



FINAL YEAR PROJECT ABSTRACT BOOK

2019 Graduates



DEPARTEMENT OF ELECTRICAL ENGINEERING
UNIVERSITY OF ENGINEERING & TECHNOLOGY,
LAHORE



IEEE



Final Year Project Abstract Book





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 PhDs 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. In order 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.

Professor Dr. Khalid Mehmood ul Hasan

Chairman

Department of Electrical Engineering

University of Engineering and Technology, Lahore.

Final Year Project List — Session 2015

Group No.	Project Title	Supervisor	Co-Supervisor	Area
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2015-FYP-25	Non Invasive Blood Glucometer	Dr. Muhammad Tahir	Dr. Kashif Javed	Computer
2015-FYP-26	Usage Based Autonomous Insurance Policy Generation Via Machine Learning	Dr. Omer Waqar	Dr. Kashif Javed	Computer
2015-FYP-27	Patient Vital Signs Monitoring and Display using Wireless Communication System	Dr. Muhammad Tahir	Dr. Ubaid Ullah Fayyaz	Computer
2015-FYP-28	A Wide Input High Efficiency Isolated Stepdown Power Factor Correction Converter	Mr. Mustafeez ul Hassan	Mr. Habib Wajid	Power Electronics
2015-FYP-29	Far Field Wireless Power Transmission using Electromagnetic Radiation	Dr. Sidra Farid	Dr. Omer Waqar	Electronics
2015-FYP-30	Efficient Monitoring of Energy Sources in Industrial Environment	Dr. Tahir Izhar	Dr. Sidra Fareed	Power
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2015-FYP-32	Acedemics, Education and University Management System (AEM.com)	Mr. Umar Shahid	Miss Ifrah Saeed	Computer
2015-FYP-33	Fuzzy Logic Based STATCOM Device for Transient Stability	Mr. Habib Wajid	Mr. Mustafeez ul Hassan	Power
2015-FYP-34	Library Autonomous System using Artificial Intelligence	Dr. Tahir Izhar	Dr. Omer Waqar	Computer
2015-FYP-35	Radar Based Intelligent Vehicle System	Dr. K. M. Hassan	Mr. Ali Shafiq	Control
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2015-FYP-37	Wheelie! A Universal Wheelchair	Dr. Kashif Javed	Mr. Umer Shahid	Computer
2015-FYP-38	AI Based Home Assistant to Control Home With Wifi	Dr. K. M. Hassan	Mr. Ali Shafiq	Computer
2015-FYP-39	Simo Smart Antenna Processing	Dr. Syed Shah Irfan Hussain	Dr. Syed Shah Irfan Hussain	Electronics
2015-FYP-40	Solar Power Auto Irrigation System	Dr. Sidra Farid	Mr. Umer Shahid	Control
2015-FYP-41	Power Flow Control by Series FACTS	Omar Imtiaz	Dr. Tahir Izhar	Power

2015-FYP-01

Seer – A Computer Vision and Machine Learning based Device for Visually Impaired

Project Advisor: Prof. Dr. Kashif Javed

Abstract

Vision is the most important and primitive tool for mankind to learn and interact with the environment. The significance of vision has skyrocketed in this current era of information technology. Sadly, there are millions of people in the world who have to live their lives in eternal darkness or with some sort of visual impairment. They rely on their family to fulfill their daily needs. We are trying to come up with a solution which can make the visually impaired people more independent in their daily chores. Visually challenged people use their sense of touch or someone else's help to identify everyday objects. Our proposed device will help the people with visual disabilities to recognize common objects in their line of sight. We want to allow them to identify familiar faces, everyday objects and recognize text that they come across in their daily life. We are using models based on machine learning and computer vision to input image through a camera and get the information about various objects in the image. The obtained information about the object is conveyed to the user in the form of audio. For object detection, we are using a pre-trained model which is trained on hundreds of thousands of images and we have fine-tuned it with our own collected dataset. The model being used is MobileNet-SSD which is based on Convolutional Neural Networks. The data collected by us spans around 30 categories with 40 to 50 images per category. With a train/test split of 80/20, we've achieved an accuracy of around 80% for object detection. For text recognition, the object containing text is first identified using a model called EAST Detector and then an OCR software called Tesseract is used to convert the image into machine recognizable text. The text detector is based on a deep neural network architecture and gives an accuracy of around 90%. In case of facial recognition, a combination of HAAR and HOG Classifier is being used to detect the faces while Nearest Means Classifier employing the vector embeddings created from our own custom dataset is being used to recognize them. The data collected by us spans around 10 persons with 50 images per person. With a train/test split of 80/20, we've achieved an accuracy of around 85% for face recognition. The major tools being deployed are Python, Numpy, Pandas, Scikit-Learn, Matplotlib, Tensorflow, Keras, OpenCV and ImUtils.



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2015-FYP-02

High Voltage and Current Testing Equipment

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

The project presents the equipments for high voltage and high current testing. There are two type of testing mainly in power system. First one is at high voltage and the other one is at high current. Portable and fully automated oil test set kit is used to measure the dielectric strength of an oil by applying a steadily ramping voltage upto 100kV. Once the oil begins to breakdown, tester will stop increasing its voltage and the value of that applied voltage has been recorded where the flashover occurs. This high voltage testing allows the non-destructive testing of transformer oil, synthetic oil and ester oil. A dielectric breakdown test is a measure of electrical stress than an insulating oil can withstand without breakdown. This test assembly contains a test vessel that has two electrodes of standard sizes and different shapes are mounted in it with a gap distance according to the IEC 60156 and ASTM D877 standards. A sample oil for testing purpose is put into the vessel and an ac voltage is applied to the electrodes. This voltage is increased until the spark passes between the electrodes. The voltage at which breakdown occurred is the test result and is evaluated by comparing it with the guidelines set in different standards.

Second one is the smart current injector, word “smart” is due to its digital and precise control. This setup also includes the techniques of testing the tripping and breaking capacity of circuit breakers, insulation of cables and also to check the entire functionality of circuit breakers under different circumstances. This project also provides a very high amount of current by which one can perform various type of testing. Basically, a step-down transformer also known as welding transformer is used whose output current is of thousands of amperes while its output voltage is 9.6V. By short-circuiting the output terminals of transformer, we get maximum current. Output is controlled with the help of controlling its input power or mainly its input voltage. Its input voltage is controlled with the help of a pair of thyristors, which are connected anti-parallel to each other. Thyristors are also controlled digitally i.e. via micro-controller.

As these equipments are highly expensive so, our prime objective is to make a highly economical, low budget and a feasible solution to the industry.



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2015-FYP-03

Smart Cane and Glasses for Visually Impaired People

Project Advisor: Dr. Ubaid Ullah Fayyaz

Abstract

This paper describes a state-of-the-art device which helps blind people in daily life to overcome navigation and identification issues. This smart device consists of glasses and cane with audio guidance. The smart cane assists a person in navigating from one place to another, without any hindrance by detecting obstacles from front, left and right. The user can also detect depth of potholes and height of obstacles. Smart glasses provide a system for facial detection, recognition and money bill identification. This device is based on Raspberry Pi 3B+ microcontroller, with 4 US sensors and 8 MP camera. It also supports water (puddle) detection and smoke detection. It uses decision tree algorithm for path navigation. This algorithm uses the information coming from US sensors to devise a probable path for the subject. For the face recognition system, HAAR cascades algorithm is used which requires a minimum of 10 pictures of a person's face for its training. Next time that person comes in front of the camera, he will be instantly recognized. Glasses, can also detect how many people are present in front of that person as well as the expressions of the person in front of him. Money bill detection system uses neural networks with dataset of all Pakistani Money Bills to identify the amount of the bill in front of the camera. This device is also trained to identify daily life objects. The final product will support multiple modes of operation so blind people can control these features with respect to their needs. This device is completely portable and rechargeable, powered by a 5V-20000mAh source. It is a low-cost device which will commendably enhance the user's travelling experience as well as his/her interaction with people and objects in indoor environment, making them independent to a great extent without any external help.



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Acoustic Source Separation and Speech Enhancement Using Deep Learning

Project Advisor: Dr. Ubaid Ullah Fayyaz

Abstract

Despite the recent advances in the field of speech processing, two important problems, namely acoustic source separation (ASS) and speech enhancement (SE), remain unsolved. Even though they are treated as separate problems in the literature, they are fundamentally quite similar and require splitting a given signal into two component signals. A number of approaches have been proposed to solve ASS. However, none of them provide satisfactory performance due to intrinsically under-determined and nonlinear nature of the problem. Neural nets are a powerful tool which can approximate highly complex non-linear functions when trained with sufficient data. In this project, we attempt to solve ASS by using a neural net based approach proposed by John Hershey et al. Spectrogram of the mixed signal is fed into Long Short Term Memory (LSTM) neural network which then maps each time frequency (TF) bin of the input spectrogram into a 40 dimensional vector space such that TF bins belonging to the same speaker are pushed together and TF bins belonging to different speakers are pushed apart. By performing K-means clustering in the new vector space, binary masks for both the speakers are recovered and spectrograms for the component signals are obtained by performing element wise multiplication of the binary mask with the input spectrogram. This model was trained on 10 hours of data. Our developed system has shown good separation quality and despite the fact that the training data did not contain any Urdu language samples, model performance does not deteriorate appreciably if one or both the speakers are speaking Urdu. Our model has applications in meeting transcription system and audio recovery in noisy or multi-speaker environments such as health examination. We have also demonstrated that a variation of this model can be used for speech enhancement as well. This is an important contribution from research point of view and provides empirical proof that machine learning based solutions developed for acoustic source separation problem can be applied to speech enhancement problem as well.



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Field Oriented Control for Induction Motor

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

Induction motors hold a paramount importance in industrial processes all over the world, therefore, new and innovative techniques to achieve better steady state and transient response must be developed to mitigate operational and maintenance costs. In this regard, the concept of vector control to provide efficient and optimized speed control is introduced contrary to the popular scalar control. Vector control involves two schemes, direct torque control and field oriented control. Field oriented control is a type of vector control that revolves around the fact that ease of control of DC motors is due to the locked arrangement of the main flux and armature flux. This orthogonality of the direct axis flux and the quadrature axis flux produces maximum torque. Considering the fact that there is an abstruse coupling between all the control inputs and the inner quantities, flux, and electric torque in an AC motor, the orthogonality, as mentioned previously in DC motors, is not present. If this same orthogonality is enacted in AC motors as that of DC motors, with the direct and quadrature axes always orthogonal, the former will also be easily governable. This project covers the design and implementation of the prototype of this concept. This prototype will have all the necessary algorithms and feedback loops coded into it to implement the concept of field oriented control. To maintain versatility, the prototype features all the conventional scalar drive control methods such as variable frequency drive and modulation index variation along with wireless control through an android application and data monitoring of the various operational parameters as per the demand of the user. These features will be coupled with the provision of providing input speed as well. Multiple circuits encompassing various electrical engineering domains are used to attain the desired goal such as high power rectifier, to change three phase AC into DC, three phase space vector based pulse width modulation (SVPWM) inverter; to invert the DC into AC to be fed to the induction motor, current and speed sensors to implement feedback loops and STM32F401 microcontroller for implementing all the required steps of field oriented control algorithm. As cost is of prime importance for industrialists, cost effectiveness will dictate most of the component selection throughout the project. In a nutshell, the prototype will be very versatile with due industrial standards and benchmarks implemented and will cater to all the needs of an industry.

Keyword: - Vector control, field oriented control, three phase inverter, SVPWM, orthogonal fluxes, AC drives, feedback loops



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Health Monitoring System Using Speech & Gait Analysis

Project Advisor: Dr. Kashif Javed

Abstract

Obesity is a perilous health problem worldwide due to the dangers associated with obesity based diseases which cause immutable physical and psychological effects. According to the World Health Organization - Obesity Statistics Report, 2016 more than 2.1 billion people are suffering from obesity globally. Its consequences includes aggravation of various lethal and death causing diseases such as diabetes, heart diseases, cancer and high blood pressure. BMI (Body Mass Index) is a universally accepted standard to measure the level of obesity. It is a criterion which presents relationship between height and weight of the body. The conventional methods of measuring BMI via weight machine and length measuring scale requires stringent experimental setups and demands measuring devices to be calibrated from time to time. It has been found through research and experimentation that BMI, age and gender of human are related to their gait and speech signals. Utilizing this information, a system is developed that uses both gait and speech for estimating the mentioned health parameters. The human gait is recorded using the inbuilt accelerometer and gyroscope of the smart-phone. Speech is recorded via Raspberry-Pi based application. Data was collected from 200 subjects; 100 male and 100 female belonging to different age and BMI groups for both speech and gait separately. The subjects are classified as underweight, normal, overweight or obese on the basis of BMI. The recorded samples of human gait and speech are preprocessed separately. For gait, statistical features such as kurtosis, mean crossing rate, auto correlation mean, auto covariance standard deviation, and jitter are used and for speech, feature extraction techniques such as MFCC (Mel Frequency Cepstral Coefficients), LPCC (Linear Predictive Cepstral Coefficients), GTCC (Gammatone filterbank Cepstral Coefficients) and PLP (Perceptual Linear Predictive Cepstral Coefficients) are used. Based on these two feature sets, two separate machine learning models are trained to predict health parameters i.e. BMI, age and gender. The accuracy of speech based predictions is 80% and that of gait based predictions is 65% using SVM (Support Vector Machine) and LR (Logistic Regression). In order to address the problem of obesity, a diet suggestion system is developed based on the predictions from the above mentioned models.



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A Hybrid-STATCOM with Wide Compensation Range and Low DC-Link Voltage

Project Advisor: Dr. Farhan Mahmood

Abstract

This project presents a comparative analysis of performance of SVC and STATCOM on real power network of Pakistan. SVCs and STATCOMs are the most important reactive power compensation devices that are used to resolve dynamic voltage problems and to improve transient stability of a network. In a stable power system, the receiving end voltages must be within allowable voltage range (0.95 pu -1.05 pu). But as load increases or decreases, the voltage at the load end decreases and increases respectively. Because of difference in voltage magnitude at receiving and sending end, reactive power flows in the network. If load increases then voltage at the receiving end decreases and reactive power demand of the system increases. Usually generators are used to supply the required reactive power in the system. But sometimes load increases to the limit where generators in the network are unable to meet that reactive power demand. In order to prevent unacceptably high voltage fluctuations or power failures it is required to keep reactive power in balance. For this purpose reactive power compensators are used.

SVC is used commonly in power systems but it has small compensation range. SVC consists of TSC and TCR branches. In case of dynamic load, capacitors limit the amount of reactive power supplied by SVC due to which SVC fails to stabilize voltage of the system as load increases. STATCOM resolves this problem as it doesn't use capacitors in its design. It is a voltage source converter (VSC) based device and allow a continuous control of reactive power at a far high speed. Transient stability analysis and voltage stability analysis is performed on QESCO and PESCO network on PSS/E to compare the performance of networks with SVCs and STATCOMs. The transient stability analysis is used to find that STATCOM has quicker response in case of fault than SVC. Voltage Stability analysis shows that STATCOM makes a power system more stable towards a voltage collapse. A hybrid model of STATCOM is proposed that has better performance than traditional STATCOM. Hybrid-STATCOM has wider compensation range and faster response time than STATCOM. It uses Thyristor controlled LC (TCLC) branch in addition to VSC. A user-built model of Hybrid-STATCOM is built in PSS/E.



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2015-FYP-08

Design and Implementation of Single Photon Quantum Computing Laboratory

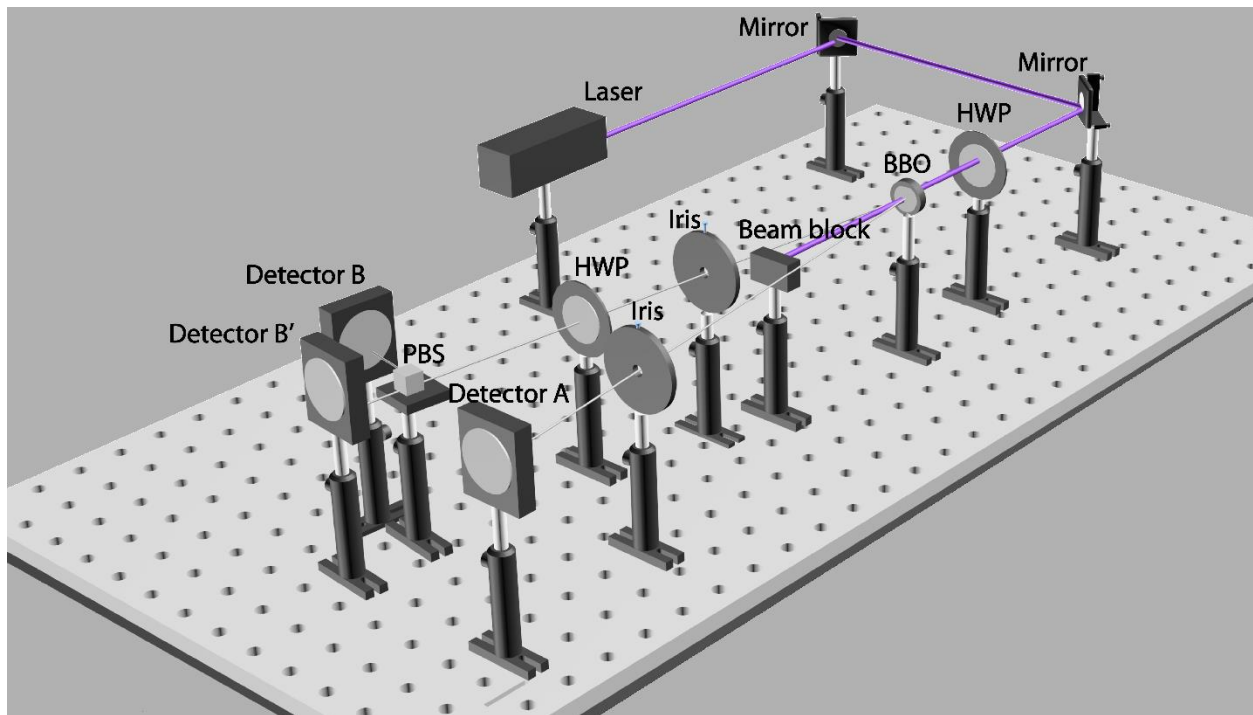
Project Advisor: Dr. Sidra Farid

Abstract

Quantum computing holds great promise for the next information revolution and is considered to be a holy grail for experimental physicists and engineers. There are many physical platforms to realize quantum bits (qubits), including the ones based on nuclear magnetic resonance, trapped ions, superconductors, spin-1/2 particles and single photons. The scheme based on single photons is preferable for the stability and accessibility of its qubits at room temperature. We have designed and realized a number of experiments that re-visit the foundations of quantum mechanics as a step towards realizing a quantum computer using single photons. Single photon pairs are produced through type I spontaneous parametric downconversion using a β -barium borate crystal. The source laser beam is of 405 nm wavelength and 50 mW power. The downconverted photons are polarization-entangled. Linear optical elements such as waveplates, polarizers and beamsplitters are used to manipulate the qubits, i.e., perform computations. Avalanche photodiodes (APDs) are used to detect the photons. Each photodetection by an APD produces a pulse of 20 ns. The pulses are counted using a field-programmable gate array (FPGA). The FPGA also counts the coincidences of photons at different detectors. The counts are transmitted through serial communication to a computer where they are analyzed.

We set up a Hanbury Brown-Twiss experiment and measured the 2nd order correlation function of the heralded photons and found it close to zero, confirming that single photons were detected in our setup. The sub-Poissonian photon coincidence statistics confirmed the anti-bunching of the downconverted photon beams. We then used waveplates to produce different polarization states with the downconverted photons and performed measurements to determine the corresponding single qubit states. After that, we produced two-qubit entangled states and performed various tests of local realism including Clauser-Horne-Shimony-Holt (CHSH) test, Hardy's test and Freedman's test. The photon correlations convincingly violated the Bell inequalities and confirmed the non-local characteristics of the two-photon system. To check the extent of the entanglement achieved, we performed two-qubit tomography and obtained the density matrix of the state with fidelity equal to 0.75. We also investigated the principle of complementarity by designing a single photon interferometer. To obtain the which-way information, the interference fringes had to be erased and vice versa. Finally, we devised an experiment to manipulate single photon qubits with Faraday rotation. The laboratory of these experiments paves way for quantum optical and quantum magneto-optical computing research and teaching.





Setup for the Hanbury Brown-Twiss experiment with heralded single photons produced through spontaneous parametric downconversion using β -barium borate (BBO). The laser beam is linearly polarized and the half-wave plates (HWPs) are used to rotate the linear polarization states. Irises are used to align the beams as well as control the beam width. The polarizing beam splitter (PBS) transmits the horizontally polarized photons and reflects the vertically polarized photons.

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2015-FYP-09

Human Following Robot with Multi-sensor Obstacle Avoidance and Image Processing

Project Advisor: Dr. Ubaid Ullah Fayyaz

Abstract

The mere reason for the existence of robots is to assist humans in any way possible. Not only should they be able to interact with humans, but they should also operate in common environment. People are generally faced with the problem of carrying stuff while shopping or travelling. For this reason, smart luggage is being introduced by many robotics and automation companies. Smart suitcases require users to wear an extra device or belt for tracking and localization purposes. Visual techniques are being implemented to identify the user and by processing the data generated by the wearable device, human tracking is performed. Visual techniques require a person to be present in Line of Sight (LOS) of suitcase at all times. The use of extra wearable devices and visual techniques pose a threat to the security of airports and shopping malls which may render these devices useless. In our project, human tracking is done using Inertial Measurement Unit (IMU) sensors of any smartphone. Using an Android application to transmit IMU sensor's data over socket through UDP protocol, distance and direction of human is calculated. Smartphone's in-built accelerometer data is used to count the number of steps. In-built magnetometer sensor is converted into a digital compass to detect heading of the person. By acquiring both distance and direction of a person, the controller that is placed on the robot, uses dual PID controller integrated through summer to cover the proper distance in the required direction. Robot's distance is measured using PWM encoders. An IMU sensor (MPU9250) placed on the robot detects heading of robot. Tilt compensation is also introduced in both smartphone's and robot's magnetometers. Tilt compensation allows the smartphone and robot to be placed in any orientation and still give the correct heading. Obstacle avoidance is introduced using a single Ultrasonic sensor. This method of human tracking can be used for various purposes. It can be implemented in suitcases to develop human following bags capable of carrying luggage at the airport. It may be implemented in shopping carts and used in departmental stores. This technology can also be used in hospitals to carry IV stands. In our



project, this technology is implemented in an electric trolley, capable of carrying 20-30 kg of luggage and other things.

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2015-FYP-10

Smart Supervisory Control and Data Acquisition System for a Distribution Transformer with Improved Health Index

Project Advisor: Miss Noor Ul Ain

Abstract

In the 21st Century, the incorporation of smart grids has become an essential part of power systems. Smart grids have allowed efficient management of the power system through provision of smarter energy dispatch and monitoring. The smart grid is an amalgamate of power electronics and internet of things (IoT). It helps us to reduce the effect of faults on power system by managing them more quickly. The benefits of the smart grids are numerous, for instance: reduction in energy usage and reduced blackouts and reliable energy infrastructure. One of the considerations in designing smart grids is the incorporation of supervisory control and data acquisition (SCADA) system for various components of the power system. SCADA system allows remote monitoring and control of power system, in real time, for better management of the power system thus achieving reliability and demand efficiency.

As the world is moving towards extra high voltage (EHV) and ultra-high voltage (UHV) power systems, the performance requirements of power transformers in the system are becoming crucial to the system reliability and efficiency. The distribution transformer serves as the heart of the distribution system and its operation is of foremost significance. To ensure a safe and reliable operation of the electrical transformers, an efficient cooling and insulation mechanism have become the need of the hour. Biodegradable oils are gradually replacing the conventional mineral oils owing to their numerous inherent benefits, such as; higher fire points, eco-friendly nature, and low values of carbon footprints.

This project demonstrates the implementation of a SCADA system for a distribution transformer. Moreover, it also proposes an improvement in health index of a transformer using the nano-technology and biodegradable oils. The project further aims at development of a prototype for a transformer, to access its parameters remotely via internet and in case of an undesired operation or event, send control signals in response. The proposed system can serve as a sub-module for smart grid-based applications. The project showcases the concepts of High Voltage Engineering, Power Systems, and Control Systems.



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Wireless Power Transfer Using Capacitive Coupling

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

Wireless power transfer (WPT) has been a subject of interest since the invention of the first coil by Nikola Tesla, which transferred power wirelessly using the inductive coupling technique. Since then, much work has been done on wireless power transfer. As the world is moving towards technological advances, WPT is fast gaining importance as an emerging field in research. An estimate of around 26-30% of the total energy generated is lost during power transmission due to resistance of electric cables. Where conventional wires have become unaffordable, inconvenient, expensive, and hazardous; wireless power transfer proposes a probe free solution to the problem of incompatible power cords, hence resulting in a safer and more efficient power system. In industries, where the risks of electric wires involved rise significantly, wireless technology has become the need of the hour.

The capacitive coupling technique for WPT has been modelled and analyzed in this research using ANSYS Maxwell software. Electrostatic and transient analysis are performed on these capacitive plates and required parameters such as capacitance, electric field intensity, voltage magnitude and electric field concentration on the plates are obtained by performing simulations in ANSYS Simplorer. The circuit of WPT is then simulated in ANSYS Simplorer which comprises of High frequency inverter using SIC MOSFETs, driven by HCPL gate driver. The parametric values such as distance, load and inductance are varied for obtaining the point, where maximum power is transferred at a specific distance and resonant frequency.

The proposed scheme of WPT through capacitive coupling finds its utilization in high power applications, such as electric vehicle charging. The software results are verified by implementing the power electronics' circuitry on the model of electric vehicle, where battery charging on the electric vehicle is done using capacitive coupling technique. The project has been implemented for the wireless power transfer of 100 W with more than 75 % efficiency at the distance of 10 cm.



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2015-FYP-12

Smart Energy Metering With Automatic Demand Response Based On Customer Participation

Project Advisor: Mr. Salman Fakhar

Abstract

Smart Energy Metering is an emerging field in power engineering. The term smart metering suggests fast and precise measurement of electrical energy. Smart energy meter (SEM) gives more control to customer on the consumption of electricity. This project is designed to overcome the issues faced in conventional energy metering because it has many irregularities, consumes more time for billing and also has chance of human error. Theft of electricity can't be controlled with the help of these meters. In conventional energy meters, users have no control on load management that causes dissatisfaction of customer. By overcoming these issues a lot of money can be saved. This is accomplished with the help of smart energy meter. Smart energy meter is an electrical device having microcontroller for measuring consumed units and a wireless protocol for bidirectional communication. SEM calculates Vrms, Irms, units consumed, power factor and total harmonic distortion and linearity of load with the help of SEM. It continuously displays all these on meter screen. Vrms and Irms are measured by processing the signals of voltage and current waveforms respectively. To get an Idea about the non-linearity of load total harmonic distortion of current waveform is calculated. THD tells about the harmonic content in that waveform. This is achieved with the help of Fourier series that gives us the information of a signal in frequency domain. GSM technology is being used for the communication purpose to get information at load end. User as well as Supply Company can also get the information of load with the help of GSM. GSM send the message to the corresponding person with help of SIM. By comparing the data received on daily basis with the supplied units the theft of electricity can be controlled. Now the demand response is totally based upon customers. Anyone can turn on/off the load considering their own priorities.

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2015-FYP-13

Implementation of Variable Frequency Drive for Three Phase Induction Motor

Project Advisor: Sir Umer Shahid

Abstract

The efficient and optimized speed control of three phase induction motor is one of the major constraints of the modern world. In Industries, we need to vary speed for various applications. As induction motor is good in such speed changing applications as compared to other motors. That's why induction motors are the horse power of the industry since long time ago. In industries, the accurate and cost-effective control of induction motor plays a dominant part in executing the series of actions. A technique variable frequency drive (VFD) is utilized for controlling the frequency and in turn speed of induction motors. The biggest advantage of VFD is its good efficiency. Power efficiency is the main requirement in Pakistan where the wheel of country's wealth is being come to a standstill by energy crisis. There are two types of VFD: scalar control VFD and vector control VFD. Scalar control is widely used in industrial applications because of its simplicity level and it imposes a uniform relation between frequency and voltage. It is cheap, easy to implement and usually used without speed feedback. But the major drawback is that this technique does not provide the dynamic control of AC machines. Vector control VFD overcomes this disadvantage and it involves two schemes named as direct-torque control (DTC) and field-oriented control (FOC). This project focuses with the designing and executing a DTC for Space vector based PWM inverter fed to 2 kW three phase induction motor based on STM32F407 micro-controller. In DTC, both torque and stator flux are directly controlled by updating the appropriate inverter states. This technique also provides indirect control of stator voltages and currents and stator flux and currents are approximately sinusoidal. SVPWM technique is used because it not only reduces total harmonic distortion but uses DC link voltage effectively too. The computer program and physical implementation for safety and controlling speed of motor is also proffered by acquiring outcomes from tests on induction motor's performance. Operative parameters are harmonized by micro-controller according to user's aspired speed. In short, this project is totally industrial based project because it is focusing industry's demands from every aspect.



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2015-FYP-14

High Efficiency and High Power Density, Isolated, Bi-directional DC – DC Converter for Residential Storage Systems.

Project Advisor: Mr. Mustafeez Ul Hassan

Abstract

Considering the evaluation of renewable in existing power grid, transformation of energy from Direct Current (DC) to Alternating Current (AC) and vice versa has proved to be an important area of research for coming years. Modern smart grid aims at interconnection between different forms at extremely high frequency as well as high power density.

The project presents a DC to DC converter with features of bi-directional power flow and electrical isolation between low and high voltage sides. DC to DC converters have wide variety of industrial applications such as in energy storage in renewable energy systems, Fuel Cell energy systems, Hybrid Electric Vehicles (HEV) and in uninterruptable power supply. Efficient Silicon Carbide (SiC) power MOSFETs of low on-resistance and low gate charge are used in Dual active bridge topology of the converter. Dual, isolated and QFN package based gate driver of Silicon LABs with high transient immunity (dv/dt) having capability of giving neat pulse at very high frequency are used in Dual active bridge topology. For achieving high power density, switching frequency is as high as order of 300 kHz resulting in size reduction of transformer and filter components. A high frequency transformer is designed to serve the purpose of isolation along with voltage level transformation between ~35 V dc and ~400 V dc. Ferrite Core EE55 having low coercivity is used in transformer design. As efficiency of a DC to DC converter is one of the most important attribute that is why to achieve high efficiency, Zero Voltage Switching (ZVS) and Zero Current Switching (ZCS) is used in Single Phase shift control logic for triggering the MOSFETs at most appropriate instant keeping the energy storage of transformer and core saturation in the picture.

Reduction of Electromagnetic Interference (EMI) during high frequency switching, parasitic effects of Printed Circuit Boards (PCBs), inherent capacitances of MOSFETs and time response of gate driving circuitry are also considered in the project. Simulation is done in MATLAB and in PSIM software having key features of new Spice Module with built-in SPICE engine, new script capability for plotting, simulation control and results processing.

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2015-FYP-15

Intelligent Circuit Breaker

Project Advisor: Dr. Muhammad Asghar Saqib

Abstract

Different kinds of arcing and ground faults cause a great loss of human lives as well as their properties. A conventional miniature circuit breaker cannot detect these faults because it is designed to only detect the over current faults. In order to eliminate this hazard, we are designing an intelligent circuit breaker that will be able to detect series and parallel arcing as well as ground faults. It will also be able to fulfil the purpose of an ordinary circuit breaker. The design is based on the study of the behaviour and characteristics of the load current signal. The arc fault current waveform deviates in some characteristics from the normal current waveform. Both time and frequency domain analyses give very useful and accurate indications for the detection of arcing current. We are working on a detection scheme in which a microcontroller monitors the load current signal and based on the indicators it decides whether tripping is required or not. For over current detection, the only indicator is the rms value of current. However, for arcing detection a number of indicators are used. These include the difference of rms value of current, difference in the instantaneous values of current, comparison of the frequency domain values of current as well as 2nd, 4th and 6th harmonic components in two subsequent windows. The frequency domain analysis is based on taking Chirp Zeta Transform (CZT) of the current signal. CZT is the more general form of Z Transform, which gives better resolution in a narrow frequency band. For the detection of ground fault, a separate CT is used which measures the difference in the current magnitude in live and neutral conductors and based upon this this difference, the microcontroller detects any leakage occurring in case of a ground fault. The final product will be able to serve the domestic consumers by detecting the occurrence of overcurrent, arcing as well as ground faults, so it will minimize the major causes for the electric fires in homes.



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2015-FYP-16

An Isolated DC-DC Boost Converter with Power Factor Correction and Active Clamping

Project Advisor: Dr. Tahir Izhar

Abstract

Power Factor (PF) forms essential parameter in power system, indicating how effectively the real power of the system has been utilized. Increasing power quality is a subject which has received increased attention in recent years. Power Factor Correction (PFC) is a technique of shaping the input current so that it will in phase with the input voltage in an AC circuit. It is one of the power quality point which is receiving greater attention by number of manufacturers, manufacturing various types of integrated circuits for PFC. Active Clamping has been widely used for many years to limit the collector-emitter voltage of an IGBT during the turn-off event.

With rapid development in power semiconductor devices, the usage of power electronic systems has expanded to new and wide application range that include residential, commercial, aerospace and many others. Power electronic interfaces e.g. switch mode power supplies (SMPS) have proved to be superior over traditional linear power supplies. However, their non-linear behavior puts a question mark on their high efficiency. The current drawn by the SMPS from the line is distorted resulting in high Total Harmonic Distortion (THD) and low PF.

Hence, there is a continuous need for power factor improvement and reduction of line current harmonics. Development of new circuit topologies and control strategies for PFC and harmonic reduction has become still more essential. We are using boost converter with power factor correction and active clamping in our final year project. Although active PFC can be achieved by several topologies, the boost converter is the most popular topology used in PFC applications. It has filter inductor on the input side, which provides a smooth continuous input current waveform. An active clamping circuit has been added to offer the zero-voltage switching (ZVS) capability of the power switches.

This project aims to develop a circuit for PFC using active clamping approach by implementing boost converter, which improves the efficiency >95% of the boost converter at 100% load and it should provide the advantages of increasing the power ratings and reducing the inductor RMS



current and input current ripples. We will keep under consideration the size of converter, cost factor and components availability.

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Wood Moisture Meter along with Wood Genre Identification

Project Advisor: Sir Salman Fakhar

Abstract

Wood industry is one of the most progressive and successful industries in Pakistan. But, as Pakistan is a third world and a developing country with an uprising economy it is very difficult for small scale industries to buy wood moisture meters at low prices. Several techniques have been applied to make an economical moisture meter. Firstly, a current sensor i.e. INA219 was used to measure the voltage and current across a piece of resistance i.e. wood. INA219 was reliable and accurate but the resistance of wood was in Mega Ohms which means that very low current will pass through it but the current sensor had a limited current range. Current amplifiers were used for the current amplification and detection by the IC INA219 but due to nonlinear behavior of transistors/amplifiers this could not happen. With all these lessons, an MPU namely, PIC32MXF032BI-SO was used and had its own current injectors of order of nA to mA as well as amperes. With the help of this and by using the formula of $t=RC$, by keeping the value of time and capacitance constant and known, any value of resistance either small or large could be calculated, this is in conjunction with the time constant concept of RC Circuit. Along with this moisture meter, image processing methods and techniques for identifying wood genres can be calculated in a simple and accurate way. Nowadays, the need for portable devices are very much. The proposed methods and algorithms offer a new solution that can be used to estimate the precision of different wood machining methods, to assist in the determination of mechanical properties of wood as well as to contribute to a more robust and simple quality control. Edge detection techniques plus the measurement of 4 central moments allow the detection of wood species with accuracy. The results obtained from the above studies provide the data to detect the species of wood and the moisture of wood as a co-relation of electrical resistance and moisture.



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Urdu Handwriting Recognition Using Machine Learning

Project Advisor: Dr. Ubaid Ullah Fiaz

Abstract

One of the most important factors that drive human intelligence is the ability to read. For machines to ever acquire general artificial intelligence, they must master this art. Due to recent breakthroughs in the field of machine learning, especially in the form of deep learning, recognition systems that can read documents are more realizable than ever before. Apart from bringing artificial intelligence one step closer to human intelligence, these recognition systems can assist people in a wide range of affairs. For example, state institutions can use these systems to digitize old records, thus sparing them the need of large storage areas. Similarly, libraries can easily create electronic versions of any old books they might have, thus preserving them for eternity. Pakistan is an emerging country in the technological world. It has recently been trying to introduce e-governance in its state institutions. One particular initiative taken was the computerization of old handwritten records, including land and medical records. Given that these number in millions, manually computerizing them is a time-consuming task. However, this process can be accelerated through recognition systems. This project aims to develop a recognition system for Urdu handwritten documents. Given a handwritten document, the goal is to create a system that can convert it into machine-encoded text, which can then be viewed and edited using a word processing software. Several approaches have been proposed in this regard. Conventional recognition systems relied on Hidden Markov Models. These have now been replaced by artificial neural networks owing to major recent breakthroughs in the area. A type of artificial neural network, the Recurrent Neural Network (RNN) and its variants, including the Long Short Term Memory (LSTM), the Bi-Dimensional LSTM and the Multi-Dimensional LSTM, are widely popular in recognition systems. This project aims to explore and build upon these existing techniques to develop a robust Urdu handwriting recognition system.



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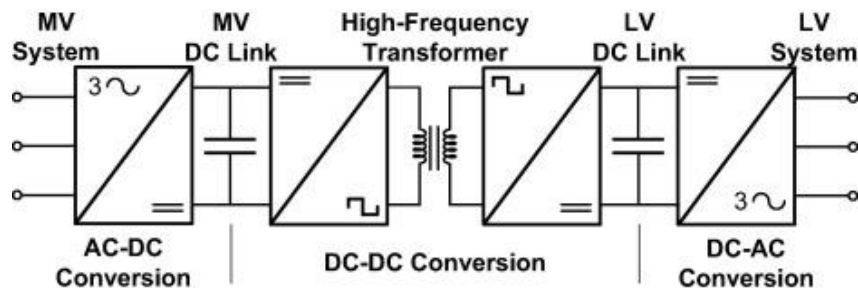
Solid State Transformer for Smart Grids

Project Advisor: Dr. Syed Abdul Rahman Kashif

Abstract

The issue of the power flow control and the losses are very paramount in distribution systems, therefore, some new and innovative techniques to achieve these goals and counter such problems must be developed. In this regard, the concept of solid state transformer to provide better flow as well as control of power with minimum losses is introduced. Solid-state transformer is basically a power electronic transformer that uses a combination of power electronic devices. The SST permits the use of intelligence in the form of programming to aggrandize the power compatibility. This hardware is immune to voltage regulation and harmonics. In addition, it has physical advantages in the form of less weight and small size. This paper covers the design and implementation of the prototype of this concept. This prototype will duplicate the function of distribution transformer but in controlled fashion while providing some other features including DC port, fault isolation and power factor correction etc. Feedback control for monitoring the voltage and current can be done for the efficient flow of power. Different circuits are used to attain the desired goal such as high voltage rectifier; to change high voltage AC into DC, capacitor bank; to draw the required power, high frequency inverter; to invert the DC into AC of high frequency(250 kHz) and to get control over terminal voltage and current, high frequency transformer; to isolate and stepping down; low voltage rectifier; to rectify the output of HFT into DC, and low frequency inverter; to change DC into AC of low frequency.

Keywords: - Solid state transformers, High frequency transformer, High frequency inverter, Power flow, Voltage regulation



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2015-FYP-20

Sign to Speech Conversion for Dumb People

Project Advisor: Dr. Kashif Javed

Abstract

Pakistan's 2017 census figured out there are more than 3.28 million individuals who are disabled. About 7.43% of them are dumb or mute. Dumb people are facing serious communication problems. As a result they feel themselves neglected. Our aim is to address this social barrier of communication and ease their life. Sign language is a good solution for communication but it only restricts among disabled individuals. Normal people do not know the sign language properly. So, we have developed such a system by using it normal and special people can communicate easily and properly. System based on smart glove is developed which accurately take input gestures of Pakistan Sign Language from a user and convert it to a speech generated output using a jack speaker. Glove is mounted with five Flex sensors to perceive bending of each finger and MPU-6050 to obtain 3-D orientation of hand in space. Raspberry pi 3-B is used as a microcontroller. Machine Learning algorithms are used in our glove based system. We have used Support Vector Machine(SVM), Artificial Neural Networks(ANN) and K-Nearest Neighbors(KNN) classifiers. Accuracy achieved from SVM is 24%, from ANN is 87% and maximum accuracy is achieved from KNN after 5 folds is 89%. Total five daily life scenarios are taken which included 45 classes or words like Pani, Sahi, Bill etc. More than 150 samples of each class is collected from 30 individuals. Total 7000 samples are collected from 700 individuals. Gestures are performed by wearing this glove by a user and each gesture's readings are recorded in an excel file explicitly in a microcontroller. Flex sensors and MPU-6050 readings as well as features like mean, variance, energy and correlation of readings are calculated for classification. Sound recordings are completed for every class which will be played against correctly classified gesture. Further hardware improvement and modification techniques are also applied for perfect achievement of results.



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2015-FYP-21

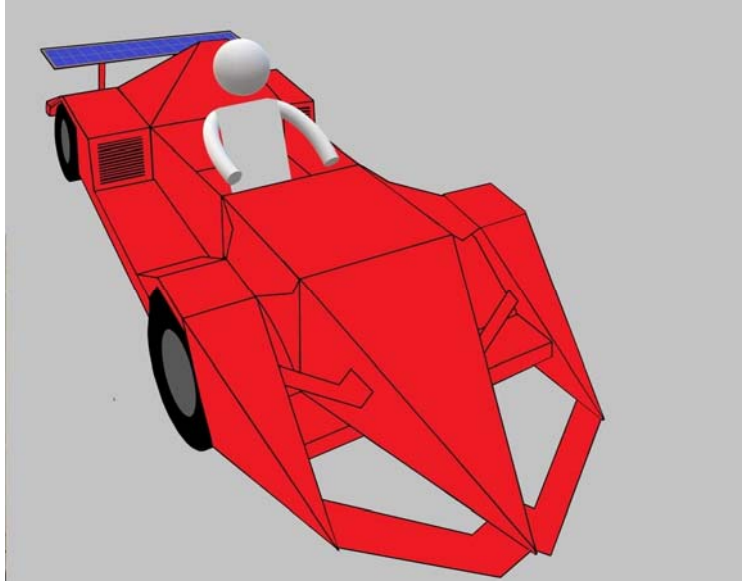
Design and Development of Solar Electric Vehicle

Project Advisor: Dr. Sidra Farid

Abstract

Due to lack of electric vehicle technology in Pakistan, imported EVs costs too much as compared to their alternative internal combustion engine vehicles. The project aims to overcome this problem by providing a cost effective as well as efficient and reliable solution. The project comprises of the designing and manufacturing of an induction motor drive, a single seat Formula 1 based vehicle assembly and Photo-Voltaic charge controller device in order to charge the high voltage battery bank through solar panels. For better utilization of battery bank advanced Space Vector PWM technique has been implemented using STM32F407Vg microcontroller and V/f method has been used to vary the speed of induction motor, a propulsion source for EV. During operation, at times it might happen that induction motor act as induction generator when decelerated because rotor take some time to slow down due to inertia. Regenerative braking capability has been implemented through same inverter to avoid the wastage of energy in braking mechanism. In order to enhance the range, a cost effective PV charge controller has been designed to charge the high voltage battery bank through solar energy. It has been analyzed that running cost of EV is more or less ten times smaller than that of internal combustion engine vehicles even if EVs will be charged through utility electricity. Vehicle mechanical structure dimensions has been carefully and custom designed in such a way that it is very drag efficient and based upon its dimensions deep analysis has been performed for load and torque requirements and for suitable motor rating selections. Many other issues regarding smooth running and braking of electric vehicle have been resolved using embedded techniques by controlling the action of propulsion source. There is no gearing mechanism involved in the designed vehicle and only accelerator and brake pedals have been provided. Torque requirement has been controlled using programming techniques. A mechanical switch has been provided in control panel to reverse the direction of Electric Vehicle by reversing the direction of rotation of induction motor through negative sequence current application.





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2015-FYP-22

Text Generation from SSVEP based BCI

Project Advisor: Dr Muhammad Tahir

Abstract

The aim of this project is to use platform of Brain Computer Interface (BCI) towards application of a BCI speller. BCI as the name suggests is a mode of communication made possible by translating the brain's electrical activity into commands for the computer hence eliminating the dependency of neuromuscular activity which is needed otherwise. So, it is a possible communication method for motor-impaired patients resulting from a spinal cord injury and the patients with Amyotrophic Lateral Sclerosis (ALS). It is especially targeted at certain patients which are awake and fully aware but cannot communicate with the external world due to complete paralysis, 'locked-in' syndrome. The Event Related Potential (ERP) technique is one of the BCI control strategies i.e. occurrence of an event helps to enhance the accuracy of brain wave acquisition by making it prominent. The Visual Evoked Potential (VEP) technique is one of the ERP techniques which can be further divided into Steady State Visual Evoked Potential (SSVEP) and P300 (P for positive, 300 for 300 ms). SSVEP technique uses potentials which are generated by excitation of retina using visual stimuli modulated at certain frequencies. This visual stimulus behaves as an input to the brain and the signals from the brain will be the output i.e. there will be some reflection of the input stimuli frequency and its harmonics in the brain waves. Hardware of this project constitutes of an electrode cap with 8-electrodes, a board (Cyton board) for EEG signals' acquisition which sends data to computer over WIFI using WIFI Shield. Electrodes are placed at occipital lobe at the back of head site. The project aims to implement control of a speller using SSVEP technique stimulated by 2D speller screen. 2D speller screen is divided into 6 sections each flickering with different frequency. The alphabets are divided in these sections and the desired alphabet is approached by the selection of one of the sections and further using divide and conquer technique.

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Dynamic Voltage Restorer (DVR) Using Matrix Converter for sensitive Loads

Project Advisor: Mr. Habib Wajid

Abstract

Dynamic Voltage Restorer (DVR) is a series connected custom power electronic device based on FACTS devices, used as a solid state transformer to compensate for voltage sags, swells, harmonics and other transients. With the continuously increasing power demand, the modern power system have to utilize large number of generation units, protection and control equipment to deliver reliable, uninterrupted and continuous power at the load according to their ratings. But due to the presence of nonlinear loads, the quality of power is compromised. Also, incidents like capacitive coupling and motor starting faults can influence the power quality. The power delivered may not be pure and it may comprise of voltage sag, swells, jerks, harmonics, momentary impulses and interruptions which have adverse effects on sensitive loads. In order to mitigate these disturbances in power system, a Dynamic Voltage Restorer is used. The goal of this project is to design and implement a DVR using Matrix Converter (MC). A Matrix Converter is a single stage AC-AC converter comprised of an array of nine bi-directional switches without any bulky energy storing devices. It provides an all-silicon solution to compensate voltage sag/swell. A direct matrix converter approach (Venturini method) is employed in which switch pulse timings are calculated directly from input voltage and desired output voltage. Since no freewheeling path is available in matrix converter for R-L load, commutation is utilized and to optimize it, soft commutation strategy is implemented. Matrix Converter has the additional feature of controlling the input power factor. This is achieved by using a combination of symmetrical and anti-symmetrical modes of operation so that input power factor is set to unity. For voltage regulation, matrix converter is operated in closed loop. A micro-controller is used to constantly monitor the output voltage and alter the switching operation using PID control whenever a sag or swell is observed.



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2015-FYP-24

Acoustic Event Localization and its Video Tracking in 3-D Space

Project Advisor: Dr. Muhammad Tahir

Abstract

The main goal of the project "Acoustic Event Localization and its Video Tracking in 3D Space" is to provide a cost-effective solution for detection and tracking of criminal usage of firearms. It involves localizing the event (gunshot, etc.) on the basis of sound, and then tracking it through video feed from camera. Previously, acoustic event localization in 2D plane and human tracking within video stream from fixed camera have been achieved. We have extended it to 3D space, while tracking with pan-tilt camera. Microphones, camera, stepper motors and multiple microcontrollers are being employed for this purpose.

The STM32F407 microcontroller is being used for sampling the microphones using Analog-to-Digital Converters (ADCs). It determines the Direction Of Arrival (DOA) of sound through the correlations of the microphone signals and calculating their Time Differences Of Arrival (TDOAs). These TDOAs, together with a special cartesian arrangement of four microphones, enable the calculation of the unit vector of the sound source, which represents the direction of the sound source relative to the acoustic node. The direction thus determined is used to point the camera in the direction of the target by moving the pan and tilt stepper motors. The Odroid embedded Linux machine is then used to detect the target in the camera's video stream using a human detector called Histogram of Oriented Gradients (HOG) and track it using Track-Learn-Detect (TLD) algorithms. As the target moves, the motors are also moved to keep the target as close to the center of the Field of Vision (FOV) of the camera as possible. For controlling the stepper motors, the DRV8825 stepper motor driver is used, and it is driven by supplying PWMs from the STM32F407 microcontroller.

This project is an important step forward in cost-efficient intelligent surveillance, and further work can be done on inter-node camera handover and the networking of many such nodes in order to develop a more complete product.



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2015-FYP-25

Non Invasive Blood Glucometer

Project Advisor: Dr. M Tahir

Abstract

Diabetes is a serious health concern and it was declared as global epidemic by World Health Organization (WHO). The number of people having diabetes rose from 108 million in 1980 to 425 million in 2017. In 2016 it was estimated to be seventh leading cause of death. Diabetes requires frequent monitoring of blood glucose level. To avoid its fatal consequences, the patient is required to have continuous monitoring of his/her glucose level. Current glucose monitoring devices use a cost effective electrochemical biosensor. The patient is required to prick his/her finger to collect a drop of blood on a strip. The problem with this method is that the strip has high cost, so regular monitoring of glucose level on daily basis becomes expensive. Moreover the patient feels uncomfortable by pricking his finger frequently to collect the sample of blood. Development of a device is need of the hour that would provide pain free glucose monitoring along with high accuracy. It has been found through research that blood glucose level alters the amount of visible or infrared light passing through the body. Using this information a system is being implemented that uses near infrared signals. A directive light beam of appropriate wavelength, to penetrate the body, is applied to a portion of patient's body. The energy transmitted or reflected back by the underlying tissue is analyzed spectro-metrically for the presence of glucose. Along with glucose level the transmitted energy is also altered by the oxygen level of blood as well as the tissue thickness. So for accurate results red light and green lights are passed through the same portion of body to estimate the oxygen level and tissue thickness respectively. The results obtained from all three light signals are then combined to accurately determine the glucose level in correspondence to its appropriate oxygen level and tissue thickness. Special wavelength bands of near infrared are selected for the analysis purpose. The results will then be trained through machine learning models to predict the glucose level for a specific person. LCD screen or mobile application will be used to display the results of predicted glucose level



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Usage Based Insurance Policy Generation via Machine Learning

Project Advisor: Dr. Kashif Javed

Abstract

“Pay As You Drive (PAYD)” or “Usage Based Insurance (UBI)” provides a new path for the drivers to get their cars insured according to their driving style through the use of technology which mainly includes mobile application development and machine learning. The goal of this project is to develop such a system which based on the driving data can label the driver’s behavior and estimate the corresponding insurance policy. The mobile application is developed using Android Studio. The smartphone sensors including accelerometer, magnetometer and gyroscope are accessed using that application. Based on the readings from these sensors the driver is classified into three main categories that are high risky, mild risky and non-risky. The readings for four events are recorded which can best differentiate the driving behavior. The events include lane change, braking, U-turn and speed bump. We have trained our models using three different machine learning algorithms including Support Vector Machine (SVM), Logistic Regression and Gaussian Naive Bayes. The training driving data is collected from 15 different drivers including both male and female belonging to different age groups on different road conditions. For every driver, we have recorded 8 readings corresponding to both variants (safe and dangerous) of 4 above mentioned events. In this way, we have 30 instances for each event that makes up a total of 120 training samples. The number of extracted features is 18. In order to calculate the accuracies for each model on all four events, 10-fold Cross Validation method is employed. The lane change event is best classified by Gaussian Naive Bayes classifier with an accuracy of 90%. The U-turn event is best classified by Gaussian Naive Bayes classifier with an accuracy of 92.5%. The braking event is best classified by Support Vector Machine classifier (linear kernel) with an accuracy of 85%. The speed bump event is best classified by Logistic Regression classifier with an accuracy of 85%. For the test phase, we have collected data from 5 different drivers and tested the models on them. On test data, all 5 instances of U-turn and Braking events are correctly classified giving an accuracy of 100%. However, lane change and speed bump events samples are misclassified giving an accuracy of 80% and 60% respectively. Our system is using a smart mobile application which is available to almost everyone nowadays, so it is user friendly and completely isolated; hence can be used by any customer.



The application lets the user capture the image of number plate of the car which will be sent to a local host over a Wi-Fi connection. The image will be stored to our database. The user will then be directed to take test for four different events separately. The sensor data in the form of a CSV file will be sent and stored in the database corresponding to the specified vehicle. This data will then be processed on the local host. Each event is categorized into two classes; safe and dangerous. Based on these events, the driver will be classified into three categories; high risky, mild risky and non-risky. The behavior of driver depends on these events individually. We have explicitly assigned higher weightage to lane change and U-turn events over braking and speed bump events keeping in view the fact that severity in both these events can lead to acute accidents. The corresponding driver's category along with the insurance quote will be evaluated.

The limitation is the placement of mobile phone in the car. It is needed to be fixed in an upright position along with the side window. This is because the training data is collected by placing the phone in this position and any change in orientation will affect the readings and hence the performance of our system. Moreover, the mobile phone must have all three sensors (accelerometer, gyroscope and magnetometer) in it. Most mid pricing range smartphones do not have physical gyroscope sensor. In that case the software virtual gyroscope sensor must be enabled in the phone, otherwise the application will not function properly.

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Patient Vital Signs Monitoring And Display Using Wireless Communication System

Project Advisor: Dr. M Tahir

Abstract

The assessment of vital signs is necessary to determine the health status of a patient. The vital signs which are essential to predict a patient's current health state are body temperature ,pulse rate ,respiratory rate and blood pressure (Blood pressure is not considered a vital sign ,but is often measured along with the vital signs). These are the routine vital signs and should be measured manually. But when it comes to the case when patient requires more frequent observations , for example , take the case of the patients in CCU or ICU , they need continuous monitoring of their vital signs .Electronic monitors are used to fulfill the need of continuous monitoring of vital signs of patients in CCU or ICU throughout the world . But when it comes to resource limited settings situation becomes difficult .Though these monitors measure the vital signs electronically thus accurately and continuously still there is a need of presence of adequate nursing staff and doctors to read the data. And the hospitals of any underdeveloped country lags the adequate number of doctors and nursing staff . So this causes late arrival of possible intervention and consequently the late start of necessary medication which lead to high number of preventable deaths. And when it comes to infants, the situation becomes more complex as ill and/or premature infants require constant monitoring to ensure the levels of these vitals remain within a particular range in order to avoid life-threatening or organ damaging situations. So, there is huge need to develop a centralized system to minimize this problem, especially designed for infants. As sensors appropriate mounting position on body for measuring different vital signs is different for different age groups. To address this issue, an automated system to measure three basic vital signs (e.g. temperature, heart rate and pulse oxygen concentration) is presented. Data will be transmitted to and displayed on a centralized screen through wireless communication system. The doctor will be able to monitor different vital signs of multiple infants on that single screen. There will also be an alarm system . In case of any emergency (value of these vital signs falling beyond safe limit) alarm will blow and



intervention will be called immediately. In this way ,this system will eliminate the need of frequent visits of doctors and nursing staff, will allow precise measurements and reduces the risk of human errors involved.

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A Wide Input High Efficiency Isolated Step Down Power Factor Correction Converter

Project Advisor: Mr. Mustafeez-ul-Hassan

Abstract

Demand of efficient power consumption has been increasing extensively over the years. Basic needs are residential, lighting, heating, refrigeration, air conditioning, and transportation as well as critical supply to governmental, industrial, commercial, medical and communication industries. Therefore, the causes of these problems are being investigated and the selection of the ideal converters with improved power factor and high efficiency is carried out to reduce the problems in electronic equipments.

This project is designed to reduce size and make portable converters with high current carrying capacity utilizing modern wide band gap devices at efficient switching algorithm at higher frequencies. The project is designed to model a DC power supply for low voltage applications requiring high current, as switching power supplies are the heart of nearly every modern electrical system. Anything that plugs into wall outlets can take advantage of switching power supplies with power factor correction.

The process of this project includes stepping down the DC voltage using DC-DC buck converter with wide input range providing the features like high efficiency, power factor correction and isolation. The full bridge circuit converts DC-AC using Bootstrap technology providing AC source for the transformer. The isolated DC-DC converters use a high frequency transformer to provide the isolation, and then steps down the voltage. To improve performance, high frequencies and fast switching power semiconductor devices are used. The high frequencies increase the efficiency while reducing the physical sizes of the supplies since they allow the use of smaller components. In a closed-loop isolated DC-DC converter the feedback circuitry senses the output voltage and generates an error by comparing the sensed voltage with its target (feedback voltage reference). DC voltage is used for many household and in other fields like battery charging, automotive and air craft applications. We are aimed to achieve our desired high current specifications for different applications using SiC Mosfets and isolated gate drivers.



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2015-FYP-29

Synchronization of Solar Power with AC Mains

Project Advisor: Dr. Sidra Farid

Abstract

With a drastic increase in the population, the energy crisis is slowly prevailing over our country Islamic Republic of Pakistan. Over the years, the power demand has exceeded the value of the power generation. However, with increased generation of power, we are burning more fossil fuels, utilizing more natural resources such as coal, water, crude oil, and adding a significant contribution to the land and environmental pollution. Another perspective is to reduce our demands from the generating stations and generate clean valuable energy ourselves using renewable resources. One of the important sources of clean renewable energy is the sunlight. Our proposed project implementation is a single phase product which is comprised of utilizing the valuable DC energy from the sunlight using the selective combination of solar panel(s) and DC batteries. In order to utilize this generated energy, it is important to synchronize it with the local AC mains. The first phase of the project involves the conversion of the solar energy to the AC supply with reduced harmonic distortion and extended efficiency. This stage will be subsumed with the help of the switch-ladder inverter configuration which involves the minimal use of the switches. The second phase involves the inverter output control. This phase will comprise of the designing and implementation of two 30/40V and two 30/120V boost converters. The third phase will subsume the designing of a suitably tuned LCL filter which will be connected to the grid with the help of the Phase Locked Loop (PLL) and Frequency Locked Loop (FLL) algorithms. Using the modern controllers the aim is to effectively synchronize the voltage magnitude, phase (single-phase only), and frequency of the converted solar energy with the local AC mains. The final phase includes the comparison of the aforementioned characteristics of the solar converted AC supply and the AC mains supply to effectively synchronize the power from the both ends. The overall product is aimed to be an environmentally friendly and cost-effective solution to thousands of local consumers.



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2015-FYP-30

Efficient Monitoring of Energy Sources in Industrial Environment

Project Advisor: Prof. Dr. Tahir Izhar

Abstract

The resource management is the key to the flourishing economy of a country. Pakistan, as a third world country, lacks energy management, which is a major point of concern for us. At this verge of industrialization where energy is the most powerful factor in determining the growth of the country, one cannot ignore the significant waste of energy. To manage and optimize the resources, the most vital and basic aspect is to monitor the usage of the resources. In the modern world, energy is the determinant factor in the progress of the country. With the revolution in the industry, it is the need of the hour to monitor the trend of energy consumption and cut off the running cost to the minimum. To make the monitoring easy and effective we are providing an Internet of Things (IoT) based monitoring system for the two major energy sources, Electricity and Water. The energy consumption trend in terms of both the resources is developed with respect to time so that we may study the energy consumption effectively and unlike energy meters which are installed at the specified locations, the proposed monitoring system can be installed anywhere within the small and medium industries i.e. nearby the switchboard, distribution box or any appliance of which the trend is to be monitored. The protocol used for the messaging is lightweight, bandwidth efficient and publish-subscribe based – MQTT (Message Queuing Telemetry Transport). IoT provides us the facility to readily access the data and identify the consumption for every month, day, and hour from anywhere in the world. The system will also provide the total consumption in terms of standard units, which may help us cut the cost by applying proper intuition to the trend. The one window operation of the resource monitoring makes us unique and provides the user with a friendly interface to work on. The proposed energy monitoring solution is unique, flexible, cost-efficient, user-friendly, and can be accessed globally.

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Wireless Charging Table Based on Inductive Coupling Strategy

Project Advisor: Miss Noor ul Ain

Abstract

Wireless power transfer (WPT) has started to gain attention of researchers recently and still there is room for improvement in performance and efficiency of the conventional WPT systems. The project features various charging modules comprising resonant coils in order to demonstrate the concept of WPT through resonant inductive coupling. WPT through resonant inductively coupled coils, has transmitting coils as well as receiving coils, paired with capacitors to operate at resonant frequency for improving power transfer efficiency. The project also presents the physical implementation of Biot-Savart's law in design considerations of magnetic field of coils. The magnetostatics simulations of the coils are performed on 'ANSYS Maxwell' software which provides the value of magnetic field around the coils, coupling coefficient, self and mutual inductances of the transmitting and receiving coils. Overall system is simulated on 'PSIM' software using the coupled inductor model. Moreover, working of some integrated circuits (ICs), used for voltage regulation at load and localization of receiver have also been simulated. A 3-D modeling of the entire setup has been carried out using 'COMSOL' software. A wireless mobile charger is implemented using the proposed strategy and performance of WPT system is analyzed by comparing the simulated and actual results of the system for change in receiving distance, operating frequency and load variation. Uniform magnetic field required for portable device charger is somewhat achieved using relay resonators, thus power transfer efficiency is also compared using relay resonators. The project focuses to achieve high end-to-end efficiency and aims at increasing the transferred power, by decreasing the overall losses of the system. The applications of the proposed system are numerous, ranging from charging of portable devices to electrification of houses and electric vehicles (EVs).



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**ACADEMICS, EDUCATION AND UNIVERSITY MANAGEMENT
SYSTEM (AEM.COM)**

Project Advisor: Mr. Umer Shahid

Abstract

With the popularity and advancements in web technology, it is imperative for every institute and university to have a website and one which is highly functional and visually attractive. With immense advancements in internet, universities and institutes are not just bound to their buildings and lecture-rooms. They developed Virtual Learning Environments in order to expand knowledge and learning over all over the globe apart from their roofs and walls. With these virtual learning environments learning ratio has been increased. In order to have same kind of facilities and advantages of virtual learning environment, we have decided to develop it for our university and expand it to some great extend where students not only get lectures but also can interact with instructors if they have any kind of difficulty. Along with it we have also developed Admin Management System which contains billing system, applications processing within reasonable time. The one who submits his application can see or notice up-to which point his application has been processed and he may be informed in real time if there are some issues regarding his application so that he can resolve them and make application to process without any delay. Along with these kinds of learning and management systems, students can also communicate or interact with each other through chatroom. Like many other universities and institutes, there are many events are going to organize and they want to get inform to everyone in real time. For this purpose, Newsfeed come into play which not only provide this facility but many more like public posts relevant to studies, internships, courses and scholarships etc. Along with it, there is also some a discussion form called blog where students can ask and discuss about specific topic. Along with we have also started CV Templates Maker where users can get their CV in specific template by providing their data. In short we developed an environment where users can find all these facilities into one place without having go and get into different places.



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Fuzzy Logic Based STATCOM for transient stability

Project Supervisor: Sir Habib Wajid

Abstract

Modern power systems have become very complex and this complexity presents new challenges to power system stability in general, and in particular, to the aspects of transient stability. Transient stability control plays a significant role in ensuring the stable operation of power systems in the event of disturbances and faults. The purpose of this project is to exploit fuzzy logic to enhance the capability of STATCOM against transient disturbances.

The basic idea is to refrain the power angle being getting disturbed. The rotor of a generator rotates at a specific angle with respect to the stator field and the angular position is proportional to the power generated. This power angle needs to remain in a specific range for the synchronous and stable operation of a generator and hence the power system. While transient interrupts including Short Circuits, line outages, load changes and plant shut down etc. cause the generator to vary power angle and even cross its specified limit and generator may lost its synchronism with the rest of the system this may ultimately lead to blackout of whole system. Thus efficient and effective measures are necessary against transients in order to avoid the generator losing its synchronism.

Our project proposes an efficient technique for remotely compensating the transient interrupts while hindering them reaching the generators, by using a STATCOM. The STATCOM will provide or absorb the extra power, following the power flow theory. The Fuzzy Control is fast because of it is non-linear nature so it can control STATCOM to provide compensation against transient interrupts. A three phase SPWM inverter with the DC capacitor bank is developed to provide the compensated power. Power is continuously monitored via PT and CT and processed in a microcontroller and the controller will change the value of angle and magnitude of STATCOM voltage in accordance with the required power.

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Enter Your Final Year Project Title Here

Project Advisor: Professor Dr. Tahir Izhar

Abstract

Confronting the challenges of manual hectic library maintenance and management system even in today's modern age, replacement of this orthodox system with an autonomous system is required. The main objective of this project is to facilitate and modernise the library management system which with some modifications can be implemented at housewares and hotels i.e. it has extendable applications. For finding the books from a jungle, a simpler algorithm is required for every single book's identity number commonly known as a serial number such that which further makes the system easier for automation. In this project, a system consisting of both software and hardware, and their interlinked communication is designed for the automation system of the library. To date number of microcontrollers are there in the market manufactured with particular specifications, among them Raspberry-Pi is used for controlling the hardware. From issuance to the placement of books, tracking of issued books record and the record of books available in the library is efficiently maintained by a graphical user interface based software backed by a database developed in MySQL. The software also keeps the track of fines imposed on members if they failed to return the book before the set deadline. For issuance or retrieval, the software sends the corresponding serial number to both robot and shelves. Wifi modules are used to transfer the serial number's command from software to line following robot's and shelf's microcontroller. Replacing the ordinary shelves with the modernly designed shelves equipped with two stepper motors for moving a Teflon made book holder vertically and horizontally which furtherly consists of a slider for moving book from shelves to book holder and vice versa, helps in retrieving a book from the robot or placing the book on the robot. The mechanism for moving a book from user to shelves or vice versa can be done in multiple ways but the one used in this project is via line following robot. The serial number is the most important identity for everything including software, line following robot and shelves. This system also contains a feature of a recommender system which applies machine learning algorithms to predict that which else resource – book, will the current user like.



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2015-FYP-35

Advance Driver Assistance System

Project Advisor: Prof. Dr. Khalid Mehmood ul Hasan

Abstract

Number of vehicles are increasing day by day and so is the risk of accidents. Studies shows that some major causes of road accidents are driver drowsiness, speeding and tailgating. The major focus of automobile industry is the luxury of the vehicles and increasing efficiency through better aerodynamic structures. This project entails some basic techniques to be used in the auto-mobile industry to reduce accidents due to some major causes including driver drowsiness, tailgating and poor driving behavior. The final product will consist of three subsystems. In the first subsystem an IR camera with two high power infrared LEDs is used to monitor driver eyes. For face detection we used sliding window technique with HOG as a feature descriptor and SVM for classification. Detected face rectangle then passed to a cascade of regression trees which is trained to estimate eyes region. Eyes aspect ratio (EAR) and percentage of eye enclosure (PERCLOS) is calculated to predict the driver drowsiness. Meanwhile, the pulse of the driver will also weigh in to compute the sleepiness score. The second subsystem is using another camera to capture live view of front vehicles. SSD Mobilenet (V2) is trained to detect bounding boxes of vehicles. Pinhole camera model is used to estimate distances of front vehicles. If the front and nearest vehicle is not at some safe braking distance, which is necessary to avoid collision in case of abrupt incidents, tailgating is detected. The third subsystem is an android mobile application which will use built in accelerometer and gyroscope for the detection of poor driving skills. It will detect the aggressive incidents like speeding, sudden braking and sharp turns and will report the driver in the end of the journey. A graphical user interface is also a part of the system to display the results of all three subsystems simultaneously. The major field of this research project is to provide all these features inexpensively. Experimental results confirm that the proposed methods provide robust results under all light and weather conditions.



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2015-FYP-36

**AW(Anti-Wheelie)
One-Wheeling Detection and Prevention**

Project Advisor: Dr. Asim Loan

Abstract

Motorcycle one-wheeling (MOW) is one of the burgeoning factors in motorcycle crashes and the threat of it is alarmingly increasing in Pakistan. Not only the life of biker is at stake, but the safety of people is at risk too. The youth of Pakistan has observed engaging themselves to one-wheelie and bike-stunts on the number of roads. The motivation for this project is to participate in this insecure act to protect people from serious injuries cause deaths or paralyzes. The mechanics of motorcycle needs to be modified in order to damp the wheelie.

The project is aimed to detect MOW using the sensor fusion and then to prevent it using the Capacitor Discharge Ignition Unit (CDIU). The detection part of motorcycle includes MPU 9250 as the sensor including the combination of gyroscope and accelerometer. The input from sensors is fed into microcontroller. STM32F401 is used as a microcontroller. Extensive tests are performed to have the right position of sensor module on motorbike. Finally, the sensor module is placed under the seat cover of motorbike towards the front side. The whole module is placed inside an insulating box for safety.

As the data obtained from sensors is noisy, hence some software-based filters are implemented using Attollic TrueSTUDIO. To get the data for testing, an SD card module is integrated with microcontroller using the SPI interface. The values for current angle of bike is recorded through SD card module and then analyzed on MATLAB. A second order infinite impulse response (IIR) filter is implemented to remove noise from its data. This filter is regressive, composed of feedforward and feedback terms. To account for drifting of data, a complementary filter is implemented and the offsets and scaling for sensors is set through the balance filter.

After the angle is being successfully detected using the sensors, the next step is to prevent the one wheelie. The project works on this by reducing the speed of motorcycle as soon as one wheelie is detected to bring the bike back to its normal position with a stable momentum. Here CDI is used as a speed limiter and a relay system is used to control the charge up energy for the spark plug discharge which is normally in the neighborhood of 100 to 200 volts DC. For high speed switching MOSFETs are used.

As a result, a concept motorbike is obtained which is able to automatically damp the one wheeling state of motorbike.

Keywords: Capacitor Discharge Ignition Unit (CDIU), Motorcycle one-wheeling (MOW), STM32F401 microcontroller, MPU 9250



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Wheelie! A Universal Wheelchair

Project Advisor: Dr. Kashif Javed

Abstract

Wheelie! As the name suggests is a wheelchair designed to tackle almost any kind of disability. It is specifically designed for disabled person to eliminates the necessity of the assistance required for mobility making user have a feel of independent accessible life. Starting from the very basic control which is **Joystick control**, a person who cannot move his legs can show mobility using wheelie's basic control that is joystick control, we implemented this part using arduino joystick. But if the person cannot move his hands either, he can show mobility by using the **head gesture control** provided in wheelie which is implemented using MPU-6050 (Accelerometer and Gyroscope). If a disabled person cannot move is head either he can control the wheelchair through **Voice control** which is implemented in Wheelie using deep learning on vocal commands, and in the worst case that the person cannot even speak, we have a solution for that also by providing mobility to the person by using the motion of their eyeball i.e. **Pupil tracking control**. In pupil control we have done real time image processing using morphological filters in order to move the wheelchair in the direction in which the eyeball is moving. For real time image processing we have mounted a camera on a helmet, the person using the wheelchair will wear the helmet and the MPU for head gesture control is also mounted on that helmet as shown in figure 1,



Figure 1: Helmet for pupil and head control

Also, in order to ensure the safety of the person using the wheelchair, we have also introduced a feature of obstacle avoidance using 6 ultrasonic sensors which can easily detect any obstacle in any direction which is about to hit the wheelchair and stop the wheelchair before collision. Out of these six 5 are used for obstacles around the wheelchair and the sixth is used to detect any holes or stairs on the ground.

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AI Based Home Assistant to Control Smart Homes Using Wi-Fi

Project Advisor: Prof. Dr. Khalid Mehmood Hassan

Abstract

Smart homes are the future. The last few years have seen Internet of Things (IoT) transform from a theoretical concept to a major priority for many organizations. With 127 devices being connected to the Internet every second, this astonishing number has been predicted to grow to a total of 20.4 billion IoT devices by 2020, approximately double of the current statistic. It is inevitable that a significant amount of work has been committed to this domain. However, the proposed systems lack the concept of localization and plug-and-play compatibility. Moreover, issues like high cost, need for continuous internet connectivity and inability to support native language continue to inundate the current technology. These problems were the initial motivation for this project and in order to overcome these shortcomings a cost-effective, IoT based connectivity system, named 'Friday' has been designed, implemented and successfully tested. It is enabled with plug-and-play functionality, allowing users to easily integrate it with their existing appliances without having to replace them.

The proposed hardware solution consists of a front panel and a bottom panel. The bottom panel contains an ESP8266-12E Wi-Fi module for local Internet connectivity, bridge rectifier circuit, zero detector circuit and other relevant circuitry to enable the switching of appliances as well as speed and dimness control. The front panel, on the other hand, carries capacitive touch sensors for user interaction with the connected devices. Thread Network Architecture is implemented, enabling the Wi-Fi module to populate a local, decentralized network of devices (or nodes) that can exchange information among themselves and provide cloud connectivity through a network gateway, that is a Node.js based server. A voice enabled, Android based mobile application has also been developed so users can control their home appliances on the go.

The project was executed in three main iterative phases of hardware development. Some of the key challenges were encountered during these three phases owing to the anomalies and physical limitations, existing in real life components. Lowering the cost of the final system was equally



daunting. However, it goes without saying that an IoT enabled automation product that eliminates the need for replacing existing devices cannot only be used in households, it also has immense industrial and commercial potential.

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SIMO Smart Antenna Processing

Project Advisor: Dr. Syed Irfan Shah Hussain

Signature:

Abstract:

Earlier Communication systems included single communication route i.e single transmitter antenna and single receiving antenna such systems are called SISO (single I/O systems).In the beginning all telecommunication systems were SISO based. SISO had only one route/channel available for communication which had many disadvantages including signal fading and lower data rates.In order to solve this problem by having multiple signal channels multiple antennas at transmission section and/or multiple antennas at receiving side are introduced which give rise to SIMO (single input multiple output) , MISO (multiple input single output) and MIMO (multiple input multiple output) systems. One major problem that arises with such systems is that signals from multiple routes become correlated because of closely spaced multiple antennas so they can't be added directly therefore they need to be multiplied with appropriate weights so that they add constructively and noise is canceled out. The array signals processing involves the algorithms for determination of the weights.

Our project includes two phases ,first one is Beamforming which adds constructively the phases of the signals and suppresses the noise or the unwanted signals by placing a null in their direction. This can be achieved by a simple FIR(Finite Impulse Response) filters. There are certain algorithms available for the determination of weights of the FIR filter.

The second phase of the project is DOA(Direction Of Arrival) estimation which will make our SIMO antenna to be adaptive i.e. the systems can make automatic adjustments of the weights of the filter while the transmitting antenna moves relative to the receiving section or vice-versa. An adaptive array can steer the beam to any direction of interest while simultaneously nulling interfering signals. Beam direction can be estimated using the so-called direction-of arrival (DOA) estimation methods.

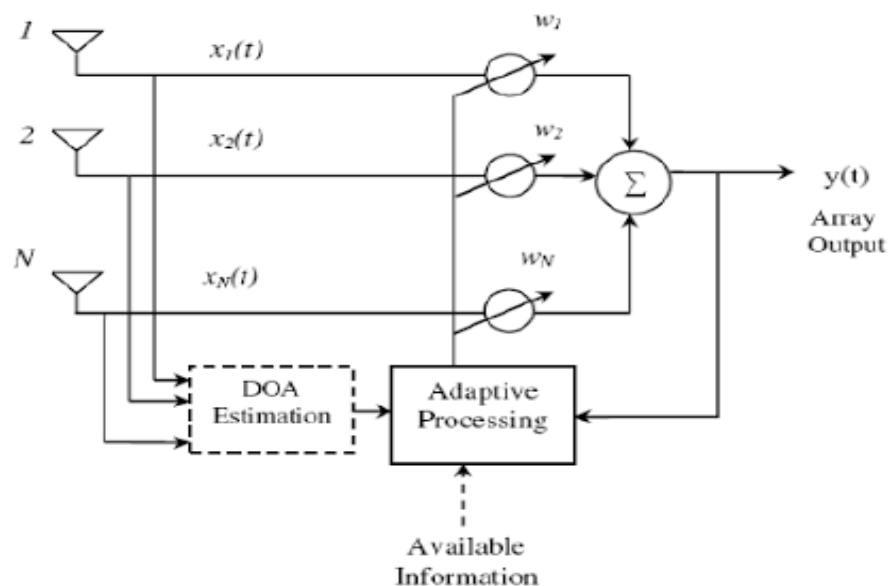
The SISO systems were adequate for the earliest telecommunication networks considering the processing speeds of machines at that time and the data rate requirement but signal fading and quality of received signal was still a major drawback because the signal is in fact a time varying traveling wave which can undergo absorption or reflection especially by perfect conductors resulting in significant signal fading and very low SNRs. With the advent of modern technologies the processing speeds of machines have increased significantly hence in order to ensure fast and feasible communication there is a need to improve data transmission rate and SNR over distant wireless media. Modern telecommunication systems are required to have better signal quality, SNR and data rates at the receiving side. The old SISO systems are unable to meet



these requirements hence advanced telecommunication systems use modern techniques such as SIMO, MISO and full dimensional MIMO.

As the name implies SIMO antenna systems will have single antenna at transmission side and multiple antennas at the receiving side. In our project we will have two antennas at the receiving side and array processing algorithms will be used for SNR improvement and DOA estimation. So, the project can be divided into two sections one is transmission side and other is receiving side.

In Conventional Beamforming, the weights are calculated assuming fixed location of receivers in the space and wave direction of interest. Once weights are set, the receiver can amplify and record the signals coming from the fixed direction while other signals are suppressed hence such beamformers work for fixed location of receivers and incoming wave direction and they are unable to adjust or adapt to changing location of receivers or incoming signal.



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2015-FYP-40

Solar Powered Auto-Irrigation System

Project Advisor: Dr. Sidra Farid

Abstract

In the field of Agriculture, it is important to use a proper method for irrigation. There are several reason for this, one being due to the lack of rainfall and scarcity of land for reservoir. The continuous extraction of water from the earth lowers the water level which makes huge chunks of this land in-arable and infertile for agricultural use. Also due to the unplanned use of water which leads to wastage of a lot of water. For this purpose we use solar powered auto irrigation system which is a renewable source of energy, to control the water instead of the more expensive power sources such as diesel powered pumps, which are also harmful to the environment. The system drives power from solar energy through photo voltaic cells. The solar energy is used to operate irrigation solenoid valve. The circuit comprises of solenoid valve, soil moisture sensor to sense whether the soil is wet or dry. The micro controller is used to control the overall system by monitoring the soil moisture sensor values. It will also control the opening and closing of the solenoid valve according to the soil moisture sensor values. If the soil moisture is lower than the base value (i.e. set value) then the microcontroller will send a signal to solenoid valve thereby opening it to allow the flow of water to the soil. We can further enhance this project by interfacing it with a GSM module to gain the control over switching operation of the solenoid valve. The purpose GSM module is to allow the administrator to control the irrigation system even when he is far away from the farm. The GSM module once connected will send a short message service (SMS) to the administrator to inform him/her that the soil moisture is low. The administrator can command the microcontroller to open the solenoid valve to allow for the flow of the water by sending back SMS to that effect.



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2015-FYP-41

Design And Implementation Of Series Compensators For Power Flow Control

Project Advisor: Sir Omer Imtiaz

Abstract

Design and Implementation of Series Compensators For Power Flow Control by designing and installing Static Synchronized Series Reactor in transmission system which will act as a compensator. The SSSR(Static Synchronized Series Reactor) enables us to adjust transmission line reactance in real time change power flow in the transmission network. And help in controlling and minimizing outages which normally occur in our power flow network. SSSR allows us rapid deploy ability, scalability and redeploy ability of power in the power flow network. As in our current power flow networks alternates path are exist for power flow so the SSSR will use these alternate existing path and support maintenance and simplify or even remove outages easily.

It will helps us to reduce the cost in removing overload outages(faults) by avoiding of construction of new generators in transmission system and utilize the under load lines and existing generators to protect overloaded lines and meet the load demand.

SSSR has ability of quick to deploy and have short payback periods allow utilities to address congestion in their system and reduce production cost.

The fast response time of SSSR means the units can be set so reactance is not injected until after the fault occurs.

The working procedure of SSSR is simple. It will control the power flow by controlling the reactance(SSSR will not add reactance just control the existing reactance) in power flow system. When the outages occur the SSSR will divert the power flow from the fault line to the alternate already existing line by controlling reactance so the power flow remain undisturbed and continue until the outages(faults) remove and after the fault removed the SSSR will again convert the power flow back in previous state. It will help us to minimize our cost of installing of new transmission lines in power flow system and also protect the load.

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