SENIOR YEAR PROJECTS

2017-2018

DEPARTMENT OF ELECTRICAL ENGINEERING
SCHOOL OF ENGINEERING
UNIVERSITY OF MANAGEMENT AND TECHNOLOGY
LAHORE

Introduction

The School of Engineering (SEN) has been created in April 2013. The school acts as a hub for various engineering disciplines and provides a common regulatory platform for the professional education in the field of engineering with the objective to achieve national accreditation of degree programs offered under its umbrella. The School of Engineering offers leading-edge programs to create design, application and innovation skills in its students by utilizing and involving their curiosity, intelligence and creativity.

The Electrical Engineering (EE) Programme at SEN is designed to enable students to be well-prepared to contribute to the rapidly changing and expanding needs of technology. The EE curriculum provides students with a strong foundation with emphasis on basic sciences and the development of excellent engineering skills through carefully planned core and elective courses. EE students also learn through a combination of design and lab work. The EE curriculum covers the essential breadth and depth needed for contemporary professional practice. Four important concentration areas have been identified in student's projects:
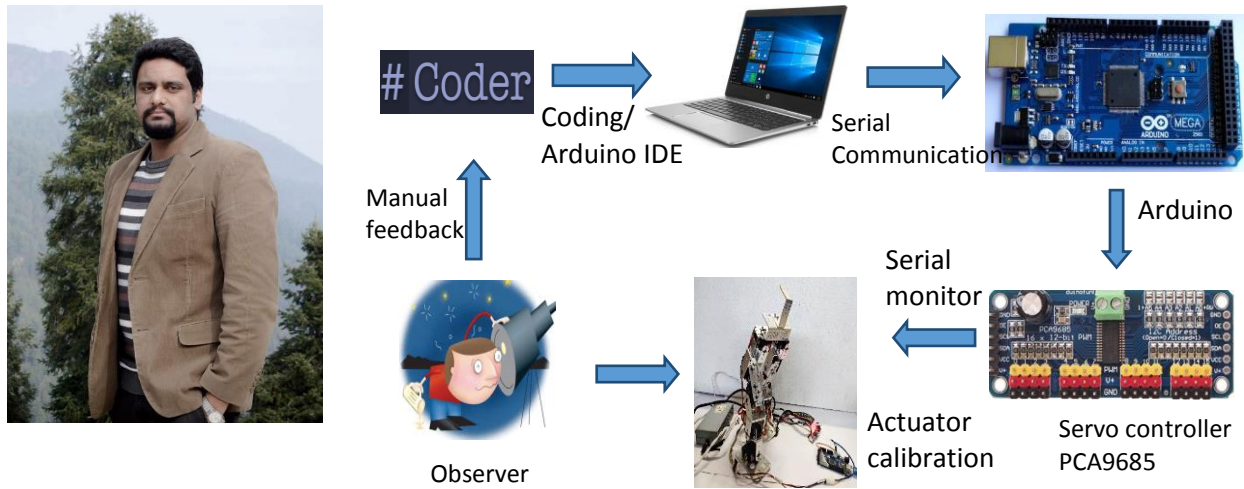
- **Modern Power and Energy Systems**
- **Communications, Signals and Systems**
- **Electronics and Embedded Systems**
- **Robotics**

In the final year of undergraduate studies students are involved in a yearlong project to demonstrate their practical knowledge. This handbook consists of a brief description of the final year projects for the session 2017–18. All the projects were displayed in an internal exhibition on June 28, 2018.This effort was coordinated by **Jameel Ahmad, Director Undergraduate Projects, Engineer Hassan Tariq, Engineer Bilal Anwar and Engineer Abdullah Khalid.**
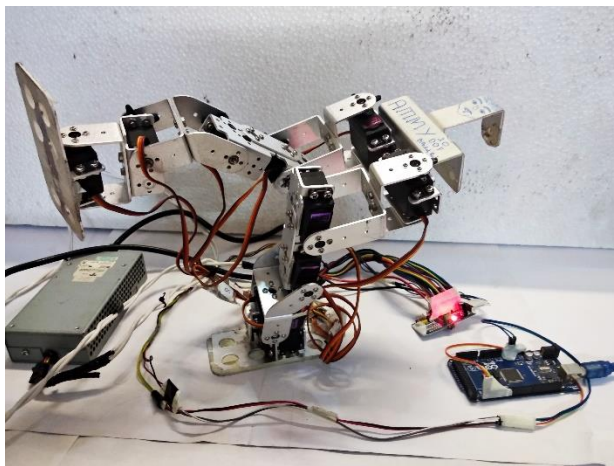
A BI-PEDAL WALKING ROBOT

Advisor: HASSAN TARIQ

School of Engineering

WORKING ARCHITECTURE

Coder → Coding/ Arduino IDE → Serial Communication → Arduino

Manual feedback

Observer → Serial monitor → Actuator calibration → Servo controller PCA9685

Awais Murtza **Muhammad Bin Tariq** **Muhammad Mohsin** **Yahya Naseem**

ACHIEVEMENTS

- Cheapest Prototype available in market. Having 10 **DOF** (Degrees of Freedom)
- Stable walking without the help of sensors.
- Human like walking tread.
- Standing up function after falling down on ground either forward or backward.
- Can kick a ball.
- Can balance it's self on a single foot.
- Can turn sideways (left & right).
- Easy to use interface for controlling.
- Verity of combinations to perform.
- Bluetooth control can be made also (upgrade option available).
- New self-devised Walking technique **SDCT** (Shift Displacement Waling Technique) for real time stability.

HIGHLIGHTS

- Assemble a Bi-pedal stable walking robot.
- A Bi-pedal that can walk stably on two legs without falling.
- Should be able to mimic human tread and keep it self-stable.

Vision Based UAV for Suspect Recognition and Following

Advisors: Jameel Ahmad

Dr. Umar Suleman

School of Engineering

Muzzamil   Abdul Rehman

Sami Ullah   Ahad Butt

Quad-copter

Flight Controller

Arduino Nano

Control and stabilize drone

PWM Signal

Serial communication

WiFi

TCP/IP protocol

Raspberry Pi

User

Raspberry Pi Camera

Raspberry Pi
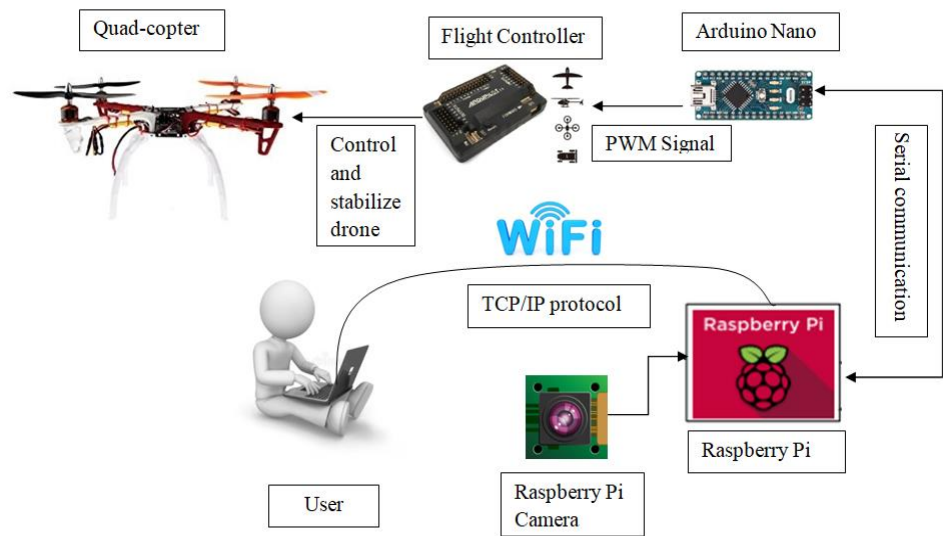
System Architecture

HIGHLIGHTS

- Assemble a quadcopter that gives a stable flight.
- Quadcopter that can fly autonomously without human interference.
- Human Tracking Drone

ACHIEVEMENTS

- Controlling quadcopter from laptop instead of transmitter.
- Stable Flight
- Autonomous Flight
- Live Video Streaming
- Video Recording
- Face Detection
- Face Tracking
- Face Recognition
- Auto Landing when WiFi signal lost

Quadcopter
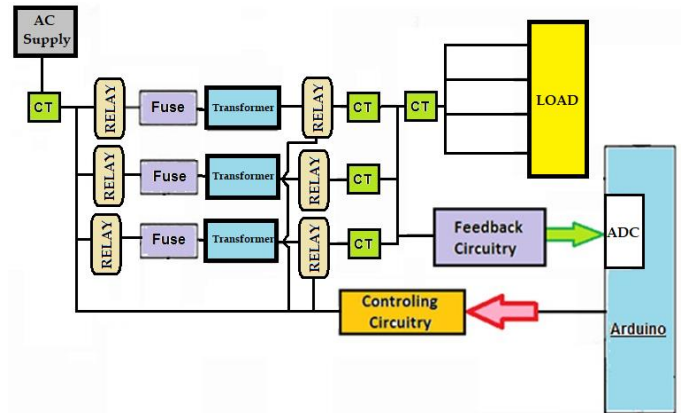
School of Engineering, UMT

Advisor: **Noman Ahmad**

Assistant Professor
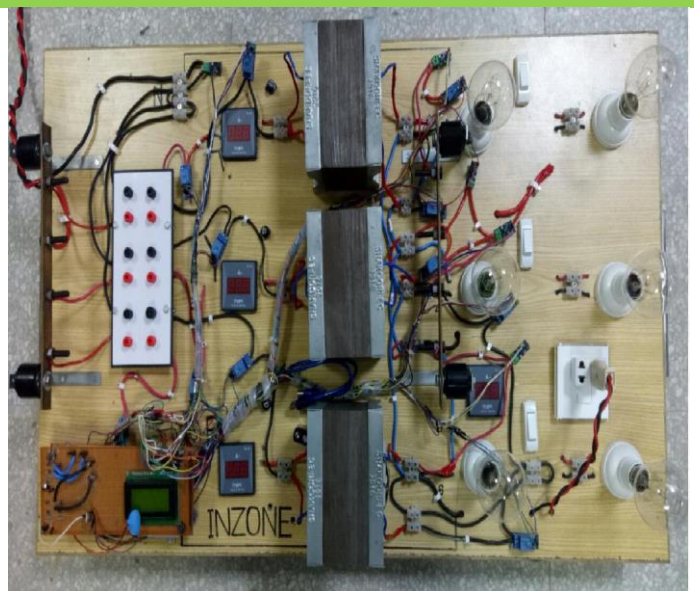
Department of Electrical Engineering

School of Engineering

University of Management and Technology

Schematic

Hamza Asif 14019019083	Talha Rauf 14019019107	M. Arslan 14019019087

Hardware Design

Highlights:

- A prototype that can effectively Share the Load among the Transformers in Parallel
- Reduce the Energy Losses of the Transformers
- Prevent load shedding due to Transformers' Overloading
- Reduce the Cost of new Transformers on Grid

Achievements:

- Sharing of load according to the Loading Conditions
- Minimized Circulating Currents
- Reduced Voltage Sags
- Power Factor monitoring system
- Reliable and Uninterrupted Power System
- ICT Funded Project

Data Acquisition and Signal Processing of ECG

Advisor: Prof. Dr. Sajjad H Shami

Department of Electrical Engineering
School of Engineering
University of Managemnt and Technology
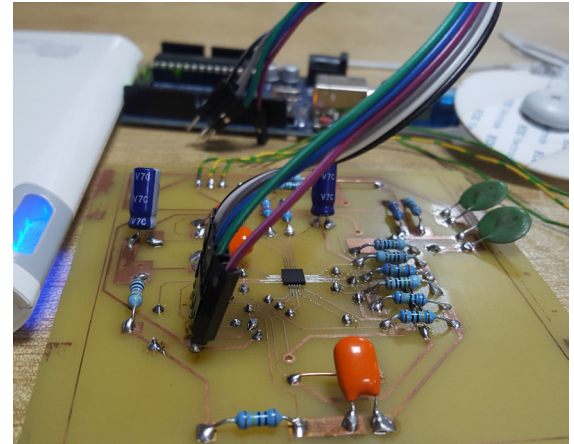
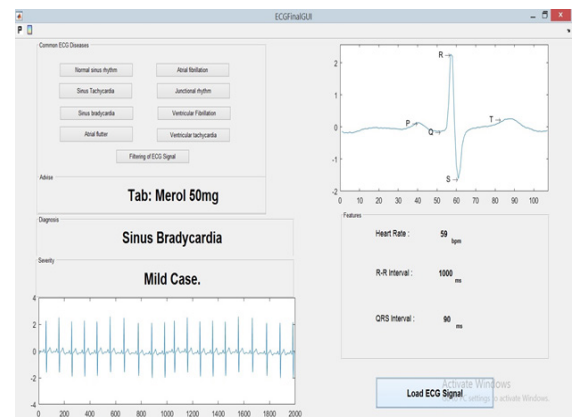

Hardware Design

User Interface

Muhammad Adeel

14019019147

Syed Arsum Khubaibullah Gillani

14019019033

Abdul Rehman Arshad

14019019008

HIGHLIGHTS

- Machine which should be cheap, easy to use, accessible to common people.

- Perform ECG of the heart, interpret its waveform and check abnormalities.

- Gives a Diagnosis plus short prescription according to abnormality detect.

- Joint applications of engineering and medical sciences.

ACHIEVEMENTS

- Real time ECG graph.

- Automatic Diagnostic report.

- Medication Advice.

Operational Control of 3 Phase MicroGrid

Advisor: Nauman Ahmad
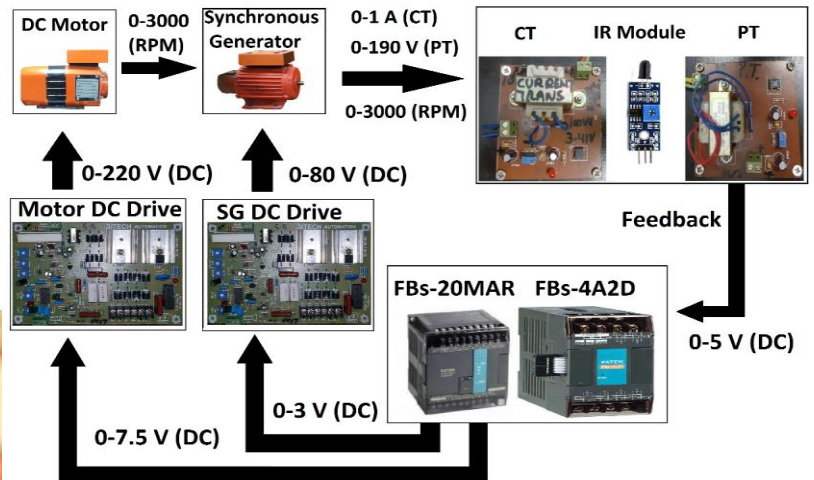**Co-Advisor: Awais Saeed**

Aamir Zia

Qasim Malik

Ahsan Javaid

Usman Rasheed

School of Engineering

Simulation/Design

DC Motor → 0-3000 (RPM) → Synchronous Generator → 0-1 A (CT) / 0-190 V (PT) / 0-3000 (RPM) → CT IR Module PT

0-220 V (DC) — 0-80 V (DC)

Motor DC Drive — SG DC Drive — FBs-20MAR FBs-4A2D
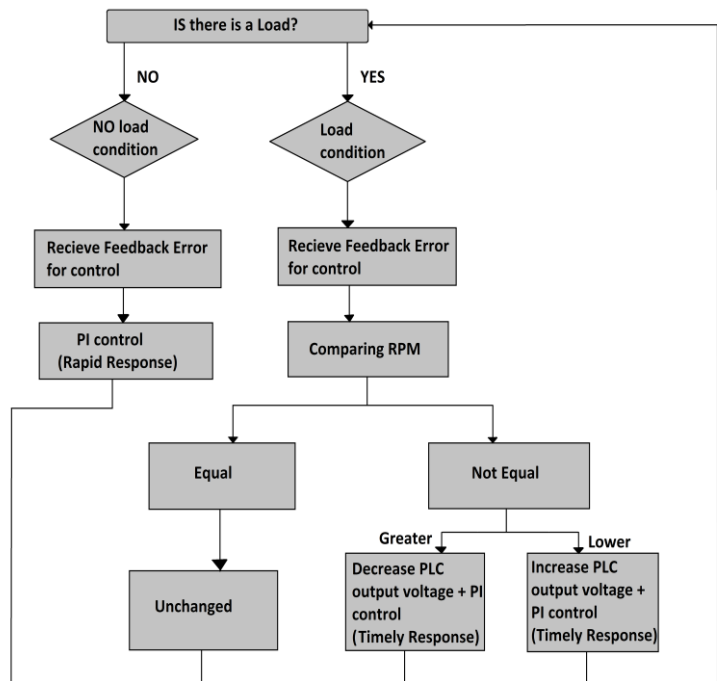
Feedback

0-5 V (DC)

0-7.5 V (DC) — 0-3 V (DC)

HIGHLIGHTS

- Design of an efficiently control PLC based MicroGrid.
- To maintain RPM and voltage stability at generator Bus Bar.
- Interfacing PLC with Virtual HMI.
- Low Cost Isolated MicroGrid Solution.
- Efficient Energy Usage.
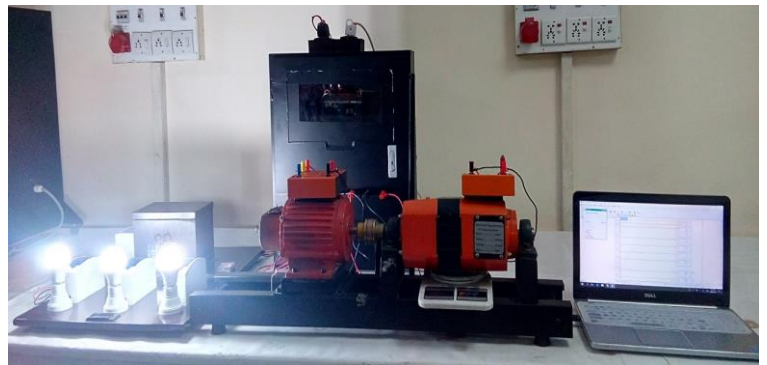
APPLICATIONS & SCOPE

- Make Experiments for our Juniors.
- Make a MicroGrid Kit.
- Useful in providing energy at Hilly Areas.
- Developing an old Electrical Machines Lab Apparatus.

IS there is a Load?
- NO → NO load condition → Recieve Feedback Error for control → PI control (Rapid Response) → Equal → Unchanged
- YES → Load condition → Recieve Feedback Error for control → Comparing RPM → Equal → Unchanged / Not Equal → Greater: Decrease PLC output voltage + PI control (Timely Response) / Lower: Increase PLC output voltage + PI control (Timely Response)

VAPSM-A Prototype Smart Meter

Advisor: Muhammad Asim Butt
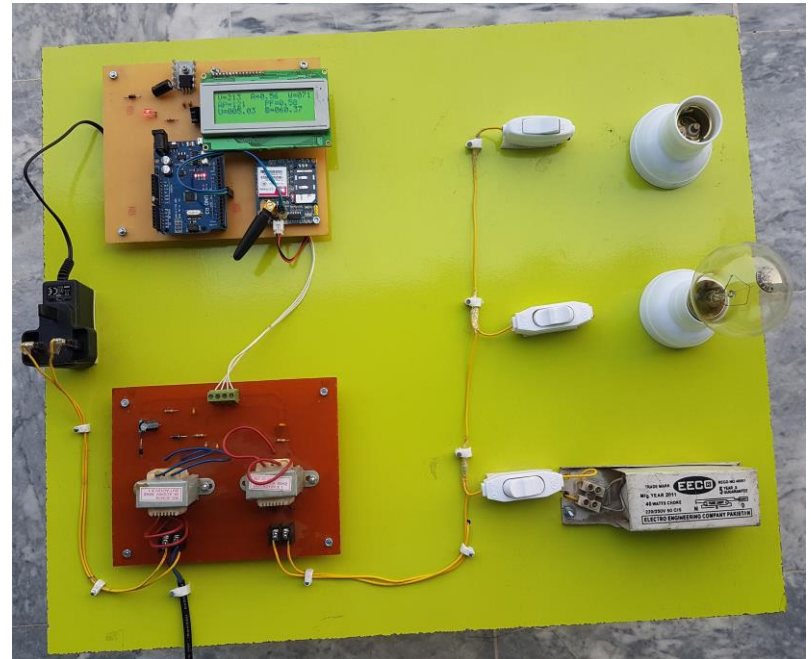
Rehan Ahmad
14019019058

Amir Hamid
14019019088

Abdul Wahab
140190190135

Muhammad Talha
14019019050

HIGHLIGHTS

• **Real time operation by measuring power consumption, voltage, current and billing information.**
• **User friendly interface and communication of VAPSM with consumer and utility provider through GSM in real time.**
• **Daily reminders of current units consumed and current bill in real time for the user.**
• **Multiple options for billing.**
• *Power factor calculation to indicate losses due to poor power factor.*
• *Application in commercial and residential metering.*

Radial Feeder Protection Laboratory Experimental Panel

School of Engineering

Advisor: Nauman Ahmad

(Assistant Professor & Director Labs)

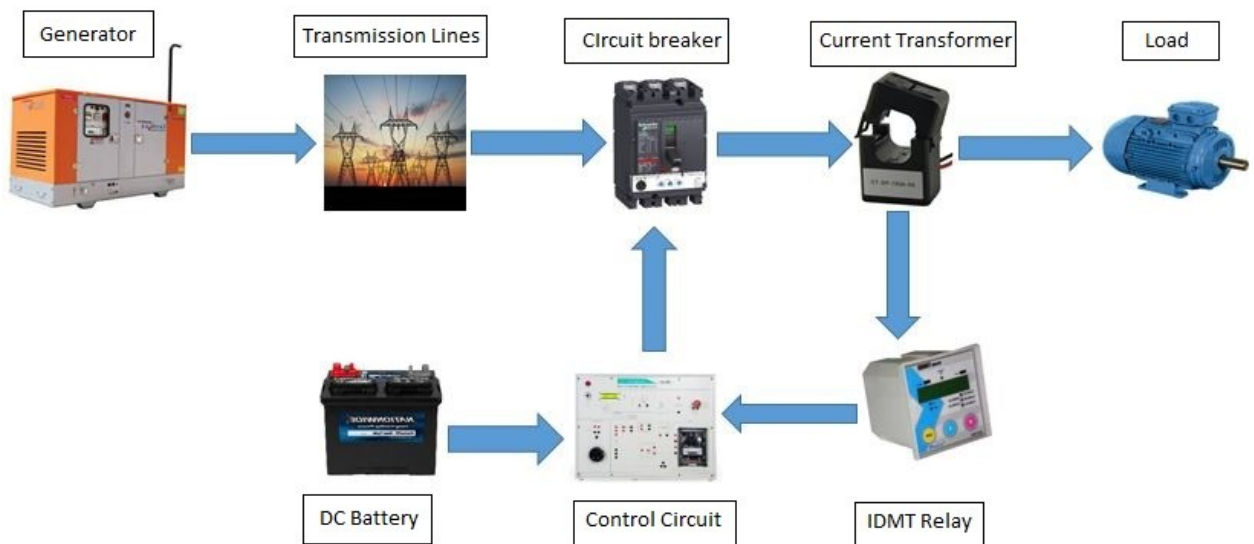Electrical Engineering Department

Team Members

Sajjad Ali

Tahir Bahar

Umar Waheed

Block Diagram

Highlights

- Customized Laboratory Experimental Panel
- Enhanced Safety of Power System & Safe Handling
- Easy Upgradation to Three Phase
- Automatic Fault Interruption
- Useful for Fault Studies of Radial System.

Overhead Transmission Line Cleaning and Surveillance Robot

School of Engineering

Advisor

Dr. Muhammad Adnan

Group Members

Jawad Ehsan

Zakir Abbas

Adil Yaseen

Sheikh Imran

Hardware Design

System Diagram
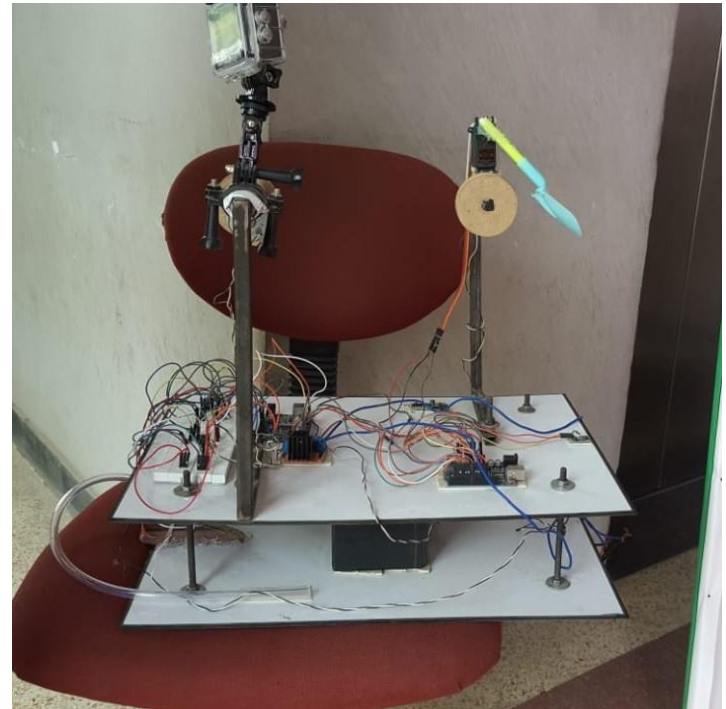
HIGHLIGHTS

- ➢ Reliable operation of transmission line cleaning will be performed by it.
- ➢ Cleaning will be done by IR controlled scrapper and water cannon.
- ➢ Scrapper used to remove the snow on transmission lines.
- ➢ Water cannon can also be used to melt the ice on transmission lines using any de-icing agent.
- ➢ It will maintain its balance on overhead transmission lines in windy conditions.
- ➢ It will do controlled movement on transmission line.
- ➢ Visualization is provided by a camera at remote location.
- ➢ Live streaming provided for the inspection of Lines.
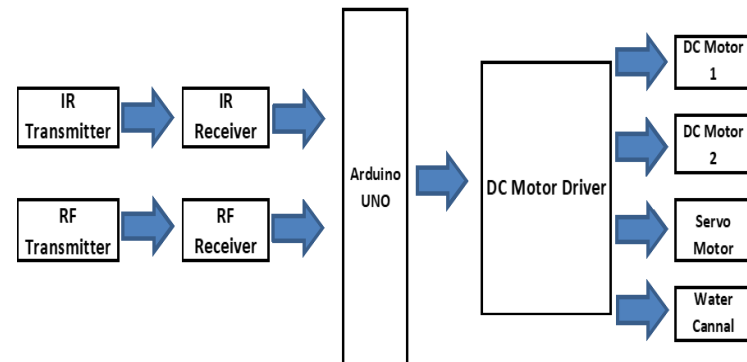
Automatic Grass cutter

Advisor:
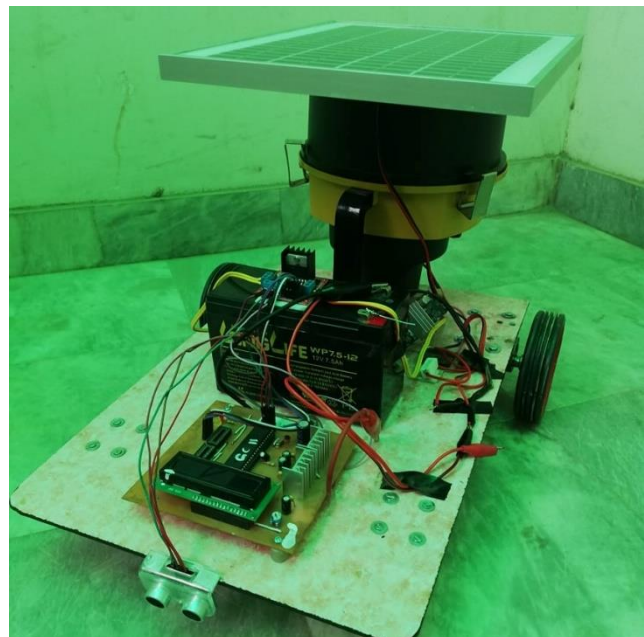
Ahmed Malik (Assistant Professor)

Muhammad Usman   Gohar Ghaffar

Muhammad Umar   Ashfaq

School of Engineering
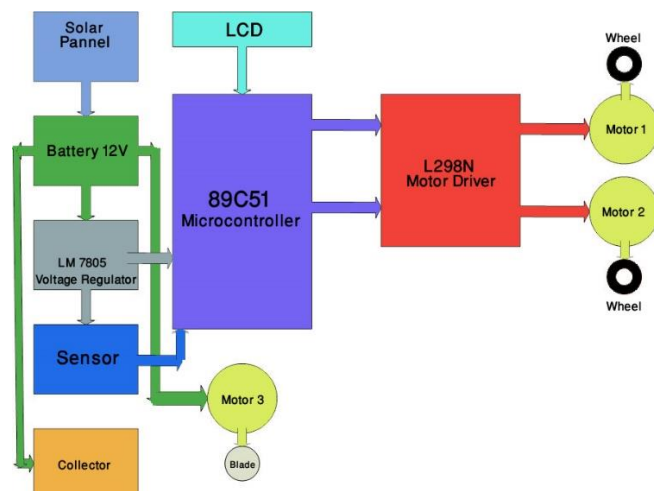

Hardware Structure

HIGHLIGHTS

- Using solar energy as a power source.
- HC-SR04 sensor for obstacle detection.
- Collector to collect grass after cutting.
- Controlling the whole system by microcontroller.

ACHIEVEMENTS

- Machine is fully automatic.
- Working properly.
- Small in size.
- Cheap & Energy saving.
- No labour required.

Block Diagram

Design and Hardware Implementation of DC-DC Converter and DC-AC Inverter

Advisor: JAMEEL AHMAD

HAMZA ALI
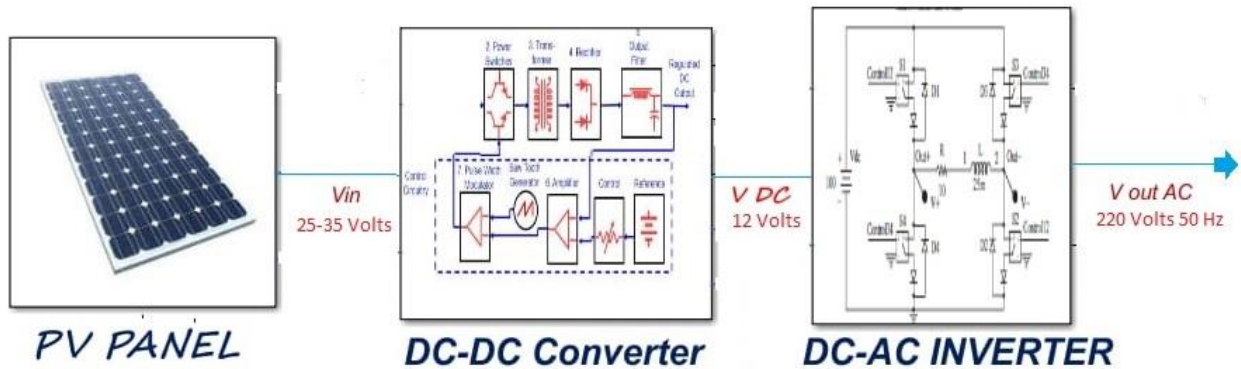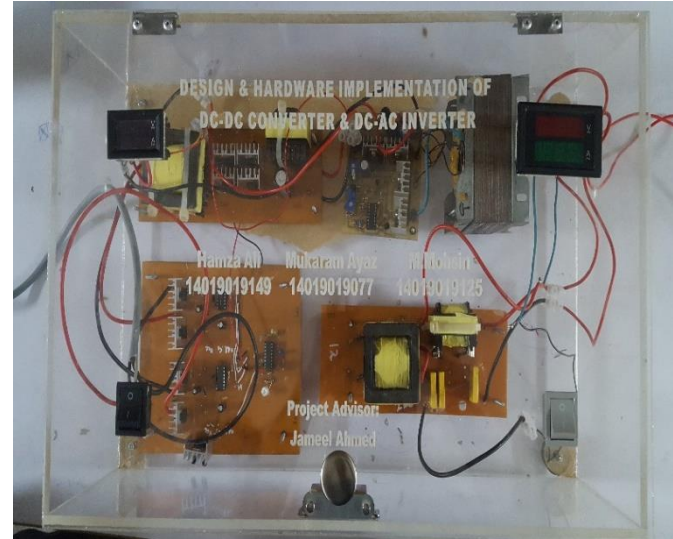14019019149

MOHSIN ALI
14019019125

MUKARAM AYAZ
14019019077

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Highlights:

1: To convert unstable PV voltages to stable DC voltages and reducing them to 12 Volts.

2. To produce the constant amplitude, constant frequency, AC supply with less than one percent variation.

3. To design on overall efficient, robust and cheap system.

Results:

Stable 12 Volts DC are obtained with at varying input P.V panel voltages.

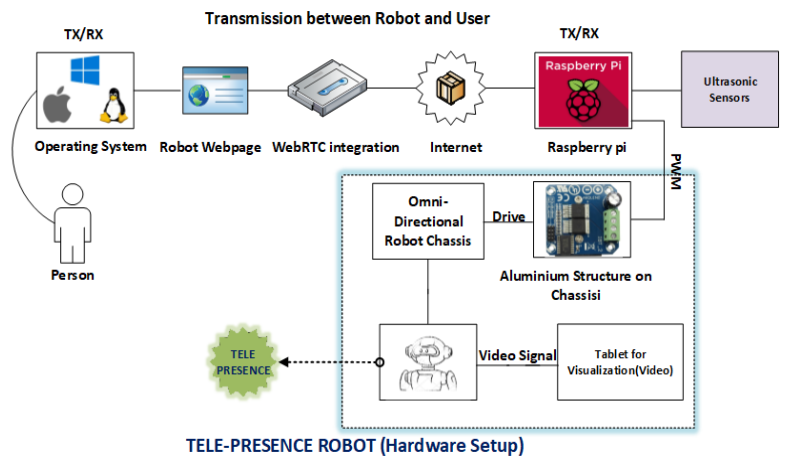12 Volts DC are converted into 220 Volts 50 Hz AC voltages.

An Intuitive Approach for the Design and Implementation of Omni-Directional Tele-Presence Robot

Advisor: Mr. HASSAN TARIQ

School of Engineering

ZAIN UL ABIDEEN   **MUHAMMD HUSNAIN JAVED**

Transmission between Robot and User

TX/RX

Operating System   Robot Webpage   WebRTC integration   Internet   Raspberry pi   Ultrasonic Sensors

TX/RX

Person

PWM

Omni-Directional Robot Chassis — Drive

Aluminium Structure on Chassisi

TELE PRESENCE

Video Signal   Tablet for Visualization(Video)

TELE-PRESENCE ROBOT (Hardware Setup)

(SYSTEM ARCHITECHTURE)

HIGHLIGHTS

- ✓ The user can control the robot anywhere in the world.
- ✓ Omni-Directional feature have zero turning angle.
- ✓ The system is completely protected using SSL and login page.
- ✓ Collision protection feature protects from collision.

APPLICATIONS

- ❖ To facilitate the human beings (Homes, offices, schools etc).
- ❖ To facilitate the doctors in hospitals.
- ❖ To make team work easier using virtual presence.
- ❖ To survey the site and fields.
- ❖ For conference meeting, class lectures and face to face interaction.

(TELE-PRESENCE ROBOT)

Advanced Real Time Automation Using System Software Control

School of Engineering

Advisor: Mr. Hassan Tariq

Umar Qayyum

Zain ul Abideen

Taimoor Hassan

Ahsan Ahmad

HIGHLIGHTS

- Hardware design to operate lights in different modes
- Software design to control lights through system software

ADVANTAGES

- Compact Design
- Quick Setup
- Portable Hardware
- Software Control
- Easy to Deploy
- Improved Organization
- Centralized Communication
- Reduces Staff Involvement

FLOW CHART

Hardware Implementation
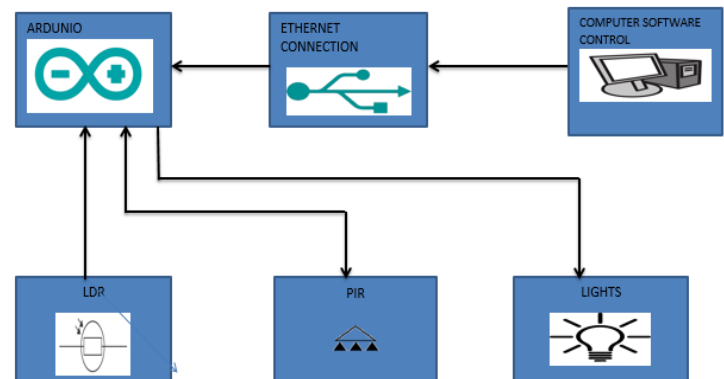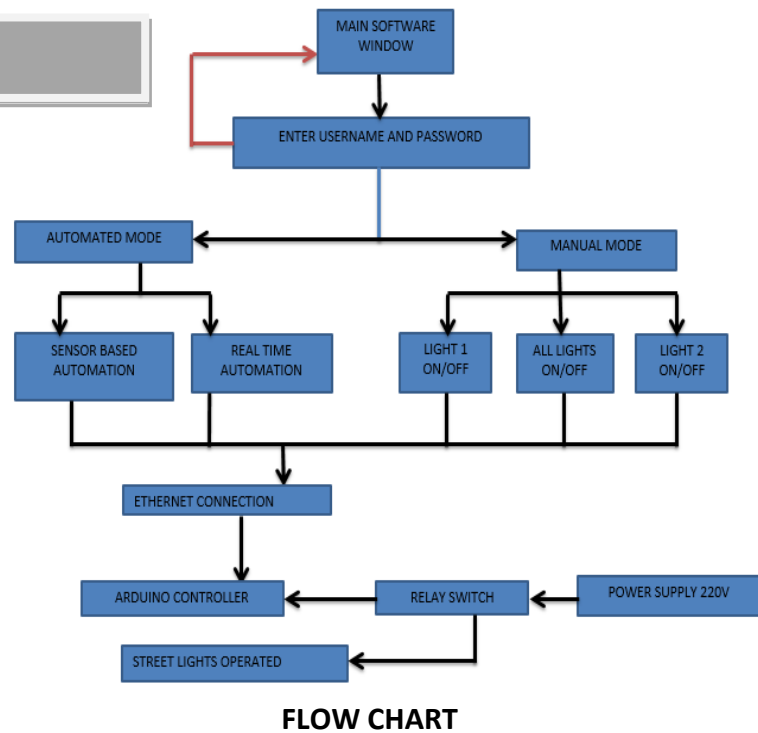
WORKER'S EFFICIENCY CALCULATION USING LEAP MOTION SENSOR

GROUP MEMBERS

Advisor: Miss Ayesha Iqbal

Bilal Arif

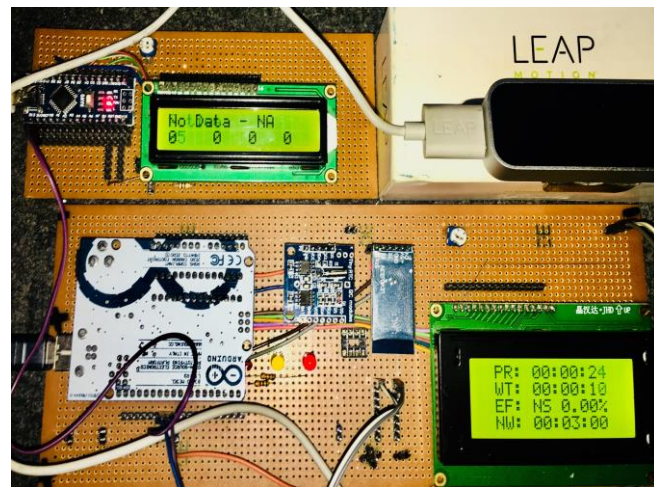Talha Arshad

Hayder Atta

Saad Imtiaz

School of Engineering
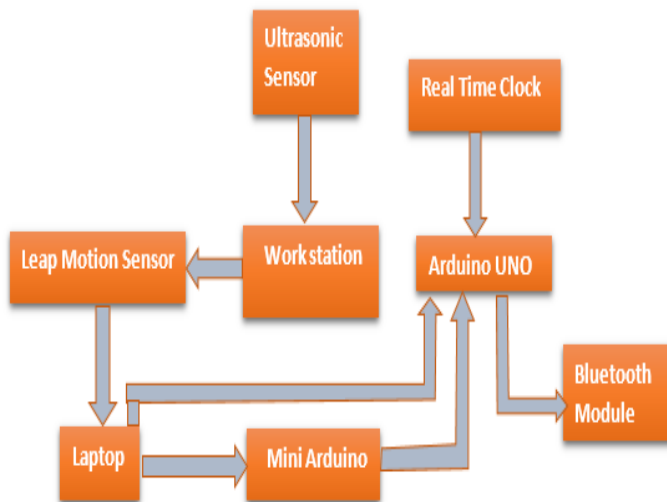
Simulation/design

Hardware Design

Highlights

- To configure and build a system for the assessment with Arduino.
- To execute a hand motion system for determining the worker's productivity.
- To build up the correspondence communication system between leap motion sensor and the worker's hand.
- To evaluate the worker's absence and presence time on the work station during the working hours.

Smart Automated Petrol Pump

Advisors: Mr. Waseem Iqbal

Assistant Professor
Department of Electrical Engineering
School of Engineering
University of Management and Technology
Lahore

**School of Engineering**

Team Members

| Rajesh Kumar | Umair Ali | Hafiz Usama | Asadullah |

HIGHLIGHTS

- Filling of fuel with Human Machine Interface (Nextion Lcd) and RFID module
- Reducing Man Power
- More secure, practical and user friendly
- A good idea to overcome the deception cases like robbery, fraud etc
- Application in other rationing products like vegetable oil, kerosene oil, milk and other similar products.
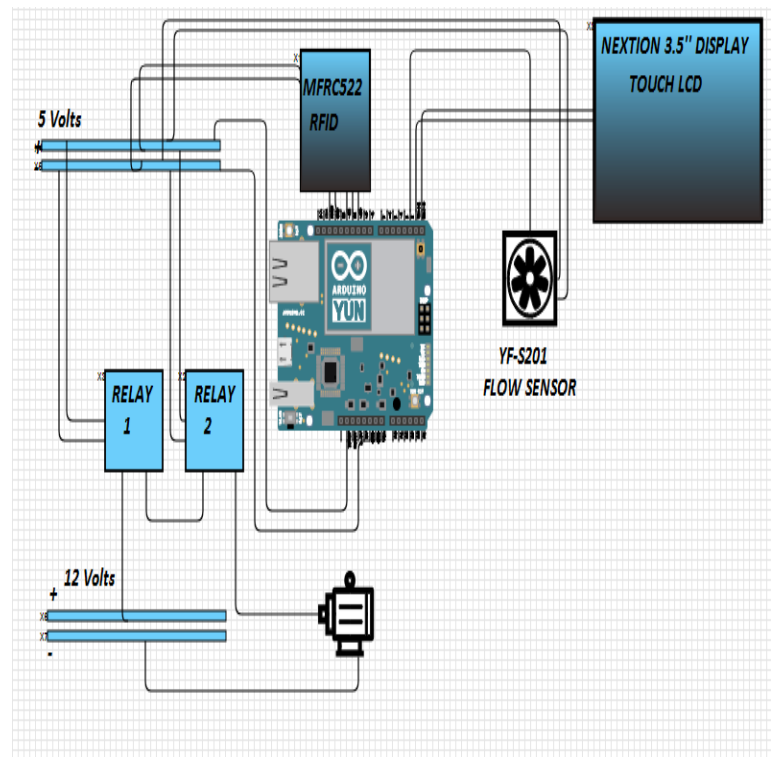
Clutter and Jammer Mitigation for Airborne Radars using Space Time Adaptive Processing
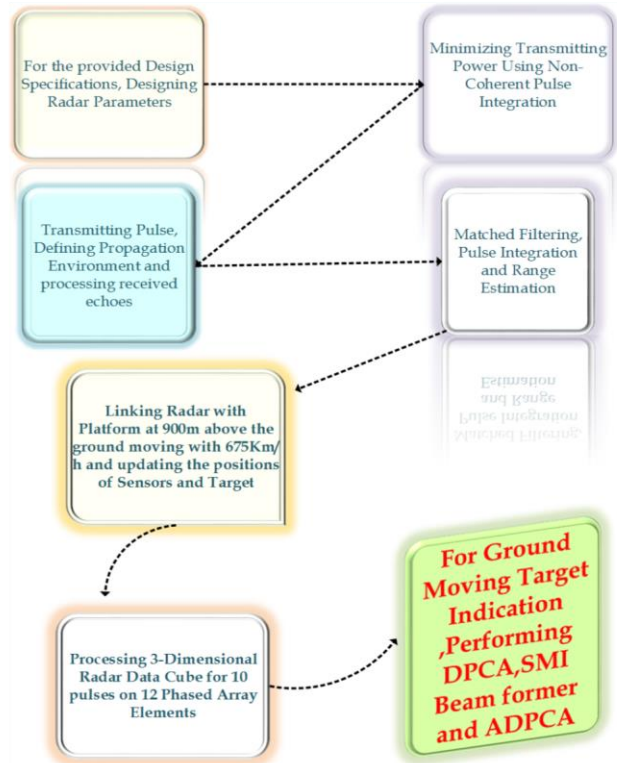
Advisor: Jameel Ahmad

School of Engineering
Department of Electrical Engineering

Waseem

Muhammad Hassan

Shahzad Khalil

Qazi Raheel

For the provided Design Specifications, Designing Radar Parameters

Minimizing Transmitting Power Using Non-Coherent Pulse Integration

Transmitting Pulse, Defining Propagation Environment and processing received echoes

Matched Filtering, Pulse Integration and Range Estimation

Linking Radar with Platform at 900m above the ground moving with 675Km/h and updating the positions of Sensors and Target

Processing 3-Dimensional Radar Data Cube for 10 pulses on 12 Phased Array Elements

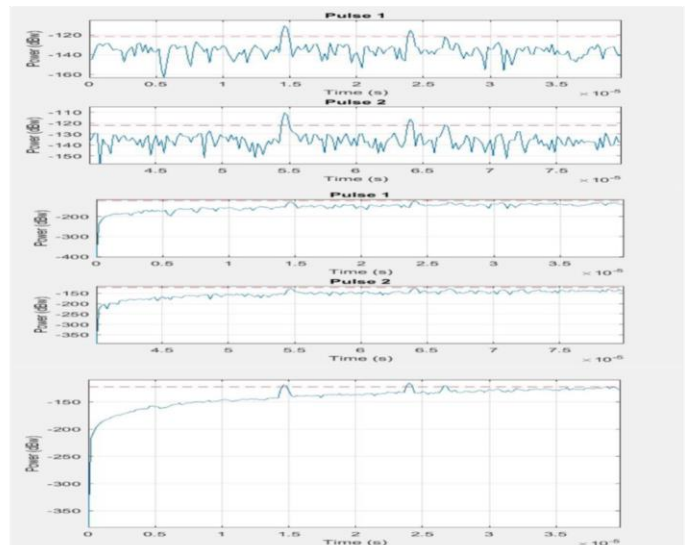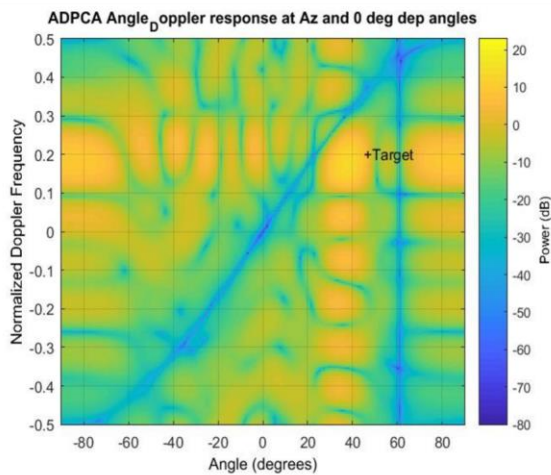For Ground Moving Target Indication ,Performing DPCA,SMI Beam former and ADPCA

Results of Radar Testing for 3 targets at different ranges

Result of Clutter and Jammer Mitigtion

HIGHLIGHTS

- Modeling of complete monostatic radar based on radar design specifications.
- Linking the monostatic radar with the airborne platform at 3000ft moving with certain radial velocity.
- Clutter and Jammer Mitigation using DPCA, ADPCA and SMI Beam-former for Ground Moving Target Indication.

Advanced Metering Infrastructure (AMI)

Advisors: Jamil Ahmad

Assistant Professor

School of Engineering

Department of Electrical Engineering

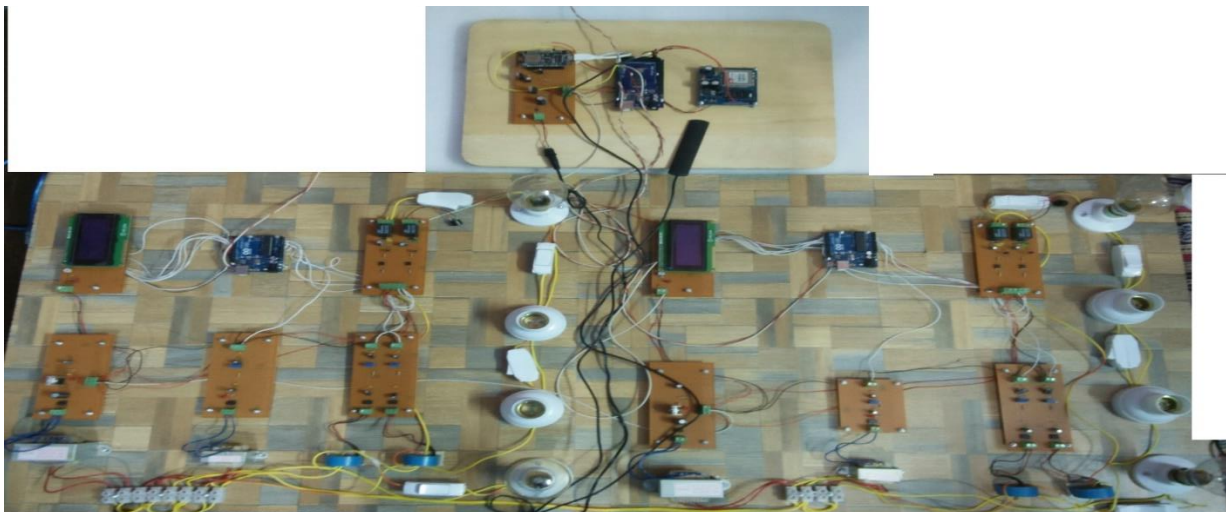jamil.ahmad@umt.edu.pk

School of Engineering

HIGHLIGHTS

- Assemble a prototype of AMI
- Energy Meter that can be access via Internet.
- Theft Control
- User Friendly

ACHIEVEMENTS

- Accessing Meter Data via internet by any place
- Stable Access
- Reduce Man's power
- Economical
- Easy to use
- Theft Detector

Small Scale Wind Energy Conversion System

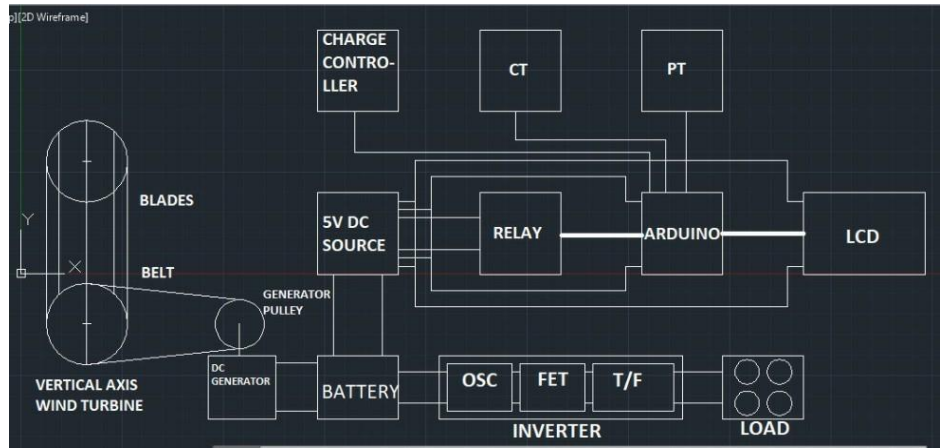**Advisor: Dr. Irfan Ullah**

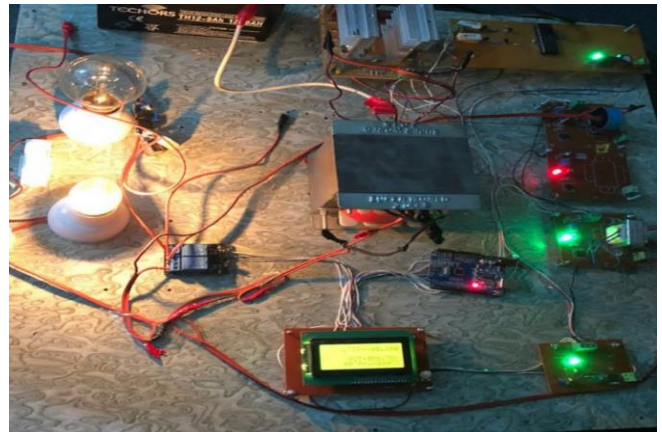**School of Engineering**

Shahzaib

Nusrat

Ahsaan

Block Diagram

Hardware

HIGHLIGHTS

- Design a wind turbine that can give us maximum power.
- A system that can give us enough power to produce the electrical energy and store that in battery.
- Free energy and cost effective.

ACHIEVEMENTS

- Designed a wind turbine on AutoCAD that can give us maximum power at small scale with maximum power coefficient.
- Controlling the battery charging by charge controller.
- Protection of load and battery using 2-relay module.
- Displaying results of load and battery on LCD.

Turbine