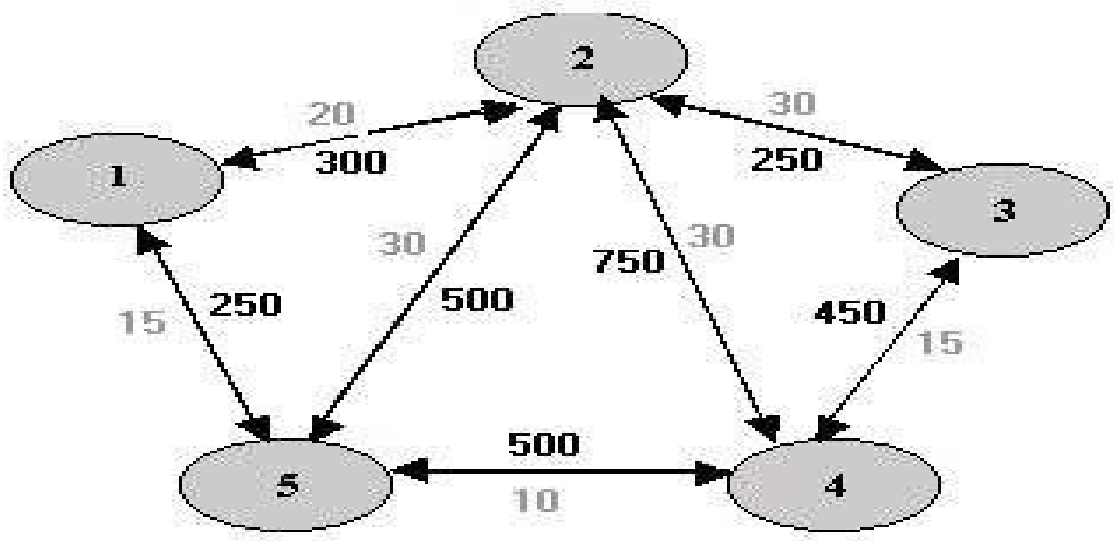
widely distributed. Micro electro mechanical systems (MEMS) technology provides us the path for highly distributed system. The sensor-substrate Sensors rate is used as a platform for the support of interface and signal processing and communication circuit.



THERMAL DETECTOR

ROUTING BETWEEN NODES

All the sensor nodes are connected to each other and also routed tothe main node. This routing is done in shortest distance where the distance between nodes only traffic is consider not thedistance.

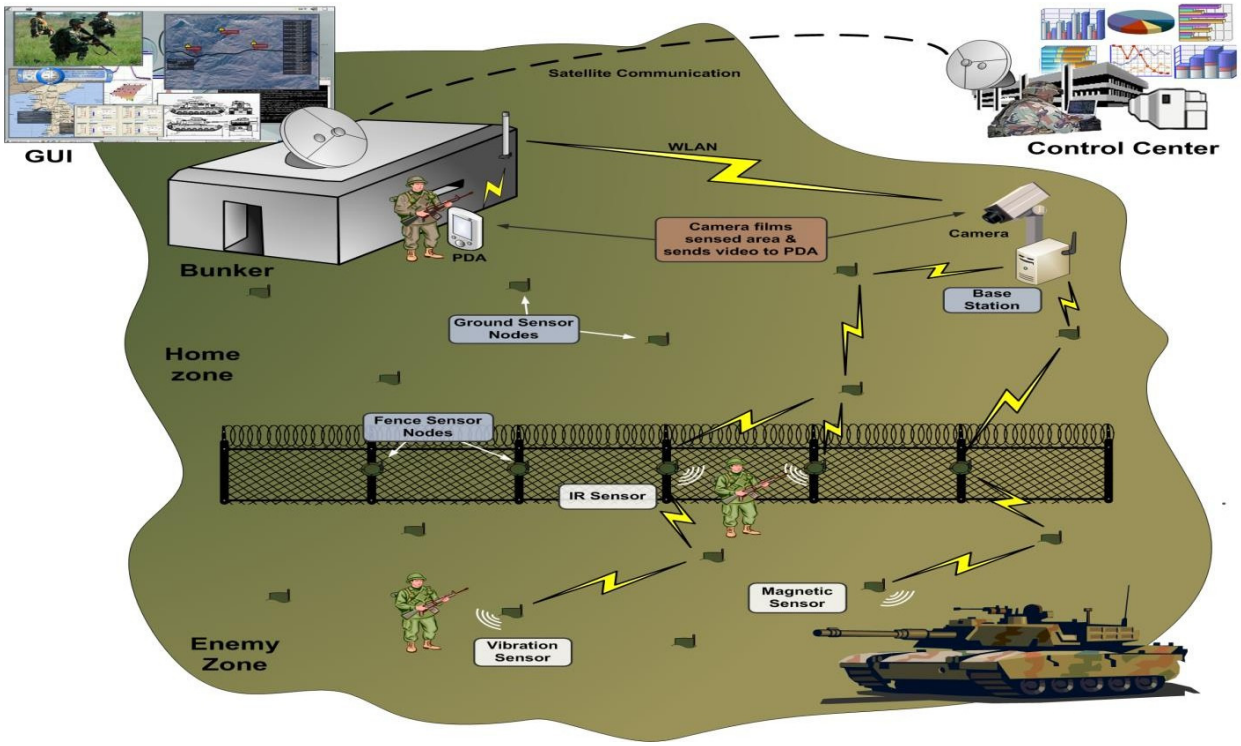


For example: If we want route from node 2 to node 5, the shortest distance will be from node 2 via node 5, and also the traffic through this path is small comparing the node 2 via node 1 to node 5.

And also if we want path from node 2 to node 4, the shortest distance is from node 2 to via node 3 to node 4 but the traffic in this path is high than the path from node 2 to node 4. So, the shortest distance is node 2 via node 4 is considered.

Applications:

1. Air pollution monitoring: Wireless sensors network are used to check the concentration of dangerous gases for cities. These can take advantage of the ad hoc wireless links rather than wired installations.
2. Natural disaster prevention: This wireless sensor network are also used in the prevention of consequences of natural disasters like floods where the nodes are deployed in the river, where the changes in the water levels are monitored.
3. Water quality monitoring: This involves analyzing the water properties in dams, rivers, lakes and as well as underground water reserves.
4. Forest fire detection: A network of sensor nodes can be installed in the forest to detect the fire in the forest. The nodes with the sensor can measure the temperature, humidity and gases produced by the fire in the forest.
5. Area monitoring: It is a common application of the wireless network sensor. In this the nodes are deployed over a region where the phenomenon of monitored. For example – In the military it is used in battlefield.



6. **Health care monitoring: The sensor network is used in the medical application like** implanted, wearable, and environment-embedded. Implantable medical devices are inserted inside the body. Wearable devices are used on the surface of the human body. And environment –embedded system employ sensors contained in the environment.

Conclusion:

The application of WSN in the areas of biomedical, intelligent parking, healthcare applications, environmental , industrial, and military applications have been briefed. These interesting applications are possible due to the flexibility, fault tolerance, low cost and rapid deployment characteristics of sensor networks. Though wireless sensor networks are constrained by scalability, cost, topology change and power consumption, new technologies are being devised to overcome these and to make sensor networks an integral part of ourlives.

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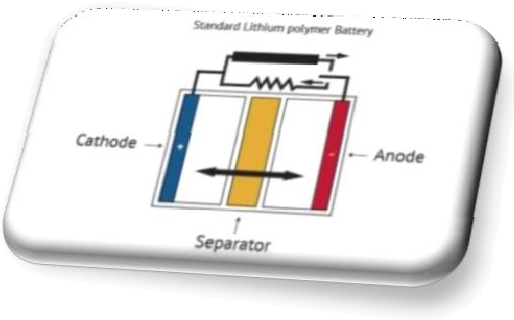
THE FUTURE IS GRAPHENE

P. Giridhar Naidu, B18EE08 (B.Tech. EEE – IV Sem)

Abstract:

Batteries are integral to our modern world, serving as essential components in innumerable devices. However, limitations in battery as the technology advances – many due to the chemical composition of battery, caused them to hinder rather than enable Innovation. Consequently, a focus of contemporary research has been on creating more effective designs and finding materials with more desirable quantities to be used in batteries. One such material is graphene, endless possibilities with astounding properties graphene is predicted to be the material that changes the world. It is a sheet of carbonatoms bonded together in a honeycomb-lattice pattern exactly one atom thick. With several desirable qualities, including a large surface area to mass ratio, high conductivity resulting from high electron mobility, light weight, flexibility, high temperature range and incredible Intrinsic strength graphene holds great potential for applications in the energyindustry.



However, there are many major obstacles to extensive graphene use, including the difficulty of producing graphene to a commercial scale. Methods have been suggested that can potentially be used for mass production. Unlike the production of the materials currently used in the electrodes of *lithium Ion* batteries, these mechanism are not resource intense, which leads to both the economical and environmental sustainability of graphene batteries. While graphene batteries are currently not widely used, numerous variants have been developed. Many of these display larger energy densities and longer battery life- span. Samsung has created a "*graphene ball"* battery with a higher charge capacity, faster rate of charge, greater temperature tolerance presents an opportunity for graphene batteries to become wide spread. Ultimately, the success of this battery could result in application, demonstrating the potential impact of graphene batteries and their ability to drive sustainable innovation.

Introduction:

Rapid innovation over the past several decades has led to increased proliferation of electrically- powered technology. These technologies have profoundly impacted our lives and as such, have become integral parts of our rapid innovation over the past several decades has led to increased proliferation of electrically-powered technology. These technologies have profoundly impacted our lives and as such, have become integral parts of our society. While

many devices are powered by direct connections to an electric grid, many more can only fulfil their purpose if they can operate without a direct and permanent tie. As such, many devices rely on portable sources of power in which energy is stored for future use— the most common of which is the battery. Lithium ion batteries, with high specific energy, single-cell voltage, energy efficiency, and long life spans, are excellent sources of power. However, while they are the most efficient rechargeable battery available commercially and operate at low costs even with a specific energy and energy density more than three times that of the next best battery, the silver-zinc (Ag-Zn) battery, the lithium-ion battery still cannot provide enough power for some things. Due to a variety of environmental factors, including climate change and finite fossil fuel supplies, people have turned to the development of electric and hybrid vehicles to reduce emissions and fossil fuel dependence. Lithium-ion batteries have become the main power storage system for these vehicles but are still unable to match the performance of a vehicle driven by internal combustion engines. Ultimately, lithium ion batteries in their current manifestation cannot continue as our primary means of portable energy storage—they are not a sustainable solution. Graphene proved to be the possible solution for thisproblem.

Description:

- **A possible solution –** It has become clear that our current batteries are not long-term solutions; researchers have begun to turn to alternatives. Graphene, which although theorized for many years, was discovered only recently. It has been shown to possess remarkable qualities due to a unique structure that increases its surface area and conductivity—as well as other properties. Although still not fully understood, many have begun to test graphene in electronic and energy systems, where the material has demonstrated that it can greatly improve efficiency. Additionally, graphene seems to be able to address the issues with sustainability currently inherent in lithium ion batteries.

- **Methods to produceGraphene–** In 2004, Andre Geimand Konstantin Novoselov created grapheme for the first time using a method called the "Scotch Tape method" . By this process, tape is used to remove layers of graphite (composed of loosely bonded graphene sheets until only a single layer remains—graphene. Their discovery had a huge impact, as it that showed graphene--previously only a theoretical substance -could be isolated as a stable material. Additionally, it allowed researchers to, for the first time, identify and measure some of its unique and promising characteristics. However, this method is not that effective; it is incredibly manual, which limits the ability to replicate the process to an extensive scale. As such, researchers have been searching for more effective methods to create the material.

Another, less proven method of producing graphene has been put forward by Ali Kamara. Through the exfoliation of graphite electrodes in a molten salt (in this case, lithium chloride), they theorize that they can produce graphene nanosheets. The process features only a single step, and makes use of three consumables—graphite electrodes, H2 and electricity. While lithium chloride is used, it is consumed only to a small degree.

There are also many other novel ways of producing graphene. Kansas State physicist, Chris Sorensen, has issued a patent for a means of producing graphene in the quantity of grams rather than in milligrams. This simple process shows promise to lead to a method to produce graphene on a far larger scale than ever before. The process involves filling a chamber with

acetylene or ethylene gas, as well as oxygen. Then, a contained detonation is created within the chamber using a vehicle spark plug. The 'soot' from the detonation is graphene and appears as an aerosol gel in the chamber.

Clearly, there are numerous ways to generate graphene, which attests to the flexibility and universality of the substance. However, many of the current methods cannot synthesize the material at a large enough scale to allow it to become commercially prevalent or are simply too harmful to both human health and the environment to warrant their widespread use. But perhaps more theoretical methods like those proposed by Sorenson and Kamali will address these concerns and provide sustainable ways to efficiently produce the material. This will then allow for the widespread, and sustainable use of graphene.

- **Conclusion: The future of graphene batteries–** With the enormous amount of technological advancements in the past few decades, we have reached a new era of more complex, impactful inventions. The increased role of electronics has led to increased demand for batteries. However, this need has raised many issues with the sustainability of the current lithium ion battery. This includes the use of increasingly rare and hard to obtain materials and the human health and environmental concerns that come with their application. Perhaps the most prominent factor, however, is the inability of current battery designs to enable further innovation. As Li- ion batteries approach their theoretical maximum efficiency, new technologies are demanding more of their power supplies. Innovations like electric vehicles, which require several times the power available to them by current batteries to near the performance of cars powered by internal combustion engines, are prevented everywhere by the limitations of batteries.

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ARTIFICIAL INTELLIGENCE Vs MACHINE LEARNING Vs DEEP LEARNING Vs DATA SCIENCE

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Abstract:

Well we r in 21st century, everything changes fast nd everyone is willing to be a part of this advanced technology which is altering very rapidly.

Most of these words AI ML DL DS are heard very often literally buzzing words. So this deals this simplifying above terms to all.

Introduction:

First we'll simply try to learn 'bout all basics terms.

AI: It deals with imparting human intelligence to machines. It focus on advancing of intelligence machines that can think like humans.Then can perform logical reasoning, learning ndself correction. This makes predictions nd make decisions.

ML: It deals with giving machines the ability to learn by training algorithms on a huge amount of data. It makes use of algorithms and statistical models to perform a task without needing explicit instructions.

DL: It's an approach to ML by focusing on learning data representation than task specific operations. It uses Deep Neural Networks inspired by brain neural networks.

DS: It's a whole set of tools and techniques by which to analyze data and extract insights from it. It makes use of scientific methods, processes, and algorithms to make this happen.

Applications:

AI is machine intelligence that can perform any intellectual task that a human can, narrow AI often does specific tasks and does it better than humans.

AI Deals with:

Reasoning and Problem Solving

Knowledge representation

Planning

Learning

Natural Language Processing (NLP)

Perception

Motion and Manipulation

Social Intelligence

General Intelligence

: ML is great for making predictions. For instance, if you show one such algorithm enough pictures of a puppy, it will identify one in a picture it has never seen before.

ML deals with:

Collecting data
Filtering data
Analyzing data
Training algorithms
Testing algorithms
Using algorithms for future predictions

: DL networks are made of multiple layers that data must pass through before producing the output. Deep Learning improves AI by enabling many of its practical applications- DL makes it possible.

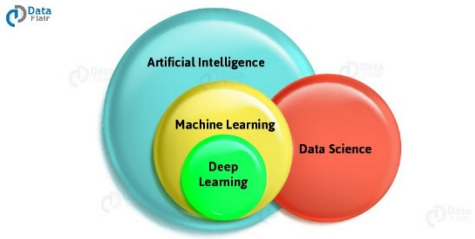
DL deals with:

Natural Language Processing (NLP)
Drug discovery
Toxicology
Bioinformatics

: DS is a field concerned with extracting insights from data by making use of scientific methods and algorithms so businesses can benefit. Data Science uses Machine Learning to analyze data and make predictions.

DS deals with:

Discovery
Data preparation
Model planning
Model building
Communicating results
Operationalizing



Conclusion:

Well, ML is an approach to AI. It is possible to achieve Artificial Intelligence without ML, but that can take millions of lines of code. Like this in achieving high edge technologies we take help of every individual field to collect data gathering, analyze it and to modify them with previous experiences and involving human world to machines so we can achieve them practically by deep visualizing, learning to efficient business and lifestyle.

Simply AI is for developing intelligent machines using ML by training machines by past experiences and improving ability to learn by its own. DL is apart from our task and busy in representing data in ML using neural networks by interlinking each and finally DS is collective part of all, uses process and methods in scientifically practical way business, etc.

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