



FINAL YEAR PROJECT ABSTRACT BOOK

2018 Graduates

DEPARTEMENT OF ELECTRICAL ENGINEERING
UNIVERSITY OF ENGINEERING & TECHNOLOGY,
LAHORE



IET UET STUDENT
CHAPTER
The Institution of
Engineering and Technology



IEEE

Final Year Projects Abstract Book 2018 Graduates



Chairman's Message

The Department of Electrical Engineering was established in 1923 as a part of the Maclagan Engineering College. The Department offers undergraduate and graduate degrees in Electrical Engineering with specialization in Communications, Control, Electronics and Power. Currently, the student enrollment, including both undergraduate and graduate, is around 1300. The Department has a faculty of 34 out of which 21 are Ph.D.'s and 7 have a Master degree. Faculty members with higher qualifications teach graduate courses and supervise research.

UET is one of the premier engineering institutions in the country. Our rigorous undergraduate program provides our students with the necessary tools and training to succeed at the next level. The bachelor's curriculum inculcates Physics and Mathematics fundamentals followed by an in-depth coverage of the principles of Electrical Engineering both in classrooms and well-equipped laboratories.

The curriculum is regularly revised to adapt to the dynamically changing needs of the field of engineering. To reinforce the liaison between industry and academia, a senior year project exhibition is held every year to provide the students with an opportunity to demonstrate their technical acumen. Internships in the local industry provide the students with hands-on experience on industrial equipment. Moreover, breadth is added to their technical know-how through industrial tours to the leading industries in the country. Students are encouraged to join the professional associations to widen their exposure to engineering research and to provide them with an active platform for exchange and expression of their technical ideas.

The graduate courses are aimed at bringing the students abreast with the most recent developments in their fields of specialization. Research work being carried out at the Department has direct bearing on the needs of national industry. The Department also offers consultancy services and testing facilities to local manufacturers of electrical and electronics equipment. Faculty members and graduate students regularly publish (present) in national and international journals (conferences).

I welcome you to the EE pavilion in this year's open house and career fair and encourage you to interact with the students so that you can appreciate their innovative and entrepreneurial abilities. I also urge you to visit the Department and discuss future collaboration with the faculty members.

Chairman

Department of Electrical Engineering

University of Engineering and Technology, Lahore.

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- Maximum Power Point Tracking using Boost Converter
- Voltage Stability through FACTS Devices
- Solar Powered Three Phase Inverter using Space Vector Pulse Width Modulation
- 3D PCB Printer
- Home Assistant with Artificial Intelligence
- Automated Utility Bill Management and security system
- Bi-Directional Soft Switching Series Resonant Converter with PWM Control and Load Independent Voltage Gain Characteristics
- Wireless Power Transmission using Magnetic Resonance

Final Year Project

[**Brief Details**]

*Department of
Electrical Engineering*

Final Year Project List — Session 2014

Group No.	Project Title	Area	Supervisor
2014-FYP-1	Development of Breakdown Voltage Tester for Liquid Dielectrics	Power	Dr. Farhan Mehmood
2014-FYP-2	Wearable Hand Gesture Recognition System for Dumb Amputee	Computer	Dr. Kashif Javeed
2014-FYP-3	Implementation of Inverter and Power Control Unit for Solar Net Metering	Power	Dr. Farhan Mehmood
2014-FYP-4	Modelling and Control of Self Balancing Vehicle	Control	Dr. Khalid Mehmood ul Hasan
2014-FYP-5	Autonomous Hover for Land Mine Detection	Electronics	Dr. Ubaid Ullah Fiaz
2014-FYP-6	Implementation of a Variable 0-50 kV DC Power Supply	Power	Dr. Sidra Fareed
2014-FYP-7	Neuro Fuzzy Inference System Based Advanced Statcom for Transient Instability	Power	Mr. Habib Wajid
2014-FYP-8	Solar Water Pump Using Single Phase Inverter	Power	Dr. Umer Tabrez Shami
2014-FYP-9	Wireless Power Transfer Through Resonance Coupling	Power	Ms. Noor Ul Ain
2014-FYP-10	Thyristor Controlled LC Compensator for Dynamic Loads	Power	Dr. Muhammad Asghar Saqib
2014-FYP-11	Optimal Energy Management of Multi-Input Based Grid Connected Converters	Power	Mr. Mustafeez Ul Hassan
2014-FYP-12	DC-AC Inverter Topology for Control and Stable Operation of HVDC	Power	Dr. Tahir Izhar
2014-FYP-13	Portable Ventilator with Feed Back Control	Control	Dr. Khalid Mehmood Ul Hasan
2014-FYP-14	A Matlab Toolbox for Protein Identification and Quantitation in Top Down Proteomics	Computer	Dr. Khalid Mehmood Ul Hasan
2014-FYP-15	Design and Development of Autonomous Farming Robot	Electronics	Dr. Muhammad Tahir
2014-FYP-16	Patient Centric Scientific Wellness Backbone for Next Generation National Health Care in Pakistan	Computer	Dr. Khalid Mehmood Ul Hasan
2014-FYP-17	Online Device Control and Ambient Monitoring Using Mesh Topology	Power	Dr. Syed Abdul Rahman Kashif (Ali Shafique)
2014-FYP-18	Smart Baby Cradle (An Automatic Baby Soothing and Monitoring System)	Power	Dr. Suhail Aftab Qureshi
2014-FYP-19	Multilevel Inverter	Power	Dr. Syed Abdul Rahman Kashif
2014-FYP-20	Intelligent Zero Net Energy with Hybrid Solar System	Power	Dr. Tahir Izhar
2014-FYP-21	Mind Controlled Quadcopter	Electronics	Mr. Arsalan A Rahim
2014-FYP-22	IP Code Design of Encoder and Soft-Output Decoder for Polar Codes	Electronics	Dr. Ubaid Ullah Fiaz
2014-FYP-23	Intelligent Discipline Maintenance System	Computer	Dr. Kashif Javeed
2014-FYP-24	Wireless Communication Based Vehicle Automation Using Optical Character Recognition	Electronics	Mr. Salman Fakhar
2014-FYP-25	Blind Assistant Robot	Computer	Dr. Kashif Javeed
2014-FYP-26	Smart Weed Detection and its Active Removal Via Visual Feedback System	Electronics	Dr. Muhammad Tahir
2014-FYP-27	Solar Powered AC Motor Drive Using Isolated Boost Converter	Power	Ms. Noor Ul Ain
2014-FYP-28	Power System Stability Using FACTS-DVR Devices	Power	Dr. Tahir Izhar
2014-FYP-29	DC-Fault Tolerant Modular Multi-Level HVDC Converter Using Switched Capacitor Submodule	Power	Mr. Mustafeez Ul Hassan
2014-FYP-30	Induction Motor Drive Control of a Car	Power	Dr. Tahir Izhar
2014-FYP-31	Deployment of Laboratory Work Bench for Partial Discharge Measurement of Electrical Equipment	Power	Dr. Farhan Mehmood
2014-FYP-32	Efficient Energy Metering with Maximum Demand Indication	Power	Mr. Salman Fakhar
2014-FYP-33	Smart Shopping Cart	Electronics	Dr. Ubaid Ullah Fiaz
2014-FYP-34	Synchronization and ATS at Smart Grid	Power	Dr. Suhail Aftab Qureshi
2014-FYP-35	2D Simultaneous Localization and Mapping (SLAM) Based Autonomous Rover with Environmental Surveillance	Electronics	Arsalan A Rahim
2014-FYP-36	Maximum Power Point Tracking using Boost Converter	Power	Dr. Umer Tabrez Shami
2014-FYP-37	Voltage Stability through FACTs Devices	Power	Dr. Suhail Aftab Qureshi
2014-FYP-38	Solar Powered Three Phase Inverter using Space Vector Pulse Width Modulation	Power	Dr. Suhail Aftab Qureshi
2014-FYP-39	3D PCB Printer	Power	Dr. Syed Abdul Rahman Kashif
2014-FYP-40	Home Assistant with Artificial Intelligence	Computer	Dr. Kashif Javeed
2014-FYP-41	Automated Utility Bill Management and security system	Power	Dr. Syed Abdul Rahman Kashif
2014-FYP-42	Bi-Directional Soft Switching Series Resonant Converter with PWM Control and Load Independent Voltage Gain Characteristics	Power	Mr. Habib Wajid
2014-FYP-43	Wireless Power Transfer through Resonance Coupling	Power	Dr. Khalid Mehmood ul Hasan (Ali Shafique)

Final Year Project

[Abstracts]

*Department of
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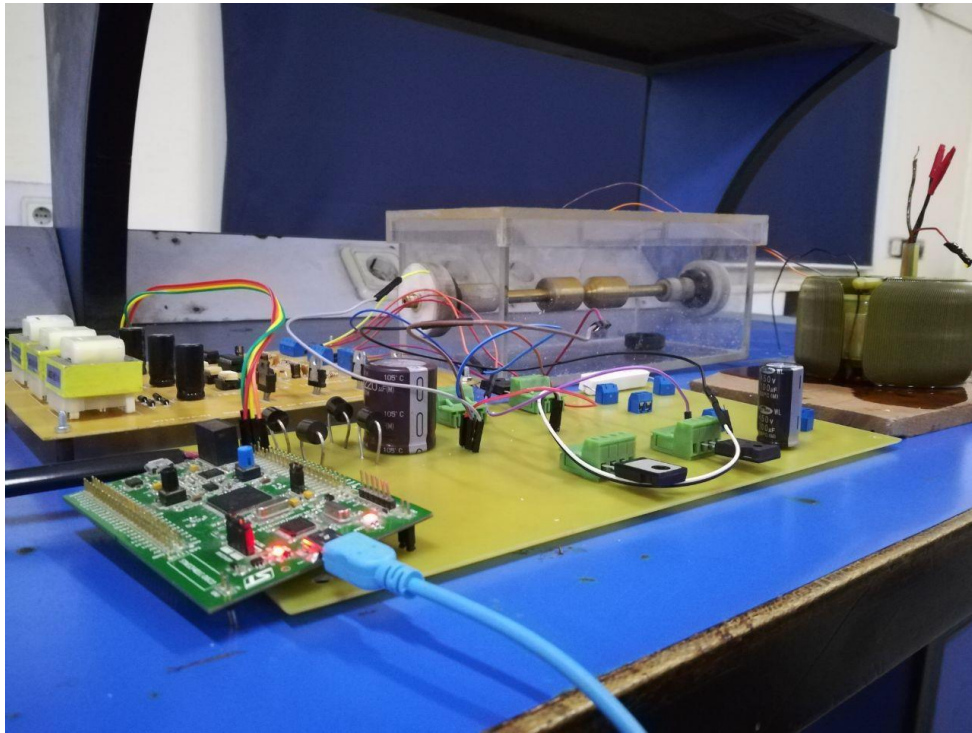
Title

Development of Breakdown Voltage Tester for Liquid Dielectrics

Project Advisor: Dr. Farhan Mahmood

Abstract

Liquid dielectrics are basically used to prevent or rapidly quench the electric discharges. They are used widely to provide insulation in transformers, capacitors, high voltage cables and switch gears. It is essential to design a device which can measure the breakdown voltage strength of these liquid dielectrics, in order to understand the reliability of equipment functionality on dielectrics used in them. The predetermined estimation of dielectric strength can help us to prevent our appliances from fatal failure, provided that they are operated in optimized range of voltages that is below the breakdown voltage of dielectrics used in them. The transformer oil (insulation oil) of voltage and current transformers fulfills the purpose of insulating as well as cooling. Thus, the dielectric quality of transformer oil is essential to secure operation of a transformer. As transformer oil deteriorates through aging and moisture ingress, transformer oil should, depending on economics, transformer duty and other factors, be tested periodically. Power utility companies have a vested interest in periodic oil testing since transformers represent a large proportion of their total assets. Through such testing, life of transformer can be substantially increased, thus reducing new investment of replacement transformer assets. Measuring the breakdown voltage of liquid dielectrics will give information about their dielectric strength. Through this test-kit, we will be able to study breakdown voltage characteristics of liquid dielectrics as well as newly developed nanodielectrics. Transformer designing is the major and toughest part of our project. We have designed a high voltage single phase transformer with input from WAPDA utility of 230V and the output will be variable with the range of 0V to 30kV (RMS). We rectify the AC input with a rectifier. This DC voltage is then inverted to a square wave with an inverter. This square wave is then converted to a sinusoid through an RLC filter. The transformer then steps up this voltage. The magnitude of the output voltage is controlled automatically through MATLAB and voltage rise rate is set to 2kV/ sec which can also be changed according to the requirement. As soon as, the breakdown of oil sample occurs as the high voltage, the protection circuit cuts the supply so that the source is not damaged by the short circuit current. The values of breakdown voltage, applied voltage and rate of rise of voltage can be monitored as well.



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Title

Wearable Hand Gesture Recognition System for Dumb Amputees

Project Advisor: Dr. Kashif Javed

Abstract

In our society we have people around us with physical disabilities. Although technology is advancing day by day but there has been no such remarkable progress in this scope of life. Our goal is to design a wearable device based on tri-axis accelerometer and gyroscope to enable people who have speech disorders and are amputated trans-radially to be able to write. For this purpose, the accelerometer and gyroscope sensor (MPU-6050) is placed on the arm and gestures are recorded from 26 individuals belonging to different age groups and gender. The gestures are the alphabets of the English language. This data is then divided into train and test in a ratio of 7:3 and processed using the Raspberry Pi controller. One major challenge is removal of noise from MPU-6050 data. This sensor comes with lot of noise, so our real struggle in this project is to extract our required gesture by minimizing as much noise as possible. To remove noise, we used the complementary filter in conjunction with the moving average filter. The complementary filter passes accelerometer data from low pass filter and gyroscope data from high pass. On the other hand, the moving average filter calculates a running sum over an interval and then averages over the same interval. This filtered data is then fused into one value. In this way the six-axis data is transformed into three-axis. To improve recognition accuracy five windows are applied on the filtered data with 50% overlap between the adjacent windows. The four features are then extracted from all 5 windows. Since there are 3-axis of each instance and 20 features are extracted from each axis hence we have a total of 60 features. Next step is to train the classifier. This is done on the raspberry pi controller using the Scikit-Learn which is a free software machine learning library for the python programming language as all our project coding is done in python language. The library holds a number of classifiers from which we selected the Support Vector Machine (SVM) and Multi-Layer Perceptron for our application. The accuracy on train data was 80.2%. In real-time, the wearable device is put on and the amputee performs an alphabet gesture which is then recognized by the classifier. The average recognition rate for real-time data is 85.12%.

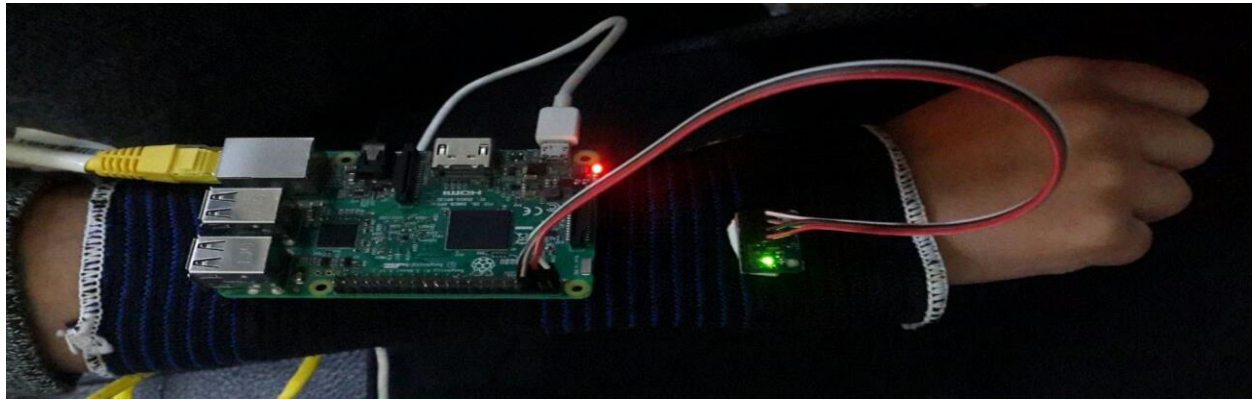


Fig1. Experimental Setup

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Title

Implementation of Inverter and Power Control Unit using Solar Net-metering

Project Advisor: Dr. Farhan Mahmood

Abstract

In recent times many energy experts, scientists, engineers and activists actively promote a 100% renewable energy vision. The recent reports suggest that, we have already used almost 2/3 of our carbon budget and at the current projected rate; this entire budget will be used by the year 2040. So, there is a need to shift our investment as well as enhance our research on renewable energy sources. The solar photovoltaic (PV) generation is becoming more important as a renewable energy source since it offers many advantages such as no fuel cost, no noise, no pollution and less maintenance. Photovoltaic (PV) generation requires expensive batteries to store energy for the use in night. Using net energy metering (NEM) we can use the energy delivered by the electric distribution companies such as WAPDA in night or cloudy weather and solar energy in day time. Net energy metering requires the meter to measure two quantities. First quantity is the Energy delivered by the electric distribution company (WAPDA) to the consumer (imported energy) and second quantity is the energy delivered by the consumer to the electric distribution company (exported energy). Bidirectional net meter is developed to calculate to display the difference between imported and exported energy. Customers are allowed to store their extra electricity on the grid and use it later using both net metering and Time of Use (TOU) policies. For example, a resident can sell his excess energy during on-peak times and buy it at off-peak hours. Not only can we use energy efficiently but we can contribute to the fulfilment of increasing energy demand of our country.

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Title

Modeling and Control of Self Balancing Vehicle

Project Advisor: DR K M Hassan

Abstract

The project illustrates the concept of traction controlled self-balancing vehicles which maintains its attitude about the dynamic equilibrium position. The efficiency is maximized by incorporating the sinusoidal current control of an environmental friendly BLDC motor. The extra maneuverability is added to touch the comfort zone of the rider by supporting his/her center of gravity in an inverted position. The constant falling state of the rider is countered with the robust control system design to actuate the wheels which accelerate to generate counter torque. The speed is controlled by enforcing a tilt back in the system. This is the best application of a classic control system, inverted Pendulum.



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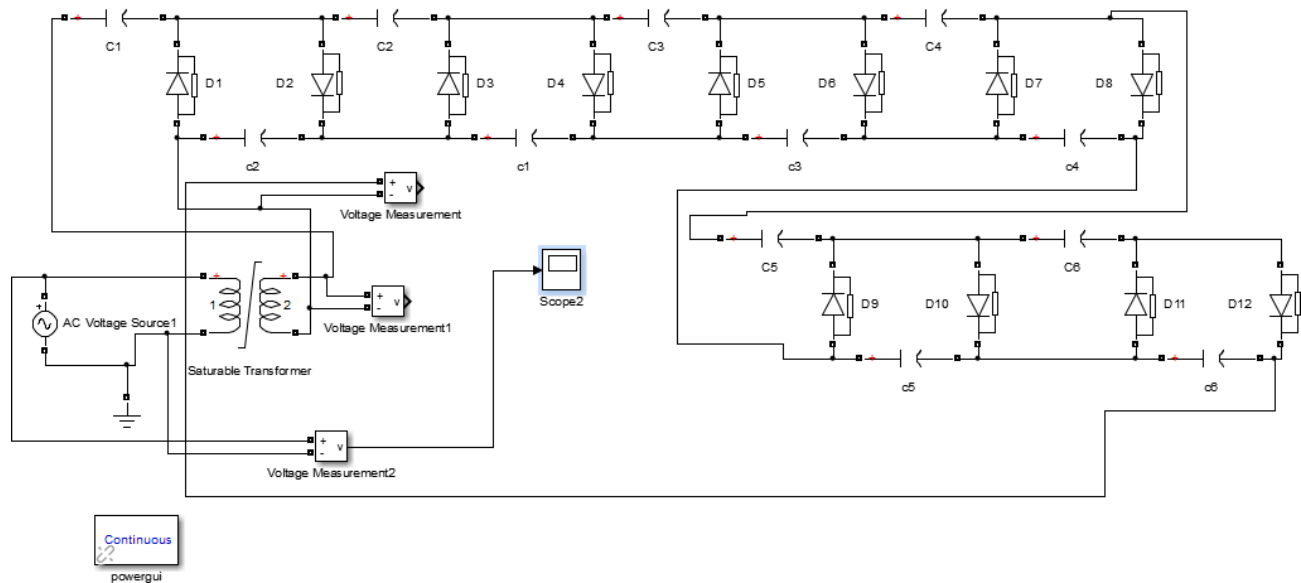
Title

Design and Implementation of 0-50 kV DC power supply

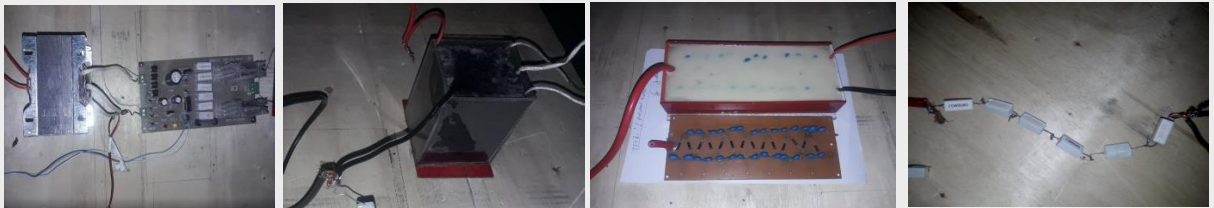
Project Advisor: Dr. Sidra Farid

Abstract

It is a high voltage DC Power supply which is mostly used for the testing of insulation of high voltage cables. The circuit design is based upon a NAND gate based analog circuit, Flyback converter and Cockcroft Walton voltage multiplier. First of all, 220V AC supply from WAPDA is stepped down by a center tapped AC transformer which gives positive and negative 12V RMS voltage. 12V and 24V AC signals are applied to NAND gate based analog circuit which generates a variable frequency PWM signal. This signal is 5V PWM signal with an offset of 24V. This signal is fed to Flyback converter which gives a variable 5kV DC signal. Flyback output decreases with the decrease in frequency of PWM signal and increases with the increase in frequency of PWM signal. So, by controlling the frequency of PWM signal, output voltage is being controlled. The output of Flyback converter is fed to Cockcroft multiplier which gives a variable 50 kV DC signals finally at the output. The output voltage can be measured by a high voltage Electrostatic voltmeter. The output voltage can also be measured using a potential divider circuit which has been used as measuring circuit for our project. The whole circuit has been simulated in MATLAB and desired results have been obtained. Following figure shows the snapshot of circuit design on MATLAB.



Hardware components are shown as follows



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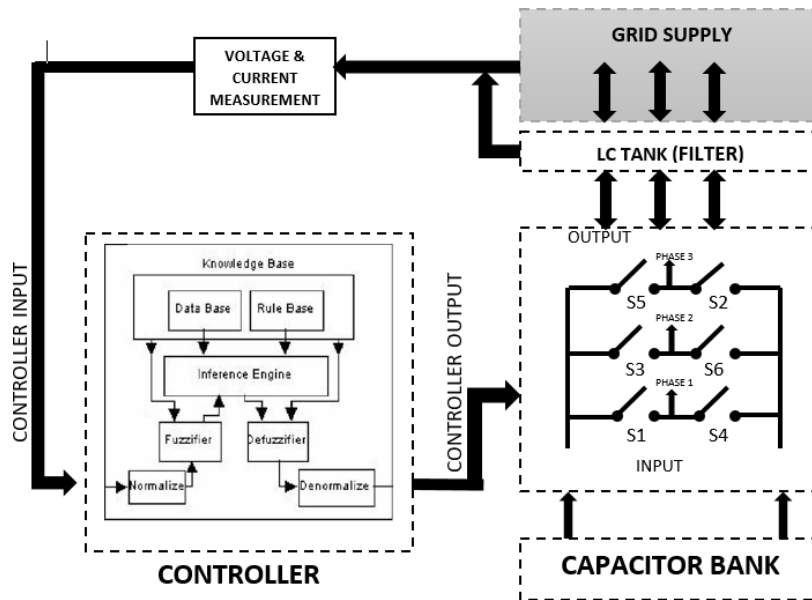
Title

Neuro Fuzzy Inference System Based Advanced Statcom For Transient Instability

Project Advisor: Habib Wajid

Abstract

Stable Operation of a Power System is essential for the reliable and continuous supply of power to load. Power system is continuously prone to different transient disturbances occurring because of events like short circuit faults and load changing in consequence of which voltage value fluctuates from its steady state value and the power system may become unstable if these transient disturbances sustain for a long interval of time. Fast remedial measures are necessary to ensure the stable and regulated operation of power system. Different techniques like PID control can be used to keep the voltage at its steady state value. But this technique is not fast and robust because of its linear nature. Our project proposes the fast, robust and non-linear control to counterfeit the effects of transient disturbances. In this project, Static Synchronous Compensator (STATCOM) is implemented to keep the voltage value at its steady state value. The control of this STATCOM is based on Neuro-Fuzzy Controller making its response faster to make the power system back to its stable operation due to non-linear nature of Neuro-Fuzzy Control. The human like decision taking power of Fuzzy Controller and adaptive nature of Neural Networks make it a fast, robust and intelligent controller. STATCOM is implemented by a three phase Sinusoidal Pulse Width Modulation (SPWM) inverter whose DC voltage input is given by DC link capacitor. The inverter output voltage is controlled by controlling the gate pulses. The inverter is tied to grid using coupling transformer which also serves the purpose of low pass LC filter by connecting a capacitor in parallel with it. For the Neuro-Fuzzy Controller grid's voltage, phase angle between grid's voltage and inverter output voltage and DC link capacitor voltage are continuously monitored. Membership functions and rules for controlling these parameters are implemented in a microcontroller and these are controlled based on these rules. The DC link capacitor voltage and inverter output voltage and grid's voltage phase angle is controlled to keep the DC link capacitor charged. The grid's voltage is continuously monitored. If the grid's voltage is higher than the steady state value STATCOM absorbs reactive power and vice versa based on the rules implemented in Neuro-Fuzzy Controller. This STATCOM absorbs active power from grid to power up the inverter.



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Title

Water Solar Pump using Single-phase Inverter

Project Advisor: Dr. Umar Tabrez Shami

Abstract

The Idea for our Project is to Create a Solar Panel System that would be used in remote areas for irrigation, livestock and many other applications, where electricity is unavailable due to increasing price of diesel, in Countries like Pakistan, Somalia and other countries in the world currently using. This Solar System will pump water from the Land which means Underground water or nearby Canal or River water and will replace the use of conventional electricity / gas powered pumping which is costly. This project is not only beneficial in terms of its reduced cost, Solar System Energy uses an Energy Source, (the sun) that is constantly available in a region like in Somalia. It will be a clean source of Energy and it will not effect to the environment for (pollution) as diesel generators do. Furthermore, it will not only be used for irrigation, but used more many applications for example residential water supply.

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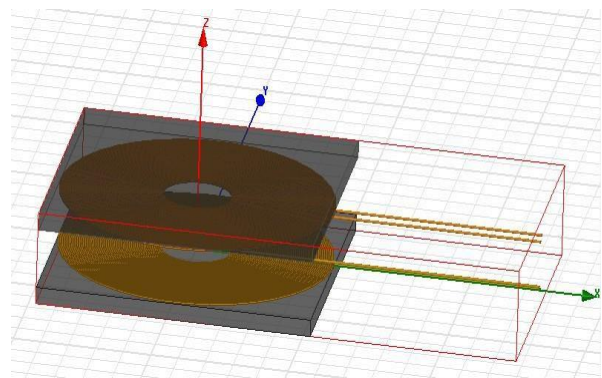
Title

Wireless Power Transmission through Resonance Coupling

Project Advisor: Miss Noor ul Ain

Abstract

This project is based on developing a way to supply power through an air gap, without using physical connectors or current carrying wires. The ultimate goal is to make a prototype of electric vehicle and track which transfers significant power to drive the vehicle. The transmitter coil is energized by alternating current to generate a magnetic field, which in turn induces a current in the receiver coil. This induced current is then used to power devices where interconnected wires are inconvenient or not possible. The objectives of the project include, achieving a significant power level to drive an electric vehicle, developing a system to power the electric vehicles wirelessly through the tracks, developing the wireless charger parking for electric vehicles and minimizing the size and cost of hardware equipment yet maximizing the power transfer and efficiency. From application perspective it can be implanted in Electric Vehicles and Tracks, wireless power can be harnessed and implemented in home equipment's charging it can be used in Aerial Vehicles and Solar Power Satellites, it can be used in charging Electronic Portable Devices, Pacemakers and Electric Vehicles and it can be used in cordless power drills for construction sites. Till now we have simulated the system on ANSYS Maxwell and PSIM to deliver the significant power wirelessly and successfully developed a prototype of Transmitter and Receiver coil to transfer 25W power wirelessly.



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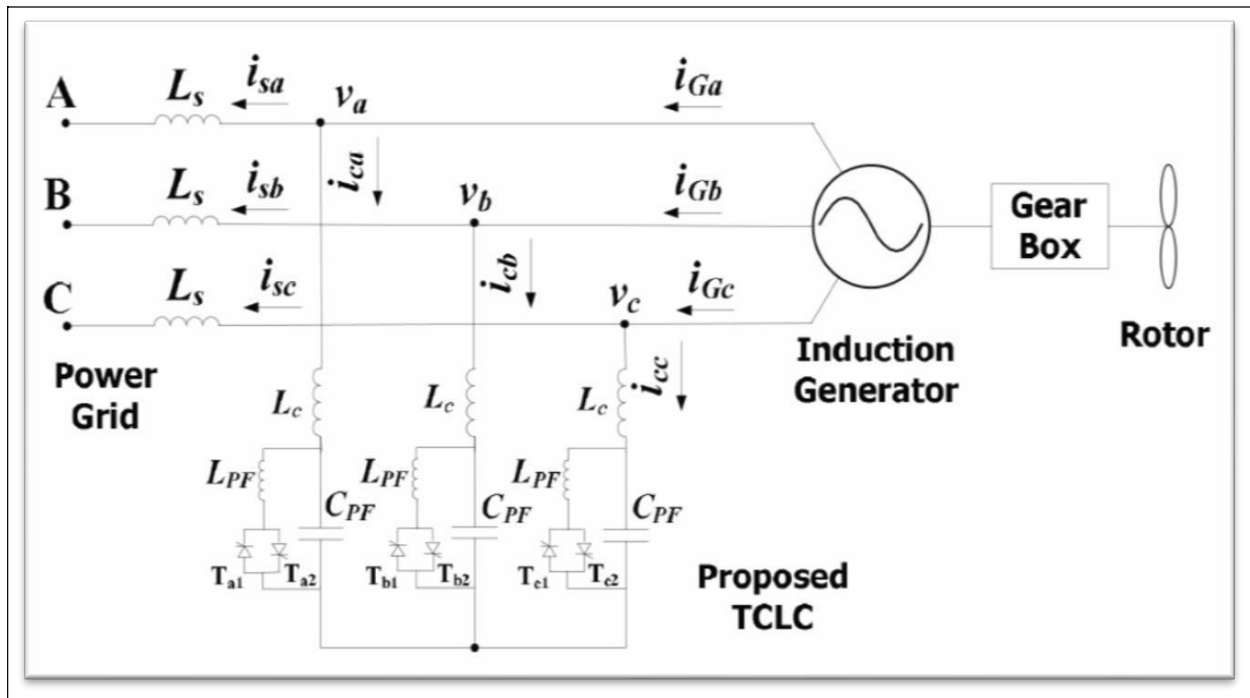
Title

Thyristor Controlled Reactive Power Compensator for Dynamic Loads

Project Advisor: Dr. Muhammad Asghar Saqib

Abstract

Reactive power compensation is necessary as more reactive power draws large reactive current which lower the power transmission capability and leads to an increase in the cost of electricity. The aim of this project is to design and control a thyristor controlled reactive power compensator for dynamic loads. Traditional static VAR compensators like fixed capacitor thyristor-controlled reactor generates lower order harmonic currents which deteriorate the system performance. STATCOM devices are also used for reactive power compensation. They have comparatively faster response with less harmonic injection. But the problem with STATCOM is that under same VA rating SVCs are much cheaper. So, our aim is to design a VAR compensator that combines good features of both SVC and STATCOM i.e. it is cheaper and also has a feature of harmonic current rejection. Furthermore, the control method is based on instantaneous reactive power theory rather than traditional theory for faster response dynamic loads. Load instantaneous reactive power is monitored continuously to determine the reactive power that must be supplied or absorbed by the compensator and the required reactance is calculated that must be provided using lookup table and firing angle alpha is calculated at which thyristor is to be fired for the required compensation. Both leading and lagging reactive power can be provided and power factor can be adjusted accordingly for lagging and leading loads respectively. The value of inductors and capacitors is calculated according to required reactive power range that has to be provided by the compensator using equations. The simulations for this compensator design are done on PSCAD (Power System Computer Aided Design). With PSCADTM we can build simulate and model power systems with ease providing limitless possibilities in power systems simulations. Wind generators tied to smart grids specifically require TCLC so it has great future aspects. Moreover, simulation and experimental results have proved that TCLC can provide VAR compensation with acceptable grid voltage and system current THD levels. So, the proposed TCLC can be considered a cost-effective solution for reactive power compensation with less harmonic injection in smart grid system.



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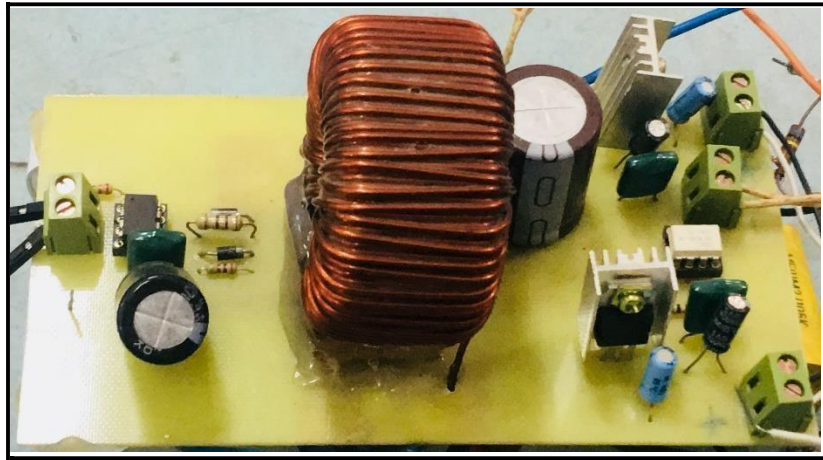
Title

Optimum Energy Management of Multi-Input based Grid Connected Converters

Project Advisor: Mr. Mustafeez-ul-Hassan

Abstract

A Multi-Input boost Converter (MIC) based inverter with grid-tie capability is proposed to obtain power from three sources and to supply the regulated output voltage to the load from the sources. The system consists of three-input DC-DC boost converter and inverter. The grid-tie capability allows this system to be used both in grid tie and islanded operational mode. Furthermore, there is also axillary DC output form the boost convertor for DC loads. The structure of MIC is simpler compared to the use of several single-input converters for each source. As the conventional source of energy is rapidly depleting and the cost of energy is rising, and there is a need to turn towards renewable energy sources like Photo Voltaic (PV) source and wind source. Since, the power from these sources is intermittent, a storage element is used to provide uninterrupted supply to the load. The converter topology enables the charging and discharging of the storage element through input power sources. The technique also reduces the system size and cost by reducing the number of components and operating at higher frequency. This improves overall dynamic response and reliability. Moreover, the inverter is based on multi-level capacitor clamped topology. The modulation technique is Sinusoidal Pulse Width Modulation (SPWM) whose frequency is variable so it can operate as a variable frequency drive or synchronize with the grid using Phase-Locked Loop (PLL). The output of the inverter is followed by a LCL filter to suppress the harmonics and to lower Total Harmonic Distortion (THD) level. The closed loop operation of converter and inverter is achieved using microcontroller.



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Title

DC-AC Inverter Topology for the Control and Stable Operation of HVDC

Project Advisor: Dr. Tahir Izhar

Abstract

The shortage of power is the major crisis we are facing these days in Pakistan. It has developed an urge to shift our attention to the more reliable and efficient methods for the power generation and transmission. As the power flow control is very difficult in AC systems, so the transfer of power is done over long distances with less power losses using HVDC links. Common applications of HVDC transmission technology have continuously based on interconnecting asynchronous AC systems, essentially for economic transportation of electric energy from remote resources. Therefore, NTDC has joined hand with private energy generation companies to overcome the shortfall of energy and laid 878 km long 660kv HVDC line from Matiari to Lahore having the capacity to transmit the power of 4000MW. Stability problems, such as inter-area oscillations, have become increasingly common in large interconnected power systems and the primary function of HVDC controls are fast and flexible power control between the terminals under steady state and transient operation, better stability of ac system, fast protection of ac and dc system faults. The main focus of our project is to analyze all these issues in HVDC lines being laid in Pakistan using the simulation software Power System Simulation for Engineers (PSS/E) and to compare the results with National Transmission and Dispatch Company(NTDC) studies. Moreover, we are also aimed to study different multilevel inverter topologies and to implement the conventional HVDC 12 pulse Voltage source inverter topology (VSI) to understand the concept of HVDC deeply. The gating signals for the switching devices are generated using SPWM technique as result 12 pulses are generated output. The proposed topology reduces the amount of harmonic currents drawn from the utility lines and gives excellent performance in case of unbalancing in the practical power systems with much less component as compared to other 12 pulse inverter topologies. Hence it is low and is more feasible.

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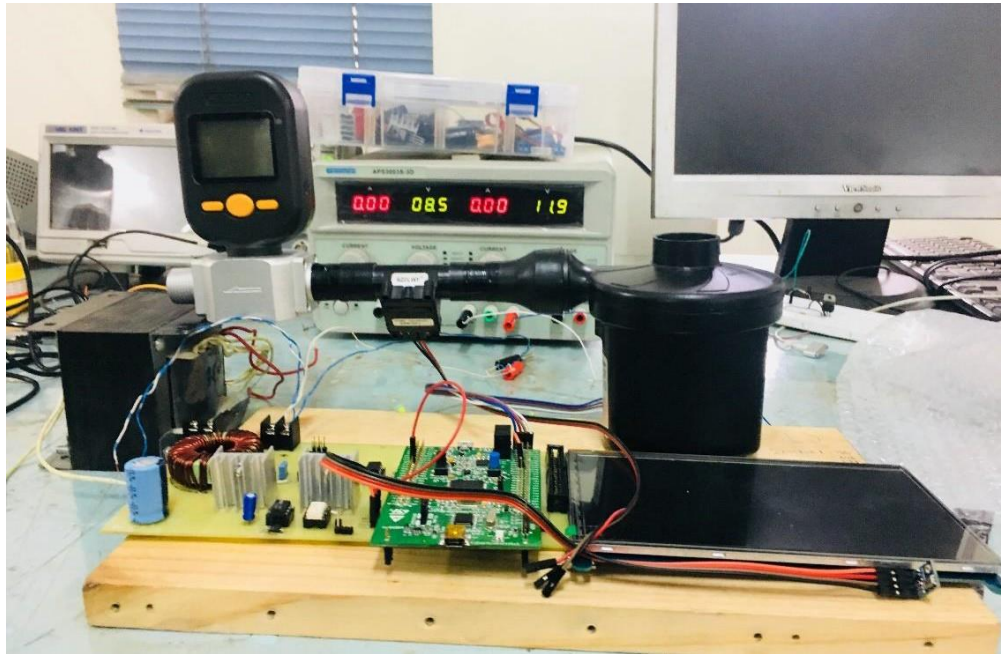
Title

Portable Ventilator with Feedback Control

Project Advisor: Dr Khalid Mahmood ul Hasan

Abstract

In Pakistan, hundreds and thousands of people die every year in search of medical facilities especially breathing equipment. Our project focuses on the development of a fully functional and low-cost ventilator with a wide range of user friendly controls. It involves the design and making of a prototype that will provide oxygen-regulated, volume and pressure-controlled air for mechanical ventilation. Precisely calibrated sensors will provide feedback signals for a closed loop system. A DC air pump controlled by a modified buck converter pumps air into the lungs via a mouth piece. Gating signals to the converter are generated in response to real time values of precisely calibrated pressure and flow-rate sensors for their respective cycles. The flow rate sensor, AWM720P1, has been calibrated using a curve fitting tool in MATLAB. This results in the development of an equation that allows mapping of an entire range of permissible voltages to discrete flowrates. Pressure measurements are made differentially using sensors BMP180. Raw output voltage levels from the sensing units are converted to variable-duty PWM signals and then fed to the microcontroller for feedback. This additional measure is for circuit isolation. Additional features include oximetry to detect oxygen levels in medical air, a GUI developed in Raspbian environment for easy access to system settings and the option to connect the ventilator to a LAN. The ventilator will both be directly powered and battery operate-able for flexible use. Our prototype is being built to support a wide range of controls so that it is adaptable from patient to patient. User-input through a Graphical User Interface(GUI), displayed on touch screen module, will act as control signals. It is in response to these signals that the breathing cycle will adjust. Alarms will be generated in response to anomalous input or system constraints out of range input or low battery. Ours is a conscious choice and a deliberate policy to build a tool that helps our masses take a collective step towards greater relief, less suffocating breaths and a self-realization of the right to a dependable future. We are looking to build a portable ventilator with all necessary features to provide a locally possible, low cost solution to ensure no man dies of suffocation.



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Title

Protein Quantitation Pipeline for Top-Down Proteomics

Project Advisor: Dr. Khalid Mahmood-ul-Hasan

Abstract

The cycle of life on Earth is fueled through one single most important entity, protein, which has major implications in almost every aspect of human life. Over the last few decades general public of Pakistan has been exposed to slow poisoning caused by contaminated water. This water contains hazardous amount of heavy metals which get absorbed by the bacteria through the process of ‘Biosorption’ leading to the vast phenomenon of “Microbial Fixation”. Due to rapid industrialization, the fixation process is deteriorating at an alarming rate, and hence, as a result of seepage through drains, the underground water table is at risk. Identification and quantitation of proteins responsible for microbial fixation, the only natural process to remove hazardous heavy metals from the water, can help us unlocking a plethora of ways to combat the issue of heavy metal contamination in Pakistan. Determining the protein content of these bacteria can lead. Our tool is free, open source and open architecture web service that provides an intuitive search environment for identifying and quantifying proteins. In this work, we extend our tool for analyzing top-down proteomics data by incorporating a much-needed top down protein quantitation tool. Currently its salient features include: (i) intensity weighted sliding window protocol for intact protein mass tuning, (ii) de novo peptide sequence tag extraction and its scoring, (iii) abundance weighted in silico spectral comparison, we further extended its horizon of capabilities by adding state-of-the-art algorithms for deconvolution and quantitation. Label free quantitation techniques are incorporated in first phase comprising of (i) Polynomial regression for missing peaks, (ii) spectral counting, a relative quantitation approach, (iii) extracted-ion chromatogram (XIC) used for simple peak detection thus quantitation. We have also taken its implementation from CPU to groundbreaking and emergent Graphical Processing Unit (GPU) technology. Further our aims include developing a top-down protein identification and quantitation engine implemented in the ASP.NET framework, which is a GPU based, open source, open architecture and publicly available web service that will use NVIDIA’s CUDA toolkit for implementing state-of-the-art algorithms for this purpose.

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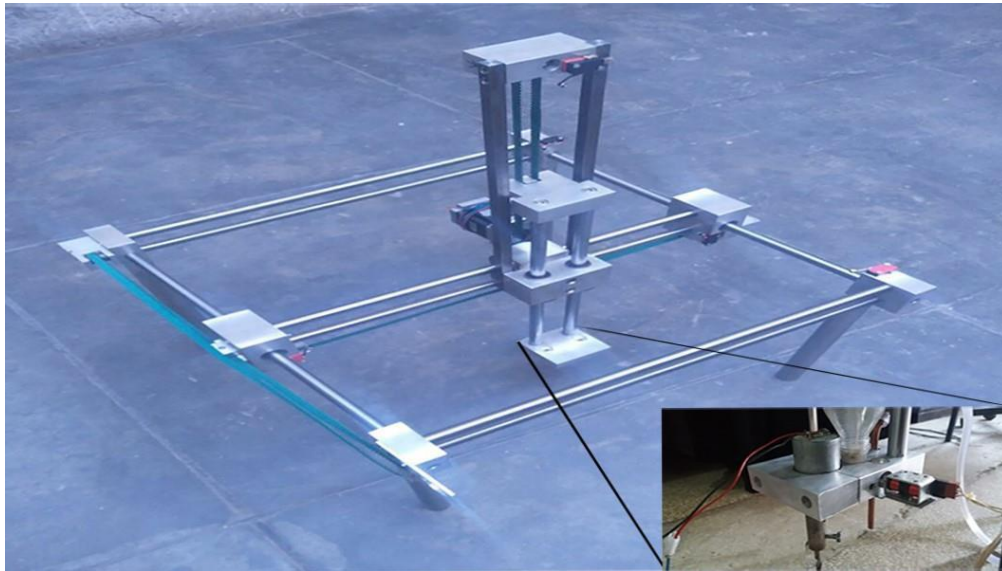
Title

Design and Development of Autonomous Farming Robot

Project Advisor: Dr. Muhammad Tahir

Abstract

Due to scarcity of energy resources and rapid growth of population, the need for finding new, more efficient and sustainable method for cultivation and food production must be increased in order to feed the world. To alleviate this process, we are designing a system for precision agriculture; a highly effective farming strategy that allows farmer to better allocate input (e.g. seed and fertilizers) and increase productivity, while minimizing environmental impact. This embedded system is capable to reduce manual monitoring of the field; owing to its motion in multi dimension, data collection using Wi-Fi link and remote sensing. Moreover, its capability of performing sophisticated task such as ploughing, precise distribution of seed, watering and spraying of pesticides, reduces the need for sufficient skilled manpower and therefore, increases the yield. An embedded system is proposed consisting of two parts, a machine end and a control section, which are intercommunicated using wireless technologies. The implemented functionalities are 3D Motion, Data acquisition via Sensor, Monitoring and Wireless Communication. In this project, we made an effort to overcome some problems in agriculture. The rapid growth in the industries is influencing the labour who are situating in the villages to migrate to the cities. This will create the labour problem for the agriculture. As the prices of commodities such as food grains, fuels, cloths and other essentials of daily life is increasing rapidly the labour demand for the more wages from the owners. These factors influencing the farmers who are interested in agricultural activity to leave their land uncultivated. By implementing this project in the field of agriculture, we can help the farmers in the initial stage of cultivation i.e. during the seeding, watering and fertilizing. The goal is to accelerate the speed of work by using robot and to give farmers a more complete picture of the current and historic crop status, in order to foster better decision making. It is expected that such decisions will benefit both farming and irrigation by saving time and resources.



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Title

HealthNext - Patient-centric scientific wellness backbone for next-generation national health-care in Pakistan

Project Advisor: Khalid Mehmood-ul-Hassan

Abstract

Pakistan ranks 149th out of 188 in provision of health care facilities to its citizens as per the UN health goals. With an annual budget of 54 billion PKR (1 USD = 105 PKR) for health-care which is around 0.002% of national GDP, even the basic primary health care services are not guaranteed to each individual in certain parts of the country. In contrast US, UK and Germany spend over 3.5 trillion USD, 164 billion USD and 236 billion USD, respectively, on health care alone, annually. The per capita allocation is further squeezed by a booming population of over 220 million that has left the entire nation reeling to even maintain the current percentage GDP spending on health. Rapid developments in health information technology have provided a direly needed window of opportunity to overcome this incumbent health care debacle in Pakistan. Pakistan now needs to leverage the advancements and innovations in this sector towards provision of high-quality ubiquitous health care services to its population. In this project, we propose to contribute towards this goal with the development of a sensor-integrated self-diagnosis software suite packaged as a smartphone application which is seamlessly integrated with the primary, secondary and tertiary health care centres across the country. We have integrated state of the art clinical guideline ensembles obtained from Guidelines International Network (GIN) consortium with comprehensive clinical knowledge from salient global health providers for *Diabetes*, *Hepatitis c*, *Pneumonia* and *Cardiovascular conditions*. These four conditions comprise the bulk of clinical mortalities in Pakistan. This fact coupled with the prevailing scarcity of clinical consultant positions the proposed project to induce a disruption in Pakistani health-care ecosystem. The core of the project is formed by a mobile application for self-diagnosis which is driven by a cohort of machine learning techniques such as Bayesian network inference, neural networks and support vector machine working off the GIN provided clinical guidelines. Application usability is enhanced by provision of multiple local languages and audio/visual translations or aids. Complementing the app is a seamlessly integrated set of wearable biosensors that continuously input numerical and categorical data for use in diagnosis.

A question engine then performs sensor data fusion and prompts the subject for requisite information. Data and diagnoses thus formed are collected on cloud for deep learning of critical parameters as well epidemiological trends during training. With the increase in subscribers and resultant increase in available data sets, the sensitivity and specificity of the system is set to improve and lead to updates in underlying models. In conclusion, we have proposed a next-generation health-care system by shifting focus to patient self-diagnosis, instead of primary or secondary health care units, by building upon ever improving data mining techniques and wearable biosensors for provision of health-care to every citizen of Pakistan.



Figure 1 Diagnosis test case for diabetes

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Title

Smart Baby Cradle (An Automatic Baby Soothing and Monitoring System)

Project Advisor: Prof. Dr. Suhail Aftab Qureshi

Abstract

The cornerstone of our project is Women Empowerment; by providing them with an Automatic Baby Soothing and Monitoring System, with a special focus on developing countries i.e. Pakistan, India, Bangladesh and other South Asian countries. This project is the personification of a Smart Baby Cradle, brought about by integrating distinctive features i.e. automatic cradle swing (using cry detection system), interactive toys and camera (for monitoring purposes), in a single unit. This project entails the concepts of electronics, machine learning and mechanical motion; employed to create a positive and progressive impact on society. This Automatic Baby Soothing and Monitoring System detects voice around the cradle, classifies it and decides whether to rock the cradle or not, based on the classification. Moreover, if crying doesn't stop, it employs music and interactive toys; to soothe the baby. In the event of constant crying, it also has a fail-safe mechanism. In such an event, it generates an alert on mother's cell phone, informing her that the child is crying constantly and she is needed right away. In this way, it aspires to bring certain amount of relief to mother, and help her balance work and domestic life.



This Automatic Baby Soothing and Monitoring System aspires to achieve certain objectives. It will provide a smart solution for child-care industry. It will help working women balance their work and domestic chores; so that they can work in tandem with their male counterparts, for the progress of their country. It will be a step closer to UN Sustainable Development Goal #5 - Gender Equality, which in turn, will brighten up the positive image of our country. Along with the increasing digitalization in every walk of life, it will most certainly play an important role to achieve a global digital future. It will eventually create a positive impact on society by empowering the women to a certain capacity.

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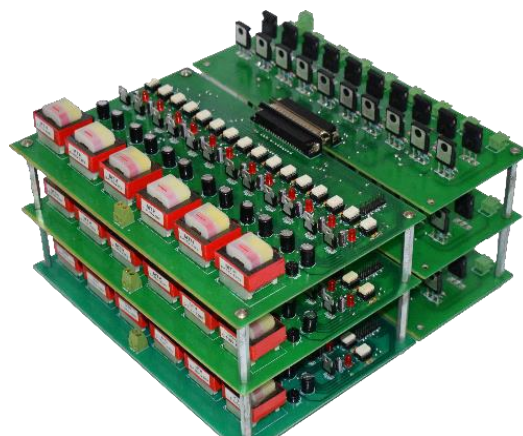
Title

Multilevel Inverter

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

The project presents a new cascaded Switch Ladder Multilevel Inverter Structure for making the efficient use of renewable energy sources. Different DC links are used to feed the inverter to get the sinusoidal output consisting of 289 levels resulting into a waveform with less than 1% Total Harmonic Distortion (THD). Optimization has been done to achieve maximum number of levels with minimum number of switches and DC sources. The objective is to minimize the switching losses and voltage stress on electronic switches and to make the inverter cost-effective with the removal of expensive active filters for producing low harmonic distortion in the output and to make it highly efficient for grid connectivity. As Pakistan is a country facing with severe energy crises. So, need of hour is to look for the new energy generating resources and to improve the efficiency of presently available resources. Renewable energy sources such as Photovoltaics, Wind, Low Head Hydro and Geo-Thermal are the expected energy resources of the future. The general function of multilevel inverter is to synthesize the desired AC voltage from several levels of DC voltages. For this reason, multilevel inverters are ideal for connecting either in series or in parallel to an AC grid with Renewable Energy Sources. Moreover, there will be no need of human efforts for Grid connectivity as it will be auto-controlled. User-friendly interface will allow everyone to visualize the ongoing operations. All the necessary parameters of grid supply and the inverter power flow will be monitored in the real time on Graphical User Interface in NI LabVIEW and it will be automated wirelessly by the mobile phone application with the computing support of NI myRIO FPGA.



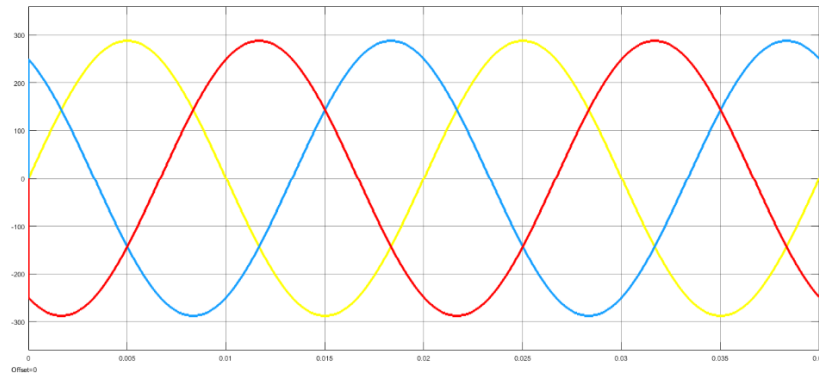


Fig: Three-Phase Output of 289 Level Inverter

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Title

Intelligent Zero Net Energy with Hybrid Solar System

Project Advisor: Dr. Tahir Izhar

Abstract

Our project is basically based on Hybrid Solar System Design. Hybrid System is a combination of grid tied and standalone PV system. Design will be demonstrated through hardware as well as software. We designed an inverter to convert AC to DC. We linked the Solar Source and utility grid main to our load through a net meter. We made a system in which we have three sources to serve the load, one is utility grid second is Solar Panels and third is battery backup. Solar Panel is taken as input and its voltage and current variations are sensed using them the maximum power point tracking is done and a pulse is generated. Pulse was used for switching in a DC-DC isolated boost converter. Then an inverter is used to invert DC to an AC. This AC is synchronized with the utility grid to achieve same voltage level and frequency as that of utility. Afterwards this synchronized AC is given to net meter to have bidirectional flow. In case of islanding our system will shut down and the load demands will be fulfilled through a backup system. Load Management is an important feature of our system in which switching is done and load is managed in such a way that system remains economical and efficient. Load Management is done that performs switching and saves more energy as compared to existing systems and adds efficiency to our system. After design of solar grid and net meter we will come towards backup system. For this we will design our backup keeping in view the minimum cost and high efficiency as compared to already proposed solutions. We will start our project in summer and will complete first part till end of seventh semester and then we will be working on backup source. Our project will provide efficient utilization of Solar Energy, cost reduction of existing system and minimum energy usage through switching.

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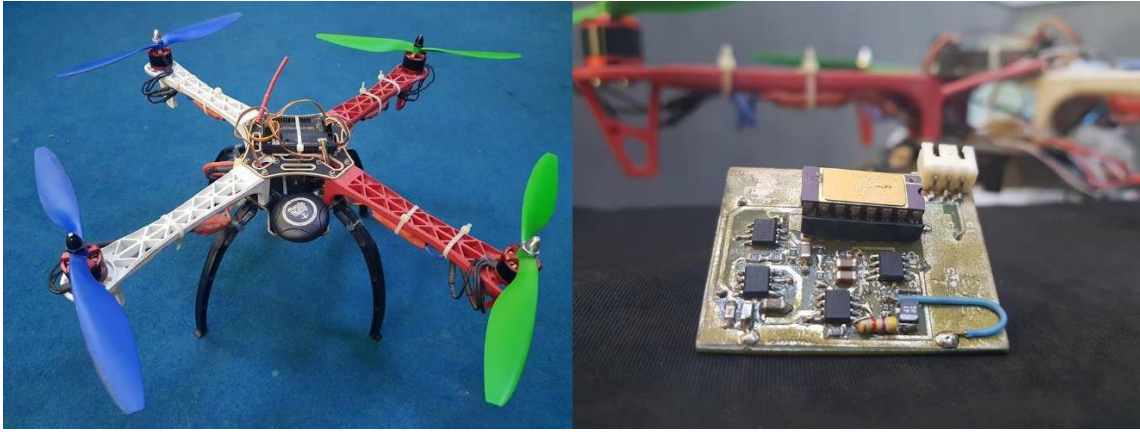
Title

EEG Controlled Quadcopter

Project Advisor: Arsalan Abdul Rahim

Abstract

Human Brain operates by the interconnection of billions of neurons. Every activity/thought result in an electrical charge in brain. This electric charge is transmitted by the extensive network of neurons and activities/functions are performed on cellular level. Every single operation in the body is commanded by the brain in the form of electric signals/waves. Different thoughts result in different kind of waves, varying in amplitude and frequency. These signals, also known as EEG signals, are in the range of micro-volts. If we obtain these signals and process them, different activities can be performed on the basis of distinguished signals. In our project, we are aiming to control a quadcopter using EEG signals. In order to acquire EEG signals we've developed a portable EEG board that fetches the brain signals through different electrodes placed on the scalp of a person. This board is not only portable but also low cost as compared to other commercial headsets, and gives similar quality results. The acquired raw EEG signals are then amplified, filtered and converted into digital signals through an analog-to-digital convertor. Distinguishing features, such as power spectral density and FFT, are extracted from purified signals using a microcontroller i.e. RaspberryPi. After this, machine learning algorithms are applied to classify the signals on the basis of these features. Thus, signals are classified into left, right, forward, backward, up and down. On the basis of these classified signals, PWM signals are generated through RaspberryPi and applied to the potentiometers present in the remote control of quadcopter. The remote control transmits signals to the controller of quadcopter and hence the flight of quadcopter is controlled. Thus, the flight of the quadcopter can be controlled by EEG signals. Quadcopter flight control is one application of EEG signals. This method of EEG signal acquisition and processing can be used for various purposes. For example, diagnosis of brain related diseases such as, epilepsy, Alzheimer's disease, seizure disorder, dementia, seizure, etc. Another application of EEG signals is operating machines/robots. This application is particularly useful for disabled and paralyzed individuals. We have operated an electronic wheelchair and a robotic arm using EEG signals. So using this technology, any type of action can be performed by mere thoughts.



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Title

IP Core Design of Encoder and Soft-Output Decoder for Polar Codes

Project Advisor: Dr. Ubaid Ullah Fayyaz

Abstract

Polar codes are mathematically proven to achieve Shanon capacity. Due to a sufficiently high channel achieving capacity and polar codes is believed to surpass turbo codes in communication technology. The encoding and decoding algorithms have been developed to work on MATLAB or on a microcontroller processor. But it gives very low throughput which was a significant constraint for its effective implementation. So we have designed Encoder and Decoder Cores on register-transfer level (RTL) and tested on Field Programmable Gate Array (FPGA) device. The state-of-the-art soft-output decoder for polar codes is a message-passing algorithm based on Belief Propagation (BP), which performs well at the cost of high processing and storage requirements. We propose a low-complexity alternative for soft-output decoding of polar codes that offers better performance but with significantly reduced processing and storage requirements. We have designed a high throughput encoder for polar codes with parameterized input data. The design maintains maximum throughput with low hardware complexity by employing both combinational and sequential logic cleverly. A polar code encoder was implemented since the input to the encoder at the sending end should match the output of the decoder at the receiving end. This encoder has been used to test the decode also. We have designed parameterized encoder for 2^n input bits, where $2 \leq n \leq 15$. Thus this encoder works for 4 to 32,768 bits input. Similarly, the hardware for the decoder was designed utilizing as minimum resources as possible. This decoder is parameterized for any number of iterations without addition of any hardware complexity. The design of cores was first simulated on ModelSim and then tested on Xilinx Spartan-3 FPGA. Glue logic was developed to test the cores which provide interface between our cores and computer by employing Universal Asynchronous Receiver Transmitter (UART). Thus we compared the data from our cores with existing algorithm output in MATLAB by getting data out of FPGA. We have tested our cores for at least 50,000 random cases.



Fig: Xilinx Spartan 3 Board, used for hardware testing of cores

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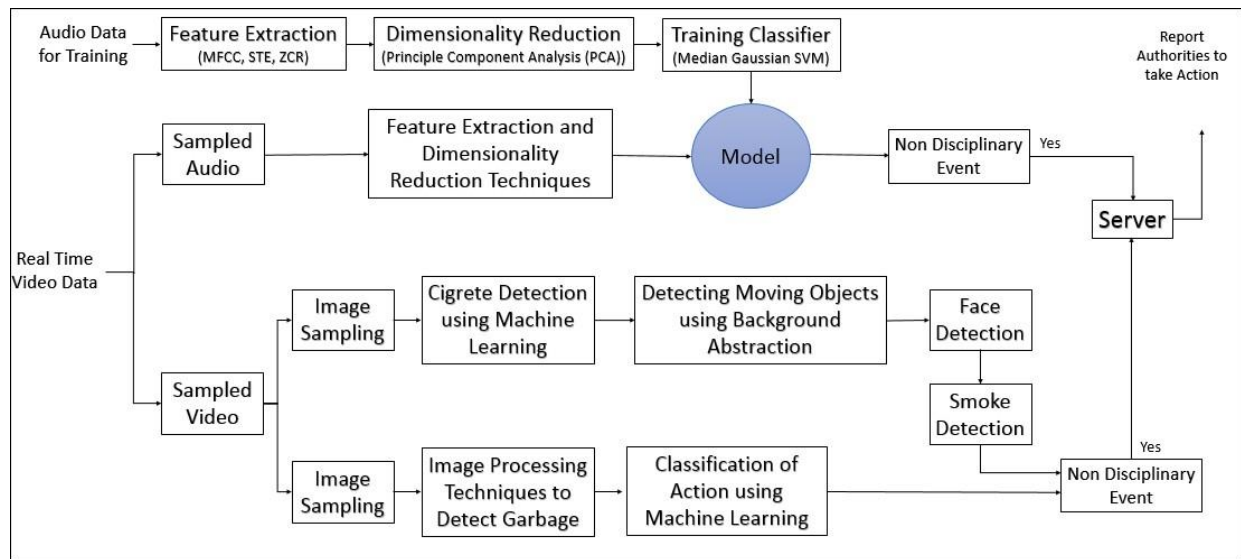
Title

Intelligent Discipline Maintenance System

Project Advisor: Dr. Kashif Javed

Abstract

Intelligent Discipline Maintenance System monitors non-disciplinary actions like door slamming, whistling, screaming, smoking and garbage throwing. The system is divided into two major parts. One is responsible for audio processing and other for video processing. The audio detection and recognition system receives real-time audio from a microphone, use standardizing procedures like Median Filters to normalize it, extract its features and form a feature matrix for that sound sample. The extracted features are Zero Crossing Rate (ZCR), Short Time Energy (STE) and Mel Frequency Cepstral Coefficients (MFCCs). In next stage, Principal Component Analysis (PCA) is used to extract more descriptive features and reduce dimensionality of the feature matrix. Finally, Support Vector Machine (SVM) using Gaussian kernel is trained and later used to recognize sounds like door slamming, whistling and screaming. The video detection and recognition system detects smoking and garbage throwing using image processing and machine learning. It receives real-time video data and detects moving objects in the captured video frame using background estimation method. Template matching is performed to detect garbage or cigarette in the captured frame. In case of smoking event detection, person's face is also detected using Haar Classifier. The smoke detection is carried out and the event is declared as smoking or not smoking accordingly. When some non-disciplinary action is detected, the system automatically reports the authority to take further actions.



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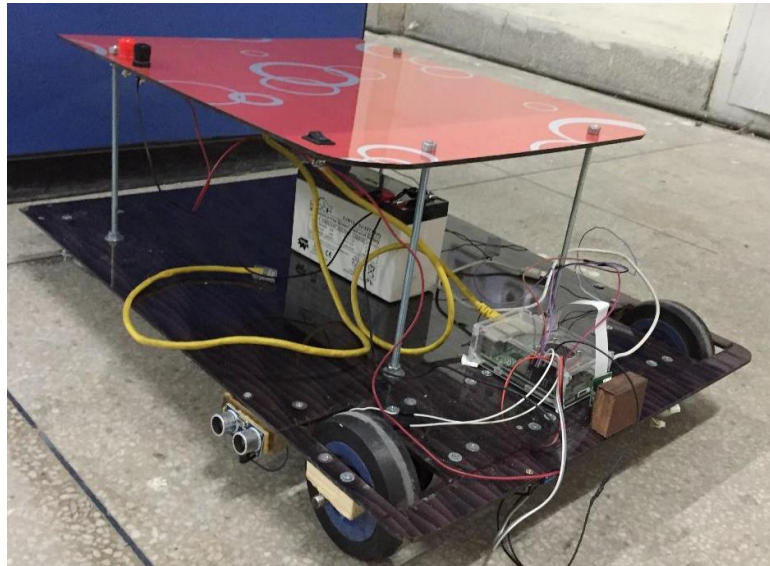
Title

Wireless Communication Based Vehicle Automation Using Optical Character Recognition (OCR)

Project Advisor: Mr. Salman Fakhar

Abstract

Automation is the spark of the industry and every industry is willing to invest in automation. This application-based project can be used for fixed areas, like factories or universities to transport payloads and equipment. We have used Optical Character Recognition (OCR) technique as it is cost effective. Optical Character Recognition is the process of converting text in an image to editable text. The character recognition is achieved through segmentation, feature extraction and classification. We have made the system wireless by using WLAN. Raspberry pi can establish a connection within 32 meters range which is typical for WLAN. Controller is driven by a power bank and a 12 V battery is used to provide power to the DC geared motors of the robot. Power bank and battery are fitted within the assembly of the robot and there is no need to provide any wired connection from external source. When we send the command through LabView to Raspberry pi, the robot will start moving towards its specified destination. The on-board camera will take images of the direction boards and feed them to Raspberry Pi which will extract the text from the image and will decide its direction (left/right) according to the extracted text. We are using pi camera also for live streaming through VLC plugin on LabVIEW. So, this project can be used for surveillance purposes as well. We are using three ultrasonic sensors, one on the front and two on the sides. The sensor on the front will help in obstacle avoidance and the sensors on the sideways will keep the robot on a straight path so that it may not collide with a wall or any other object. When the extracted text from any image matches with the given command, the robot will stop there and will wait for further instructions.



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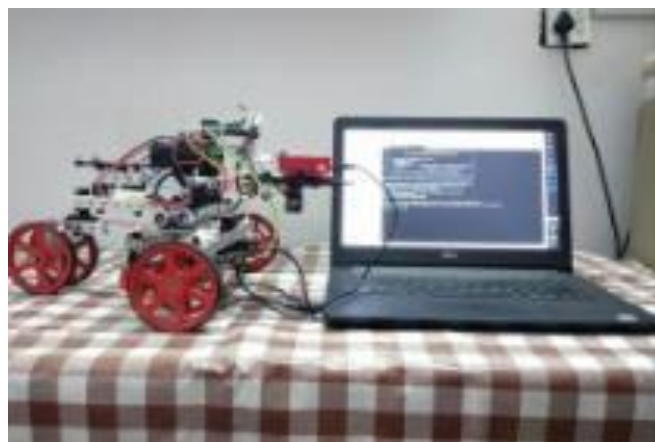
Title

Blind Assistant Robot

Project Advisor: Dr. Kashif Javed

Abstract

Nearly 2 million people are blind in our country Pakistan and almost 6 million of the people are partially impaired and cannot see the world around them clearly. Number of Blinds is expected to cross 3 million by 2020. More commonly white cane is being used to help the blind individuals. Moreover, I based glasses are also employed in the major countries like United States of America. We are thus trying to develop a mechanism that will help the blind people in their daily activities and they will be able to move and go freely anywhere they desire regardless of the any obstacles in the way. The aims of our project are as follows. First, to navigate a blind person to his destination within the given map. Second, detect any obstacle in the way and navigate through another path. Third, to control his appliances via voice commands. Destination will be given via robot, obstacle detection will be done via range finder, home automation will be done via GSM Module and position of appliances and controlling them via voice commands will be done via push button. Researchers have addressed the localization problem for mobile robots using many different Kinds of sensors, including rangefinders, cameras, and odometers. In this proposal, we consider a Robot that will guide a visually impaired individual to its destination safe and sound using precise Path finding algorithms that include A* Algorithm, D* Algorithm and a bit of D* Lite. These Methods have gained popularity because of their reduced error rate and amazing efficiencies of Finding the obstacles. Further this paper discusses a very brief summary of raspberry pi 3 that Will be used. The visually impaired person will be able to walk freely and reach its desired Location with utmost accuracy.



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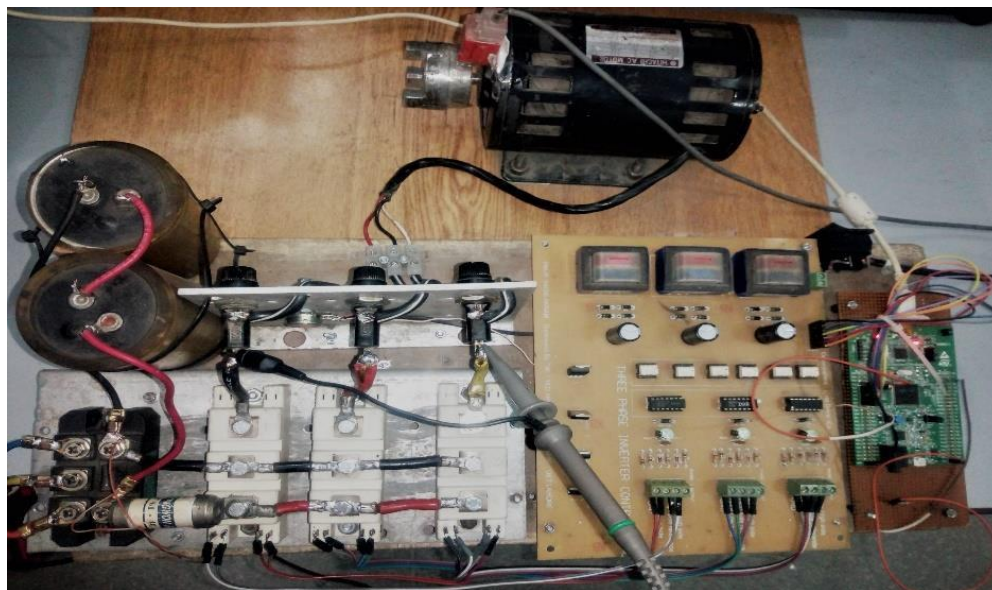
Title

Solar-Powered AC Motor Drive Using Isolated Boost Converter

Project Advisor: Miss. Noor Ul Ain

Abstract

The project demonstrates the speed control of a three-phase induction motor using isolated boost converter. The converter employs the push-pull topology for continuous source current from the renewable solar energy source. To have more gain and high energy density in the dc to dc converter the output voltage of the solar source is boosted up by using a high frequency transformer. Also a voltage feedback loop is implemented in the converter in order to keep the output dc voltage constant. For an efficient speed control of the three-phase induction motor, V/f speed control method is employed with the Space Vector Pulse Width Modulation(SVPWM) technique in the inverter. In parallel, a Variable Frequency Drive(VFD) is made for a three-phase induction motor rated up to 50 hp or below. The VFD is intended to achieve low value of starting current for the motor and also a complete control on the motor's speed. Real-time power quality monitoring is done using NI my RIO to improve the performance of converter as well as inverter qualitatively and to reduce losses.



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Title

Power System Stability Using FACTS Device: Dynamic Voltage Restorer

Project Advisor: Prof. Dr. Tahir Izhar

Abstract

Sensitive loads require an uninterruptible supply of voltage and they are particularly prone to voltage sags. As variations in load voltage can cause severe damage to them and sometime complete failure of systems. This project presents an improved voltage control method that can compensate for voltage sags and swells in the power system and maintain the voltage in desired range. The most severe problems in the power system are voltage sags, swells, harmonics and spikes. In order to overcome these problems many devices including DVR is choice of interest. DVR is most efficient and effective modern custom power device which is used in power distribution networks. DVR basically employs a series of voltage boost technology using solid state switches that injects voltage into system; in order to maintain the system voltage at rated value. DVR can also add other features like: line voltage harmonics compensation, reduction of transients in voltage and fault current limitations. In our technique, during the times of voltage sag or swell, the source voltage is made to pass through an IGBT connected in AC RMS voltage controller configuration which chops the sine wave according to a certain value of duty cycle decided after comparing the measured voltage at load end with the desired value that is 230V RMS. According to error in desired and sensed voltage, PWM is generated according to which sine wave is chopped. This chopped sine wave is then fed to an auto-transformer which doubles the voltage at its output, this is compensated voltage. A filter at the output gets rid of the harmonics in the chopped wave as switching frequency of PWM is as high as 3khz. This filter produces a pure sinusoidal waveform of required magnitude at the load. This technique is more effective in the sense that, it uses only less switching devices and has a very quick response during abnormal conditions.

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DC Fault Tolerant Modular Multilevel HVDC Converter using Switched Capacitor Submodule

Abstract

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Title

Induction Motor Drives of An Electric Car

Project Advisor: Dr. Tahir Izhar

Abstract

The project presents the induction motor drives of an electric car. The foremost requirement for this technique is the design of three phase inverter. The inverter consists of Exb841 driver IC, IGBT module and STM32F407VG. Gate driver IC has dual functionality, used for isolation from STM32 if current exceeds its rating .. IGBT modules are used which are of high rating 600V and 100A as we need high voltage to drive three phase induction motor . IGBT is used for high power low frequency mechanisms. A MATLAB code is developed for 180-degree conduction, 120 degree conduction and also for sine PWM technique PWM technique is used to generate pulses and these pulses are applied at input of the gate driver IC. The gate pulses obtained are applied to IGBT module and output ac voltage is obtained. The three phase ac supply is used to run the three phase induction motor. V/f control method is used for **drive control** because of its versatility. In order to maintain flux constant if voltage is increased then frequency should be increased else there will be saturation and core losses. Open Loop V/f control is successfully implemented on a three-phase Induction Motor. Torque needs to be found constant for various rotor speeds. The closed loop V/f control of motor is implemented by PID of STM32f4 which gives a way of controlling the speed of motor, by keeping maximum torque constant . Moreover, in order to control navigation of motors of a car, a Bluetooth module HC05 is configured to STM through serial communication. Data is sent using mobile app to HC05 and STM will execute following commands according to the instruction sent from Android and then it will be able to control the direction i.e. left right motion of a car.

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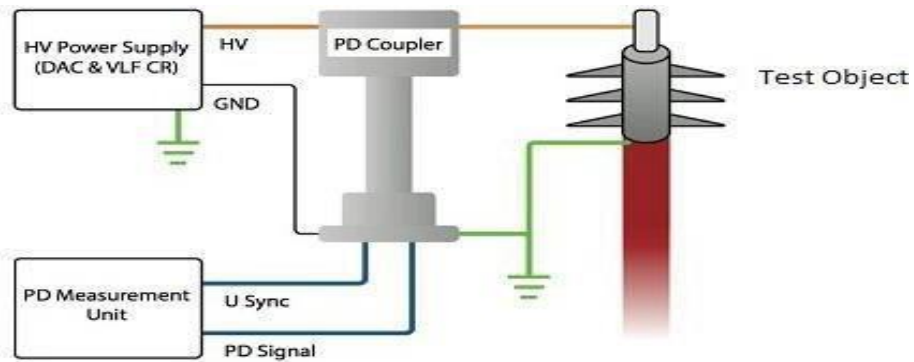
Title

Deployment of Laboratory Work Bench for Partial Discharge Measurement of Electrical Equipment

Project Advisor: Dr. Farhan Mehmood

Abstract

Nowadays it becomes more and more important to operate the electrical equipment efficiently. To achieve this, condition-based maintenance is a good way to reduce maintenance time and cost. For condition-based maintenance, partial discharge is an important tool to indicate the insulation conditions. Partial discharge (PD) is short release of current caused by the buildup of electric field intensity in a finite region. This localized current manifests itself as an electrical pulse that is measurable at the output of the test object. PD event occurs due to voids, air gaps and gas bubbles present in insulation. The void region has a lower dielectric constant than the surrounding material, creating a capacitance. A partial discharge can then occur when the electric field difference across the void exceeds minimum breakdown field strength. There are many techniques used for PD detection. The apparatus present in high voltage lab is using “electrical detection” technique. In this method, a high voltage is applied across the test object along with a coupling capacitor in parallel with it. The charge that is lost by void is provided by capacitor and this apparent charge is measured. Based on this charge, the severity of PD event is judged. During aging of a defect in high voltage electrical devices, different PD mechanisms can occur. PD detection can be used as a tool to judge the state of the device and the quality of its manufacture. We will only test the PDs occurring in transformers and power cables in this project. In this project, the PD measuring set available in high voltage lab of UET is deployed. PD equipment present in the high voltage laboratory of the university is not functional since 2002 due to some unknown reasons. Also, we have no helping material and staff to operate this equipment. Our task is to bring this equipment into working condition to enhance the testing capability of high voltage lab and the revenue generated to university each year.



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Title

Efficient Energy Metering with Maximum Demand Indication

Project Advisor: Mr. Salman Fakhar

Abstract

Efficient and smart metering is the trending field in power engineering in this era. The term efficient metering implies the fast and accurate measurement of energy in efficient and economical way. This project develops a meter that measures the RMS voltage, RMS current, power factor, active power, reactive power along with the on time indication of maximum demand to adjust load accordingly, preventing penalties and heavy bills. The meter can be utilized both at the domestic and industrial scale with the slight modifications for both sectors. The voltage is stepped down using transformer then rectified using bridge rectification and fed to the analog to digital (ADC) port of STM32F407VGTx microcontroller. The interval of at least 300 samples is summated after squaring each sample then divided by no of samples and multiplied with the factor of stepping down to get the accurate value of RMS voltage. The RMS current is measured in terms of voltage using Hall Effect sensor ACS712. The Hall Effect sensor is installed in series with the load generating an AC output voltage corresponding to the current with an offset of 2.5 volts. The output voltage of ACS712 is maintained in 0-3 volt range using diodes in series and fed to the ADC port of STM32F407VGTx. The offset is removed in coding and the same topology that of voltage measurement is used and that value is multiplied with a factor to get the accurate RMS current value. The zero crossing of voltage and current waveform is detected to determine the phase angle between voltage and current to get the power factor. The real, reactive and apparent power is evaluated by implying the conventional logics in the microcontroller. The power is then converted into the energy by multiplying with the timing factor. The parameters are displayed on the LCD and the microcontroller is synchronized with the laptop for the real time power and energy monitoring. If value of the power factor and energy is 90 percent of the specified value then the user will be alerted through message that maximum demand is about to reach and if it has crossed the specified value the user have to pay penalty and heavy bills.



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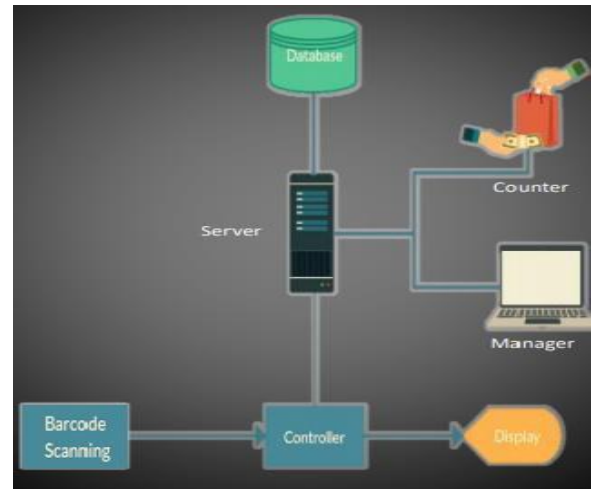
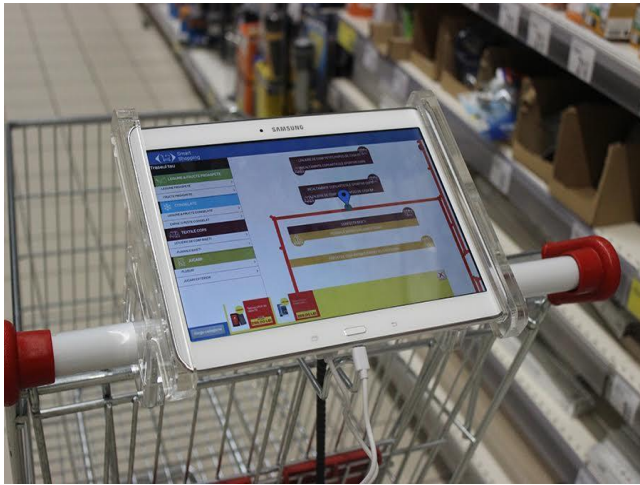
Title

Smart Shopping Cart

Project Advisor: Dr. Ubaid Ullah Fayyaz

Abstract

In modern era, technology is shaping each and every aspect of human life, thereby leading to more efficiency and reliability. Many shopping malls are incorporating technological advancements for increased convenience towards customers. For smart shopping malls, smart shopping cart is an essential requirement which will solve certain problems commonly faced in a shopping mall like dissatisfaction because of long waiting time for check-out process and involvement of a lot of man power. The shopping cart as a package consists of a microprocessor, barcode reader, LCD screen, wireless card, and power supply. A barcode scanner is used to scan the barcode of the item to be purchased. After scanning, the system compares the item with database using a Wi-Fi server & the details (name, price, and quantity) of that item are displayed on LCD screen and purchase list is updated accordingly. The smart cart has amazing features like searching the item to check its availability and price, showing daily sales report, creating shopping list, and displaying trending items. The dominant feature of the product is increased managerial control, by which manager will be able to see the statistics of carts designated by cart number, the quantity of available products, and the graphical representation of daily sales report. There are two levels of protection against theft, hence when a customer places a product without scanning; it is detected via anti-theft techniques. When the customer is taking cart through the shopping mall without scanning for a specified period of time, advertisements can also be displayed on LCD screen. The advertisement will be disappeared when any of the products is scanned by the customer. On pressing “end shopping” button, the complete details and purchase list of that specific cart is sent to the cashier and the only thing the customer has to do is making payment and collecting his cart’s merchandise from the counter. The smart shopping cart depicts the involvement of technology in revolutionizing the shopping experience of customers and making the management task much reliable and easy for manager.



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Title

ATS and Synchronization at Smart Grid

Project Advisor: Dr.Sohail Aftab Qureshi

Abstract

ATS Synchronization approach is implemented in this project. An automatic transfer switch (ATS) is an electrical switch that switches a load between two sources. It is often installed with a backup generator, so as to provide temporary electrical power in case of mains electrical power failure. Synchronization modules will be used for the synchronization purposes. The purpose is to obtain a reliable Power System in which seamless transition between two sources is obtained to ensure continuous electrical supply to avoid blackouts. ATS Synchronization function involved in this project includes steps like A short while before normal power source fails; the genset is synchronized with the main power supply. When the main power source fails the transfer switch breaks its connection to the mains and shifts the electrical load to the emergency power source. When utility power is restored, the transfer switch returns the load from the generator to the normal one. GC400 mains is the perfect solution for the management of a genset working in parallel to the mains by the internal power regulator. Soft loading and unloading is automatically performed. GC400 mains a powerful genset controller designed for synchro/parallel applications. Based on the load demand, the controller is able to start or stop the genset. All ATS synchronization systems include load sharing function to ensure balanced use of the different gensets. Load sharing function is available as option: when energy demand is low, only on genset starts the other remain in standby unless the demand increases. According to load demand the utility grid and genset are synchronized through module and hence uninterrupted supply is available to the load.

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Title

2D Simultaneous Localization And Mapping Based Autonomous Rover With Environment Surveillance

Project Advisor: Mr. Arsalan Abdul Rahim

Abstract

The autonomous navigation of robots in unknown and uncontrolled environment is a huge challenge because it requires a set of subsystems to work together. Simultaneous Localization and Mapping (SLAM) based robot addresses the problem of creating a map of an unknown environment having static or dynamic landmarks and simultaneously locating its own position in the map. Localization and mapping are interdependent so doing both simultaneously is a difficult task. Laser Sensor is being used to measure the distance of the objects in the environment. The Gyroscope and speed-sensor are used for odometry reading to estimate the approximate position of the rover in the environment. Occupancy Grid Mapping Technique is used to map the surrounding environment in which map is divided into grids having different weights based on occupied and free space. Particle Filter based Localization is used to localize and find the actual most certain position of the rover. In Particle Filter, many instances of the rover are created and their correlation with the map is calculated to find the best position. A solution to the SLAM problem would help a robot in forming a complete map of the environment without any human assistance. Once it generates the map, it can choose how to traverse the surroundings by interpreting the map with the help of particle filter localization, or a location can be chosen at the user's end for where the robot should go. The robot also has environment monitoring capabilities using Temperature sensor and Luminosity sensor. These sensors provide information about the physical conditions of the environment such as the temperature of surrounding objects, ambient temperature and intensity of light. The design of the structure itself is to allow it greater maneuverability in rough or uneven terrains. This is made possible by using Rocker-Bogie mechanism. A SLAM based robot has applications in many fields like self-driving cars, package delivery, cleaning, agriculture, surveillance, search and rescue, transportation. Note that all these applications occur in uncontrolled and unknown environments.



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Title

Maximum Power Point Tracking Using Boost Converter

Project Advisor: Sir Umar Tabriz Shami

Abstract

MPPT using BOOST converter is a type of power electronic DC-DC converter intended to extract Peak power the solar panel can provide based on the principle of maximum power transfer theorem according to which the maximum power from source to load occur when there is an impedance matching between the two. It can also be interpreted in term of ohm's law as to extract the required power just change the load impedance by changing the IV characteristic either by increasing the voltage across the load or by decreasing the current thereby adjusting the load impedance to the desired level of load required for the desired power and this is done by using boost converter that is supposed to increase the DC voltage level up by decreasing current through the load. As the solar panel power is constantly varying depending upon the surrounding conditions such as temperature, weather and solar irradiance so the MPPT process must be smart and automatic and for that purpose we will implement some smart and intelligent device like microcontroller to constantly chase the peak condition and to operate the PV module at that condition. There are different algorithms governing the MPPT but we decided to use perturb & observe method as it is simple to program as well as to implement. It is also known as hill climbing method. So our project is actually a hardware implementation of MPPT algorithms. This project can greatly reduce the cost as well as the design of PV system e.g a 12 v, 100 watt solar panel can easily run a 36 watt DC fan as rated but it cannot run two fans simultaneously at rated speed as it is intended to. This is because the voltage drop drastically as we connect two fans so by using MPPT based technique we can save our money ie now we can run two or three fans with a single solar PV module.

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Title

Voltage Stability through FACT Devices

Project Advisor: Dr. Sohail Aftab Qureshi

Abstract

The national grid of Pakistan has been facing power crises since last decade primarily due to lack of sufficient generation to meet the required load demand. Realizing this fact, the government of Pakistan gave incentives to generation developers both in public and private sector to overcome the generation shortage. Thus, a lot of generation is being added in the national grid and it is expected that generation deficit will be overcome in year 2018 and onwards. The problem currently being faced in the grid system is the low voltage profile due to inadequate reactive power supply in various load centers. The low voltage problem has also seriously affected reliability of power supply during peak load condition. This problem will aggravate when load demand will grow further in future. The unnecessary flow of reactive power also results in increase of transmission system losses. The solution to handle the low voltage problem and manage excessive reactive power flows during normal and outage conditions is the effective use of shunt type devices which include fixed capacitors to provide reactive power during steady state conditions; and Switched Capacitors and/or Static Var Compensator (SVC) to provide reactive power during outage conditions to keep the voltage profile within limits and save the grid system from collapse. The same problem is observed in the QESCO network of Pakistan. Load centers are remotely located, the transmission lines are very long and generation centers are few and are unable to provide the necessary reactive power to the load centers. The project we are working on, will solve the voltage stability problem of the specified region. Our project will highlight the applications of FACTS (Flexible Alternating Current Transmission Systems) devices (like different types of series controllers, shunt controllers, series-shunt controllers etc) in Power Systems and the software to be used for this purpose is PSSE (Power System Simulator for Engineering). FACTS devices are used nowadays to enhance the controllability and increase the power transfer capability of the transmission systems. We will simulate and optimize the power system performance through the application of suitable FACTS devices. We will analyze the system through load flow and transient stability analysis.

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Title

Solar Powered Three Phase Inverter Using Space Vector Pulse Width Modulation (SVPWM)

Project Advisor: Prof Dr. Suhail Aftab Qureshi.

Abstract

As the humankind is rushing towards stronger economies, the world is running of its available resources. Therefore, the need for renewable energy resources has increased. Solar energy is one of most important, cheap and environment friendly form of renewable energy. This alternative energy can significantly contribute with the reduction in the emission of greenhouse gases in the atmosphere, which attack the environment deeply. In this project we are going to use PV system which will take energy from sunlight and convert it into useable form of energy. But the problem arises, when the position of sun keeps on changing throughout the day, which decrease efficiency drastically. So, in this project we are going to track the position of sun throughout the day to increase efficiency. Then as the environment of some specific location does not remain same so maximum power point tracking of PV module is also deployed in our project, which will track the maximum power point using buck boost converter to energy from module efficiently. Output of buck-boost converter is then boosted up to 560 volts with isolated boost converter using push pull topology. So that inverter gives complete line to line WAPDA voltages which is 415 to 420 volts at output. Energy from PV module is DC, but mostly our household items consume AC Power. So, we have to convert this DC from PV module to AC by using Inverter. Because some energy is lost during conversion, so we have to use technique which does so efficiently, space vector pulse width modulation is one of most efficient technique, so we are going to use this technique in our project. Inverter converts DC to AC using space vector pulse width modulation technique(SVPWM).

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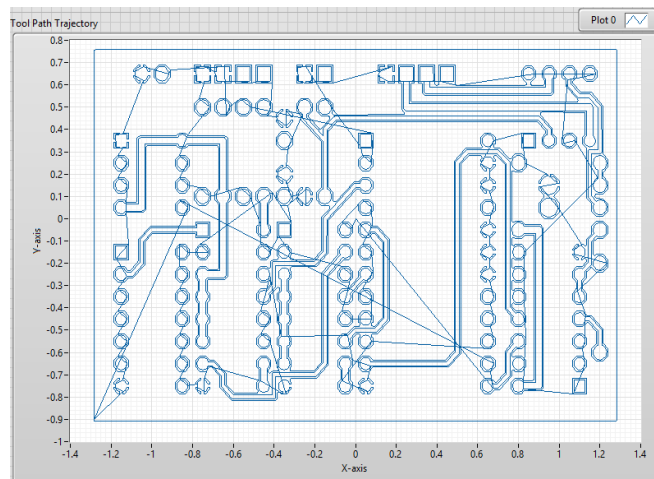
Title

3-D PCB Printer

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

The project is based on Printed Circuit Board fabrication by CNC (Computer Numeric Control) machine executing pre-programmed sequence of control commands, thus automating multiple machine tools. The idea is to present a local low-cost solution of fabricating Printed Circuit Boards while maintaining precision and accuracy. The product should not only work for etching and milling Printed Circuit Boards but also on workpieces of different materials like plastic, wood, soft-metal etc. The procedure incorporates both the execution of Gerber files generated by Computer Aided Design or image of design given in form of jpeg and png file, to formulate geometry and machine control commands in LabView, for precise movements over all three dimensions.



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Title

Home Assistant with Artificial Intelligence

Project Advisor: Dr. Kashif Javed

Abstract

The inchoate interpretation of the intelligent home assistant can be taken into account as an additional helping hand to carry out various daily chores. Though having rather manifold breakthrough aspects, we restrict to the prototype of a model that can markedly be rendered to rather notable extents. The preeminent principal of the assistant is to adhere to the orders of a specific person who throws words at the assistant. Adhering to the person's will is further translated into the assistant performing the task, for example, grabbing a plate and traveling all the way back. The very central principal is rather a complex one to tackle, and constitutes whole three strides; the first one is to identify the voice of the speaker and interpret, as the training data set suggests, corresponding to an action revolving around an object previously a part of the training data as it would allow the assistant to recognize precisely. The second step includes equipping the assistant with a source of vision with which it can scan through the entire surroundings hoping to find the object around which the action circles. This has been done by assembling a camera with the assistant enabling it to view the object and identifying it as the center of action. The third stripe is to commute all the way up to the object and concluding the requested activity. The step feels smooth and simple to execute but an entirely opposite fact turns out to be true when we have to take into account of all the restrictions and hindrances on the way up to the object. Those hindrances can sure be avoided manipulating the obstacle avoiding mechanism into coping to our aid but this does not allay the problem that the trajectory is simply not stored in a memory to be re-traced back without any predicament. Currently the jeopardy is being tackled by introducing the Kaman filter that estimates the point at which the object is moving (in our case the robot is supposed to be moving possibly around an obstacle, the relative motion between the assistant and the object would serve the part). A cruder approach is to apply grids to the viewing screen and whenever the destined object goes out of the view it can be retraced back into view playing with the co-ordinates (for example the x-axis being positive or negative for leftwards and rightwards motion of the object). Once the trajectory has been concocted, the assistant commutes towards the object avoiding every hindrance and re-traces back to the initial point having dealt with the task assigned.

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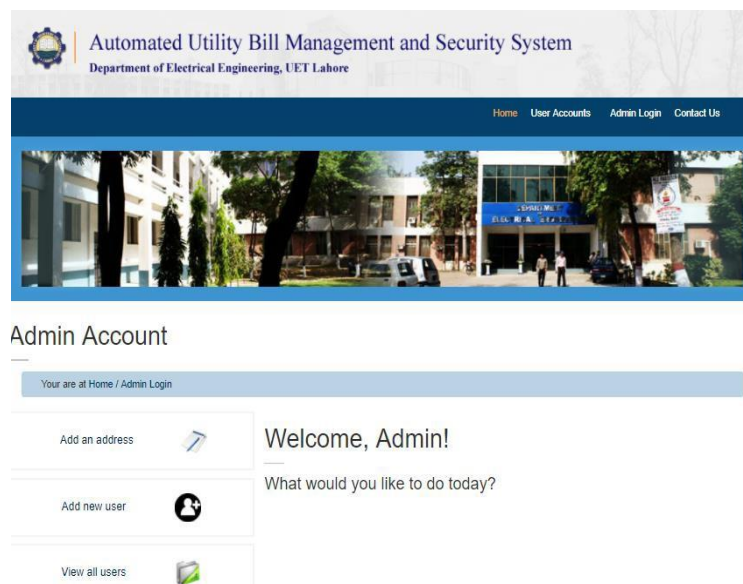
Title

Automated Utility Bill Management and Security System

Project Advisor: Dr. Abdul Rehman Kashif

Abstract

Automated Utility Bill Management and Security System incorporates two features. Billing automaton feature uses multi-featured website and android application to improve the conventional way, the power utility providers gather and handle billing data. Website is developed using Macromedia Dreamweaver. PHP and javascript are used for back end programming of the website while HTML is used for front end. Website has the capability of calculating the bills, generating PDFs and sending emails to the respective persons. Mobile application is made basically for layman meter readers, who will enter the meter reading which will then automatically be inserted into the database. Automatic vehicle identification feature enhances security on entrance through number plate recognition. System works by capturing the image of vehicle, processing of image which includes detection of number plate and extraction of registration number of vehicle in a string. This registration number is compared with a database and hence authentication is achieved. This part of system is implemented and simulated in MATLAB. In essence, this system has completely automated the security system. To add on, website and application altogether have eased the chores related to calculations of public utilities (electricity, gas and telephone bills). The integrated system is implemented, tested and proven to be stable and reliable.



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Title

A Bidirectional Soft Switching Series Resonant Converter with PWM Control and load independent voltage gain characteristics

Project Advisor: Sir Habib Wajid

Abstract

A fixed frequency operated dual active bridge bidirectional series-resonant (BSR) converter is proposed for energy storage system in DC micro-grid. Simple PWM control is applied to the proposed converter to regulate the power flows and achieve the following attractive features like, the voltage gain of the converter is only determined by the effective duty cycles of switches and has nothing to do with the amplitude and direction of the transferred power, which is a significant innovation and improvement in comparison with most of the existing resonant converters. Theoretically, the normalized voltage gain can be regulated from zero to infinite, which means the proposed BSR converter is a Buck-Boost converter and suitable for wide voltage range applications. The direction of power flow and the operation mode, i.e. the forward or backward mode, can be changed automatically and smoothly with the simple PWM control. ZVS turn-on is achieved for all the active switches within the entire operation range.

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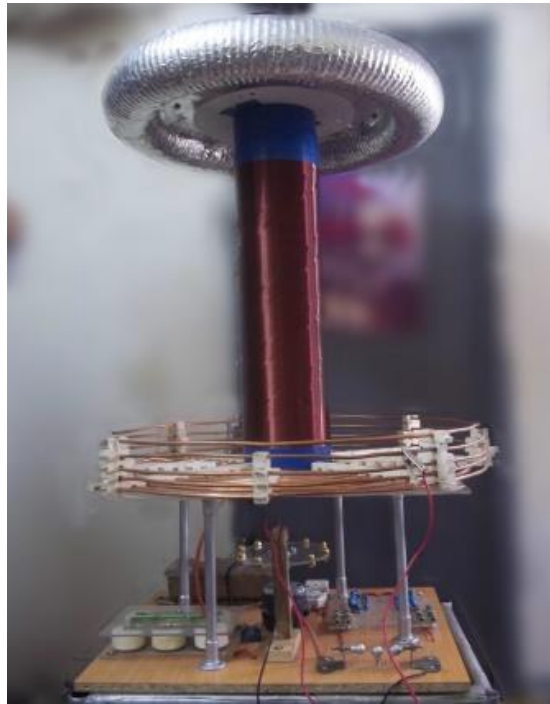
Title

Wireless Power Transmission using Magnetic Resonance

Project Advisor: Prof. Dr. Khalid Mahmood Hasan

Abstract

Today we see lot of wires that have tied us when it comes to transmitting or receiving. Imagine world without wires and the power being transmitted from one place to another without it. The world would be less heavy, less investment, less expenditure and many more other benefits. We will shortly see what possible areas and application could this technique be used. The history of wireless power transfer dates back to the nineteenth century, when Nicholas Tesla for the first time tried to transmit the power without wires. In 2007, researchers from MIT introduced the concept of magnetic resonance coupling to transmit the power without wires. They lit a 60 watt bulb at a distance of 2 meters, which was a new milestone in this field. In our project we are using magnetic resonance technique to transmit the certain amount of power to a distant receiver wirelessly, where we are using Tesla coil as our transmitter and receiver can be any gadget or a house hold device. Our project ensure that the cell phones, laptops and other power electrical devices within a certain range get charged on their own , with no need of plugging them that can prevent the sockets with all sorts of wires. The project focuses on the amount of power transmitted and the distance of transmission. Wireless power transmission has a wide application range in power transfer being used for home appliances, medical equipments, vehicular charging to making the city autonomous. In our project we will also try to minimize the losses while transmission to make it more efficient.



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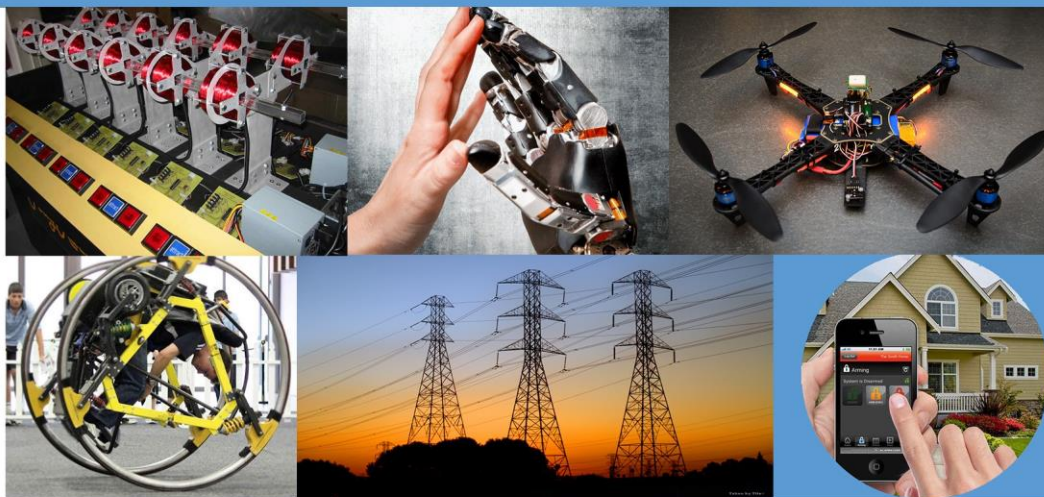
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ABSTRACT BOOK

Development of Breakdown Voltage Tester for Liquid Dielectrics. Wearable Hand Gesture Recognition System for Dumb Amputee. Implementation of Inverter and Power Control Unit for Solar Net Metering. Modeling and Control of Self Balancing Vehicle. Autonomous Hover for Land Mine Detection. Implementation of a Variable 0-50 kV DC Power Supply. Neuro Fuzzy Inference System Based Advanced Statcom for Transient Instability. Solar Water Pump Using Single Phase Inverter. Wireless Power Transfer Through Resonance Coupling. Thyristor Controlled LC Compensator for Dynamic Loads. Optimal Energy Management of Multi-Input Based Grid Connected Converters. DC-AC Inverter Topology for Control and Stable Operation of HVDC. Portable Ventilator with Feed Back Control. A Matlab Toolbox for Protein Identification and Quantitation in Top Down Proteomics. Design and Development of Autonomous Farming Robot. Patient Centric Scientific Wellness Backbone for Next Generation National Health Care in Pakistan. Online Device Control and Ambient Monitoring Using Mesh Topology. Smart Baby Cradle (An Automatic Baby Soothing and Monitoring System). Multilevel Inverter. Intelligent Zero Net Energy with Hybrid Solar System. Mind Controlled Quadcopter. IP Code Design of Encoder and Soft-Output Decoder for Polar Codes. Intelligent Discipline Maintenance System. Wireless Communication Based Vehicle Automation Using Optical Character Recognition. Blind Assistant Robot. Smart Weed Detection and its Active Removal Via Visual Feedback System. Solar Powered AC Motor Drive Using Isolated Boost Converter. Power System Stability Using FACTS-DVR Devices. DC-Fault Tolerant Modular Multi-Level HVDC Converter Using Switched Capacitor Submodule. Induction Motor Drive Control of a Car. Deployment of Laboratory Work Bench for Partial Discharge Measurement of Electrical Equipment. Efficient Energy Metering with Maximum Demand Indication. Smart Shopping Cart. Synchronization and ATS at Smart Grid. 2D Simultaneous Localization and Mapping (SLAM) Based Autonomous Rover with Environmental Surveillance. Maximum Power Point Tracking using Boost Converter. Voltage Stability through FACTS Devices. Solar Powered Three Phase Inverter using Space Vector Pulse Width Modulation. 3D PCB Printer. Home Assistant with Artificial Intelligence. Automated Utility Bill Management and security system. Bi-Directional Soft Switching Series Resonant Converter with PWM Control and Load Independent Voltage Gain Characteristics. Wireless Power Transmission using Magnetic Resonance.



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