

HIGHWAY WIND TURBINE MONITORING USING IOT AND CLOUD

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Communication Engineering

by

M.LIKHITH KUMAR (39130288)

P.SATYANARAYANA (39130330)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC JEPPIAAR NAGAR, RAJIV

**GANDHI SALAI,
CHENNAI – 600119**

APRIL-2023



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of
M.LIKITH KUMAR (39130288) and P.SATYANARAYANA (39130330)
who carried out project entitled "HIGHWAY WIND TURBINE
MONITORING USING IOT AND CLOUD" under our
supervision from Nov 2022 to Apr 2023.

Internal Guide

Dr.M.SUMATHI

Head of the Department

Dr. T. RAVI, M.E., Ph.D.

Submitted for Viva voce examination held on 20.04.2023

Internal Examiner

External Examiner

DECLARATION

We, **M.LIKHITH KUMAR (39130288)** and **P.SATYANARAYANA (39130330)** here by declare that the Project Report entitled “**HIGHWAY WIND TURBINE MONITORING USING IOT AND CLOUD**” done by us under the guidance of **Dr.M.SUMATHI** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

1)



2)



SIGNATURE OF THE CANDIDATES

DATE: *20.04.2023*

PLACE: *CHENNAI*

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. NANDHITHA, M.E., Ph.D.**, Dean, School of Electrical and Electronics and **Dr. T. RAVI, M.E., Ph.D.** Head of the Department, Department of Electronics and Communication Engineering for providing us necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr.M.SUMATHI** Professor, Department of Electronics and Communication Engineering for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of the project work.

We wish to express our thanks to all teaching and non-teaching staff members of the **Department of Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

We express our gratitude to our parents for their constant encouragement and support for the completion of the project.

ABSTRACT:

Wind energy is one of the non-conventional forms of energy and it is available in affluence. Electricity can be generated with the help of vertical axis wind turbine.

This projects aims of utilizing this wind energy in most effective manner to get the maximum electric output, and therefore we selected highway as our installation site where we can take the advantage of the moving vehicles on both the sides of the road.

In the present work, turbine is design and fabricated as per the specifications. The power generated is stored in battery and then can be used for street light, signal or toll. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming.

Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe Our Proposed Work also includes various sensors to monitor operations of wind turbines such as fire sensor, smoke sensor, humidity sensor and temperature sensor which constantly monitors the values and transmits it to control room via cloud technology.

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	V
	TABLE OF CONTENTS	VI
	LIST OF FIGURES	VIII
1	INTRODUCTION	
	1.1 OVERVIEW	1
	1.2 MONITORING SYSTEM	1
	1.3 EMBEDDED C	2
	1.4 OBJECTIVES	3
2	LITERATURE SURVEY	4
3	REQUIREMENT ANALYSIS	
	3.1 HARDWARE REQUIREMENT	6
	3.2 SOFTWARE REQUIREMENT	6
	3.3 ARCHITECTURE DIAGRAMS	7
	3.3.1 Block Diagrams	8
	3.3.2 Flow Chart	9
	3.4 TECHNOLOGIES USED	10
4	SYSTEM ANALYSIS AND DESIGN	
	4.1 EXISTING SYSTEM	12
	4.2 DRAWBACKS OF EXISTING SYSTEM	12
	4.3 PROPOSED SYSTEM	13

	4.4 SYSTEM MODULES	
	4.4.1 Arduino Uno	14
	4.4.2 Sensors Used	15
	4.4.2.1 MQ Smoke Sensor	15
	4.4.2.2 Infrared Flame Sensor	16
	4.4.2.3 Humidity Temperature Sensor	17
	4.4.3 Led Display	19
	4.4.4 Cloud	19
	4.5 FLOW DIAGRAMS	20
5	RESULTS AND DISCUSSIONS	22
6	CONCLUSION AND FUTURE ENHANCEMENT	
	6.1 CONCLUSION	29
	6.2 FUTURE SCOPE	31
	REFERENCES	32
	APPENDIX - SOURCE CODE	33

LIST OF FIGURES

FIGURE NO.	NAME	PAGE NO.
1	ARCHITECTURE DIAGRAM	7
2	CHARACTERISTICS BLOCK DIAGRAM	8
3	BEHAVIORAL BLOCK DIAGRAM	9
4	WORKFLOW CHART	9
5	SERIAL MONITOR OUTPUT OF SMOKE SENSOR	16
6	SMOKE SENSOR OUTPUT OF HUMIDITY SENSOR	18
7	EXECUTING PROCESS FLOW CHART	20
8	WORKING BLOCK DIAGRAM	21
9	OUTPUT ROADMAP	24
10	CLOUD OUTPUT	24
11	SERIAL MONITOR OUTPUT OF HUMIDITY TEMPERATURE	25
12	OUTPUT OF SMOKE SENSOR	26
13	VALUES DISPLAYED AT CLOUD	27
14	OUTPUT OF LED SCREEN	28
15	PROJECT WORKING MODEL	28

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

In the meantime, Wind is caused due to uneven heating of earth's surface, atmosphere, irregularities of earth's surface and rotation of the earth about its own axis. The amount of wind flow depends on various factors such as earth's rotation speed and difference in temperature of places. Energy produced by this blowing wind is called as wind energy. Electricity plays a vital role for development of the country, so the production of electricity is one of the main aims of the country. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming. Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe

1.2 MONITORING SYSTEM

As we already discussed earlier that the project is a combination of more than two features, where each feature is different from one another but has one single point of contact that is cloud system .So, the features are fire sensor, smoke sensor , temperature and humidity sensor. To do this project, we used Arduino IDE and Embedded C code, which is platform independent. This app plays a very important role in monitoring and alerting control room when there is a fire accidents or natural calamities occurred at wind turbines, which is also its main use. This feature, Wind Turbine Monitoring system is

developed in order to view the information to the control room about the fire, temperature and humidity along with power generated details. This feature also has a web page in which, real-time cloud In this feature, it requires internet and so in that. Thus this application helps to monitor and repair the broken or damaged wind turbines instantly using IP Address of the turbine. The main aim of developing this application is to reduce the time to a great extent that is spent in searching for the broken or damaged turbines. Thus this application provides the required information in no time and also helps in quicker decision making.

1.3 EMBEDDED C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on micro-controller that are programmed by embedded C.

The processor of an embedded system is considered to be the soul of the respective embedded system, example the micro-controller microprocessor, Complex Programmable Logic Device (CPLD), DSP or Field Programmable Gated Array (FPGA) can be considered as processors. C code gets compiled into raw binary executable which can be directly loaded into memory and executed. C provides optimized machine instructions for the given input, which increases the performance of the embedded system. Most of the high-level languages rely on libraries, hence they require more memory which is a major challenge in embedded systems.

1.4. OBJECTIVES

The main objective of this project is:

- a. To Generate Electricity From Wind Turbines
- b. To Monitor and Safeguard Turbines from Rust and Damage
- c. To Lower Environmental Pollution and Hazards

Vertical axis wind turbines (VAWT) have great potential to contribute to growing worldwide support on green energy. For these machines to be efficient, they must be applied outside of their traditional farm environment. Here, the natural wind flow is free to move unobstructed by trees or buildings down a highway and would be sufficient enough to turn the blades of the turbines. The relative wind velocities produced by passing traffic would act in conjunction with the natural wind to increase the angular velocity of the blades. The target for this project is to better understand the effects of design considerations that will contribute to a more efficient turbine. It is hoped that this research and experimentation will make a small contribution to the evolving field of “green” energy and reduce dependence on fossil fuels

The main aim of developing this application is to reduce the time to a great extent that is spent in searching for the broken or damaged turbines. Thus this application provides the required information in no time and also helps in quicker decision making.

.

CHAPTER 2

LITERATURE SURVEY

2.1 Monitoring Of Highway Wind Power Parameter and Controlling Highway Light Through IOT By Pramod, M S; Naveen, P N; Chaithra, N R; Ranjith, K; Vikas, Gowda H S (2017). International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT)

The wind turbines are designed to produce wind energy from the highway due to rapid move of vehicles. The fast growing source of energies are wind and solar. In this we are using the wind energy as it is freely available everywhere. Due to the movement of vehicles, the wind energy is enormously produced on the highways which are unused. So, we can make use of this energy to produce power and to overcome some problems of electricity. Now, we can place the windmill or wind turbines at the mid of the highway, because it can generate the energy when the vehicles move on the both sides. The generated power is used for nearby streetlights. All this parameters are controlled and monitored through IOT from the base station. If the efficiency of the common wind turbine is improved and widespread, the common people can cut back on their power costs immensely. C provides optimized machine instructions for the given input, which increases the performance of the embedded system. Most of the high-level languages rely on libraries, hence they require more memory which is a major challenge in embedded system.

2.2 A Review Paper on Vertical Axis Wind Turbine for Design and Performance Study to Generate Electricity on Highway by S. Shukla, D.P. K. Sharma, S. A. Patel, International Journal of Advance Engineering and ResearchDevelopment (IJAERD)

The use of wind power for energy production, renewable energy is one of the oldest methods for tapping. Socio-Economic development and use of renewable energy is an essential component of economic development. Tidal energy, wind energy, etc., such as abundant renewable energy sources and reduce dependence on fossil fuels can help. With increased concern for environment now days led to the research for more eco-friendly sources of energy and with this considerations wind energy can be deliberated as a feasible option in this regard. Different types of wind turbines such as horizontal axis wind turbines and vertical axis wind turbines are mostly used for energy extraction. Horizontal axis mainly used in huge scale applications and thus its implementation is generally a concern due to enormous instalment setup and initial budget; whereas vertical axis wind turbines offer promising solution for medium sized residential spaces or smaller ruler areas. Energy production from wind turbines will certainly be affected by geometry of bade it is using and its orientation in turbine. For effective and operational use of turbine both parameters must be optimally set and determined. This review emphases on several stages for design and development of improved vertical axis wind turbine which will studies various factors such as wind energy scenario, different accessible energy extraction techniques, design and performance analysis of vertical axis wind turbines. It will comprise Optimization of design parameters of vertical axis turbine blades in view of different parameters such as geometry orientation in assembly

CHAPTER 3

REQUIREMENT ANALYSIS

3.1 HARDWARE REQUIREMENTS

The hardware requirements we use in our project are;

- I. Battery
- II. Vertical Turbine
- III. Relay Controller Switch
- IV. Arduino UNO
- V. LCD Display
- VI. ESP 8266 Cloud Wi-Fi Module
- VII. MQ/15 Smoke Sensor
- VIII. Infrared Fire Sensor
- X. Humidity Temperature Sensor

3.2 SOFTWARE REQUIREMENTS

- I. A Laptop For Power Supply
- II. Any operating system like windows
- III. Arduino IDE
- IV. Cloud Ubidots
- V. Server for back-end
- VI. Internet minimum speed (1mbps)

3.3 ARCHITECTURE DIAGRAMS

An architectural diagram is a diagram of a system that is used to abstract the overall outline of the software system and the relationships, constraints, and boundaries between components. It is an important tool as it provides an overall view of the physical deployment of the software system and its evolution roadmap.

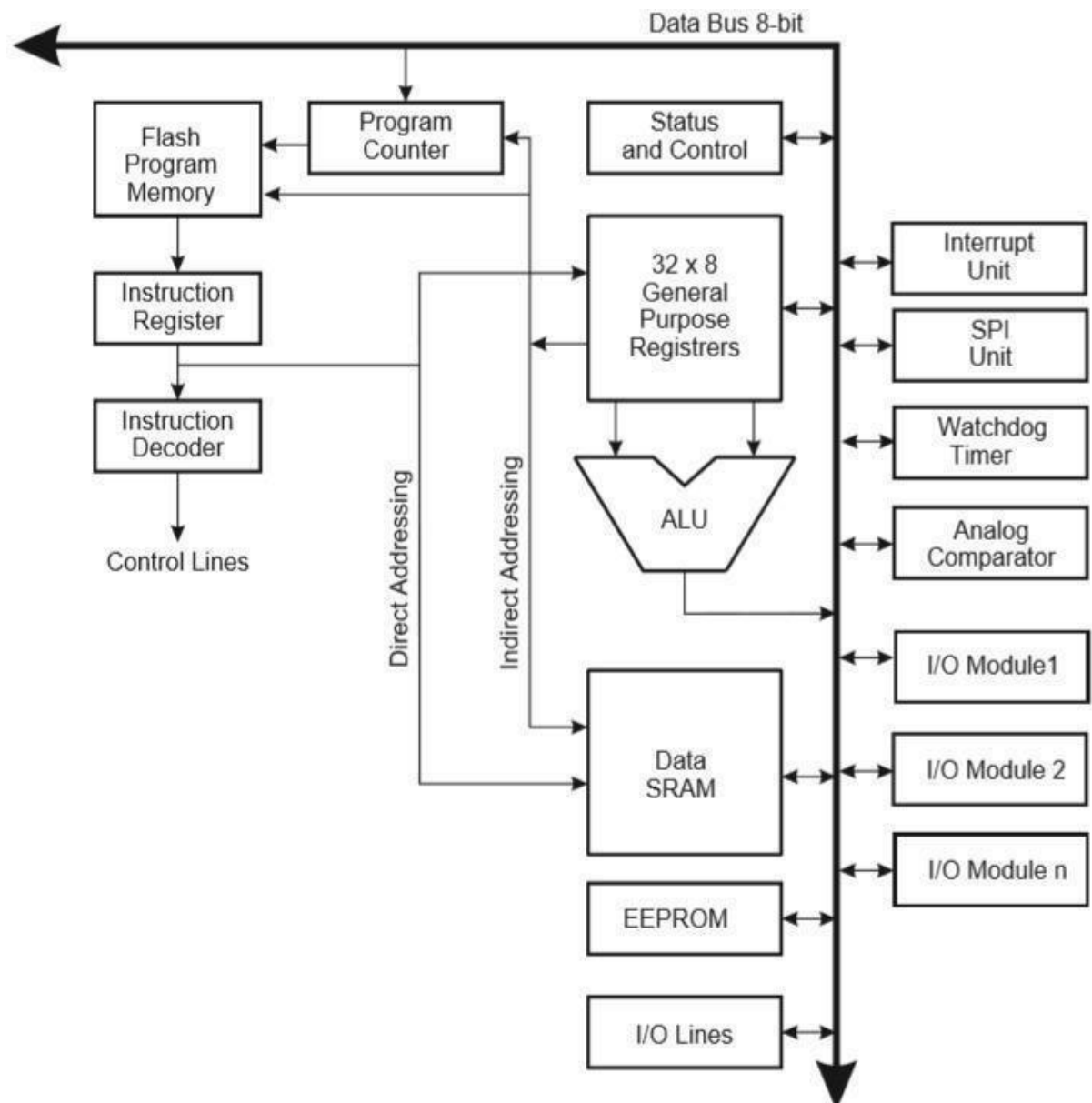


Figure 3.3 Architecture Diagram

3.3.1 BLOCK DIAGRAM

The Block Diagram is used to define each Block's characteristics in terms of its structural and behavioral features, and relationships between the Blocks such as hierarchical relationships. Blocks have optional compartments that describe Block characteristics



Figure 3.4.1 Characteristics Block Diagram

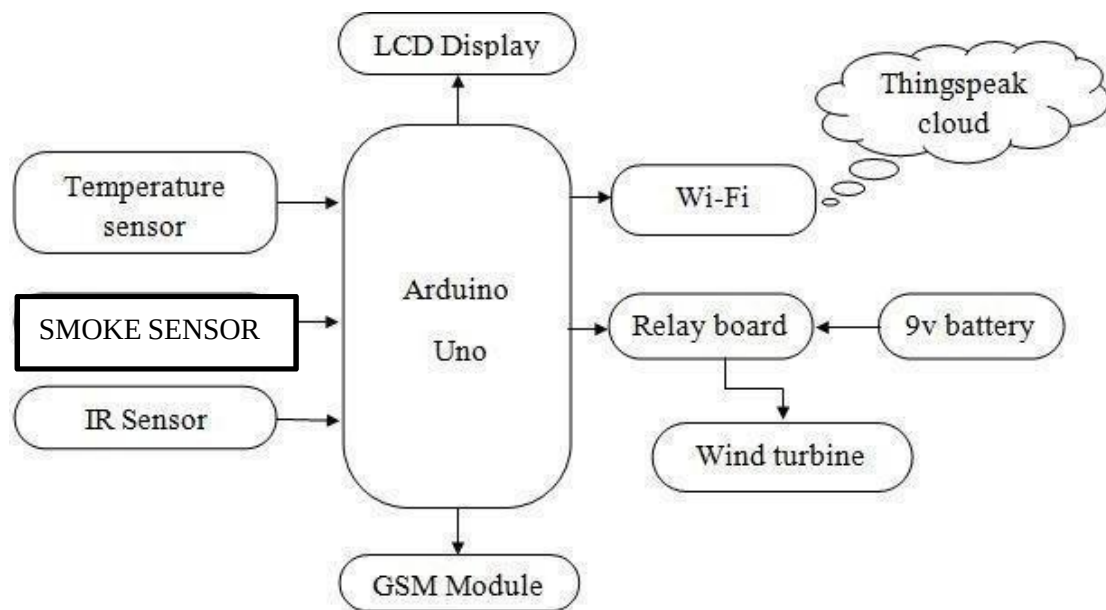


Figure 3.4.1 Behavioral Block Diagram

3.3.2 FLOW CHART

A flowchart is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes arrows.

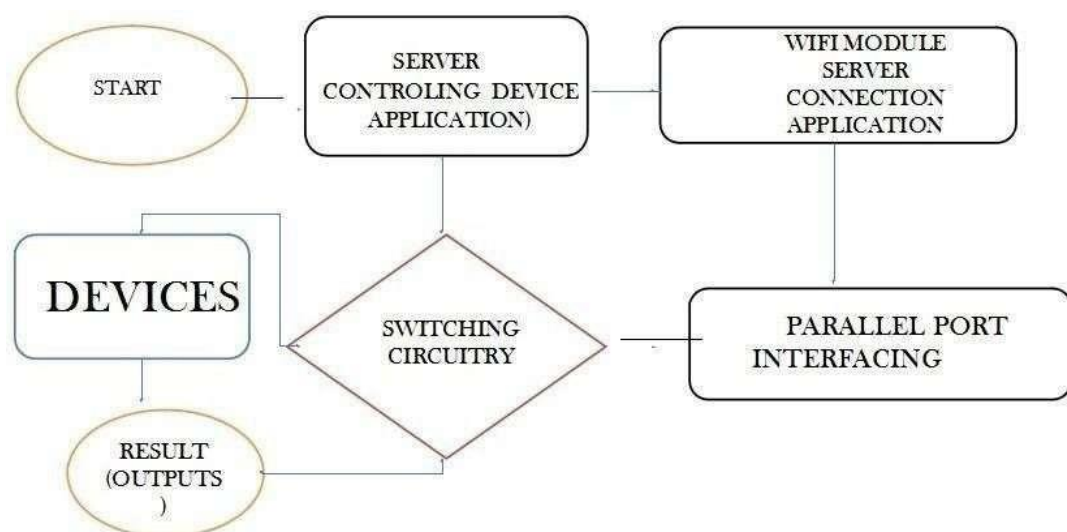


Figure 3.4.2 Workflow Chart

3.4 TECHNOLOGIES USED

ARDUINO

Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board micro-controllers and micro-controller kits for building digital devices.

A pre-assembled Arduino board includes a micro-controller, which is programmed using Arduino programming language and the Arduino development environment. In essence, this platform provides a way to build and program electronic components. Arduino programming language is a simplified form of C/C++ programming language based on what Arduino calls "sketches," which use basic programming structures, variables and functions. These are then converted into a C++ program.

Arduino UNO is a micro-controller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro-controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

CLOUD

"The cloud" refers to servers that are accessed over the Internet, and the software and databases that run on those servers. Cloud servers are located in data centers all over the world. By using cloud computing, users and companies do not have to manage physical servers themselves or run software applications on their own machines. ESP8266 is a wifi SOC (system on a chip)

ESP8266 can be used as an external WiFi module, using the standard AT Command set Firmware by connecting it to any micro-controller using the serial UART, or directly serve as a WiFi-enabled micro controller, by programming a new firmware using the provided SDK. This module has a powerful enough on- board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on- chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self- calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things) solution!

EMBEDDED C

Embedded C is an extension of C language and it is used to develop micro-controller based applications. The extensions in the Embedded C language from normal C Programming Language is the I/O Hardware Addressing, fixed- point arithmetic operations, accessing address spaces, etc. The processor of an embedded system is considered to be the soul of the respective embedded system, example the micro-controller microprocessor.

Complex Programmable Logic Device (CPLD), DSP or Field Programmable Gated Array (FPGA) can be considered as processors. C code gets compiled into raw binary executable which can be directly loaded into memory and executed. C provides optimized machine instructions for the given input, which increases the performance of the embedded system.

CHAPTER 4

SYSTEM ANALYSIS AND DESIGN

4.1 EXISTING SYSTEM

Different turbines have been built in various shapes around the world from the beginning of wind turbine technology to utilize wind energy and turn it to electricity. There are many ways to categorize wind turbines, but the rotational axis classification, which is either horizontal or vertical, is the most common and widely used type. . The axis of rotation in this form is parallel to the field, and this axis is usually parallel to the wind stream. When the rotor shaft is mounted vertically as a type of wind turbine, a vertical axis wind turbine (VAWT) is easier to maintain and mount, as the clutch and generator can be positioned at the bottom of a (VAWT) where it is low to the ground. There is no need to point it in the wind, which is another advantage of this setup . Despite these benefits, VAWT has faced many challenges, from the natural calamities, rusting due to humidity and Fire Accidents . Considerable researches have taken place on Vertical Axis Wind Turbines (VAWTS) control for different situations.

4.2 DRAWBACKS OF EXISTING SYSTEM

- a. The Wind turbines does not have monitoring system to monitor
- b. Wind turbines often gets rusted and damaged which couldn't be noticed.
- c. Wind Mills are prone to fire accidents and natural calamities.
- d. The User Interface is not easy to understand and use.

4.3 PROPOSED SYSTEM

In this system, we make utilization of Vertical Axis Wind Turbine for creating energy, for the inverter. A Vertical Axis Wind Turbine is a kind of wind turbine where the principle rotor shaft is set transverse to the breeze while the fundamental parts are situated at the base of the turbine. This framework is controlled by AT Mega 328 micro controller, it comprises of a vertical axis windmill, DC motor, 12V battery, DC inverter, MOSFET switch, LCD and transformer. The windmill produces mechanical energy when wind courses through the turbine.

Further We designed to control vertical turbine devices by remote, app and IP address. Remote is connected with central controller and IRDA (Infra red Data Association) is connected to both central connector and IRDA Decoder, a local Wi-Fi sensor to process in the server to give the output.

IP address is connected with cloud via internet, the given IP address is moved to the local network by detecting information's from cloud network, then it process under the main server to give the output.

Real Time Values are Transmitted from circuits to cloud over a WiFi Module Node Mcu ESP8266 . Each Wind Turbine is given unique tag to identify and same reflects in the control room where the monitoring of turbines take place.

Any Wind Turbine Prone to damage due to corrosion , fire and natural calamities will be alerted to control room along with the damaged wind turbine's unique id which helps them to locate and identify damaged turbine with ease.

4.4 SYSTEM MODULES

4.4.1 ARDUINO UNO

4.4.2 SENSORS

4.4.2.1 MQ SMOKE SENSOR

4.4.2.2 INFRARED FLAME SENSOR

4.4.2.3 HUMIDITY TEMPERATURE SENSOR

4.4.3 LED DISPLAY

4.4.4 CLOUD

4.4.1 ARDUINO UNO

Arduino UNO is a micro-controller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro-controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Code Written is then uploaded into main controller UNO board and then verified and tested for any bugs before running the program application

C provides optimized machine instructions for the given input, which increases the performance of the embedded system. Most of the high-level languages rely on libraries, hence they require more memory which is a major challenge in embedded system.

4.4.2 SENSOR

4.4.2.1 MQ SMOKE SENSOR

MQ2 smoke sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. MQ2 smoke sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the smoke. This change in the value of resistance is used for the detection of smoke

MQ2 Gas sensor works on 5V DC and draws around 800mW. It can detect **LPG, Smoke, Alcohol, Propane, Hydrogen, Methane** and **Carbon Monoxide** concentrations anywhere from 200 to 10000ppm..

Connecting the MQ2 Gas sensor module to the Arduino is pretty easy. Start by placing the sensor on to your breadboard. Connect VCC pin to the 5V pin on the Arduino and connect GND pin to the Ground pin on the Arduino .Connect D0 output pin on the module to Digital pin#8 on the Arduino and A0 output pin on the module to Analog pin#0 on the Arduino.

To work with the sensor we need to power the sensor first, for that we are using the 5V and GND pin of the Arduino UNO Board and we are connecting the output pin of the sensor to A0 pin of the Arduino. The main job of this op-amp is to convert the incoming analog signal to digital signal. Other than that we also have an onboard 10K potentiometer that is used to adjust the sensitivity of the MQ-2 Gas Sensor module or the triggering voltage of the module.

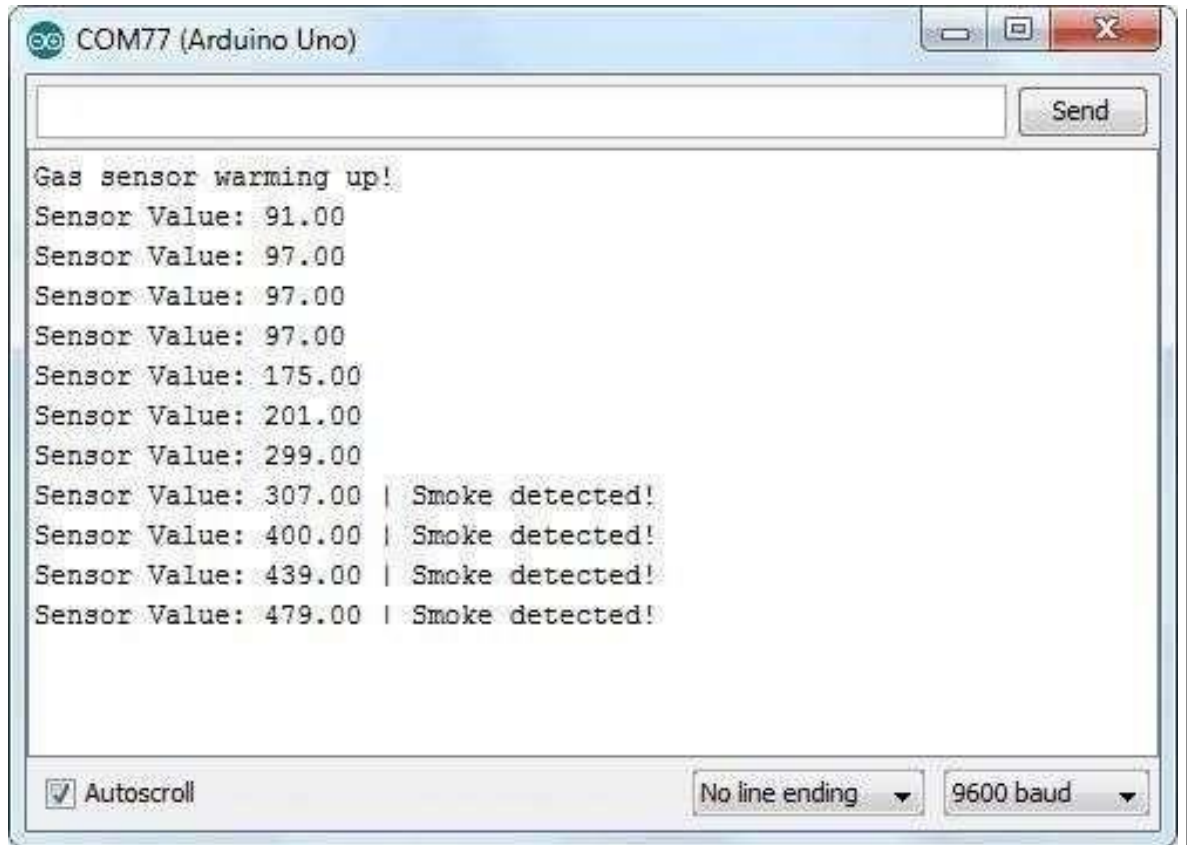


Figure 4.4.2.1 Serial Monitor Output Of Smoke Sensor

4.4.2.2 INFRARED FLAME SENSOR

The IR flame sensor is used to detect the presence of fire or other infrared source (Flame or a light source of a wavelength in the range of 760 nm to 1100 nm can be detected). It can be used in fire fighting robot or heat seeking robot. These sensors operate by using an infrared band. A small thermal imaging camera in these detectors can instantly detect the presence of hot gasses released anywhere near the infrared detector. In certain cases, other sources of hot gas that occur near the infrared flame detector.

To test the Flame Sensor and ensure that it is working correctly connect the VCC to a 5v power source and GND. Move a flame source with in a foot of the front of the Ir sensor and the D0-LED should light up.

If holding a flame within 1.5 feet in front of the sensor; "case 0" will be activated and " *** Close Fire *** " will be sent to the serial monitor.

If holding a flame between 1.5 feet and 3 feet in front of the sensor; "case 1" will be activated and " ***Distant Fire*** " will be sent to the serial monitor. If no flame is detected in front of the sensor; "case 2" will be activated and " *No Fire* " will be sent to the serial monitor.

4.4.2.3 HUMIDITY AND TEMPERATURE SENSOR

The DHT11 sensor is able to measure temperatures from 0 to + 50 °c with an accuracy of +/-2 °c and relative humidity levels of 20 to 80% with an accuracy of +/-5%. A measurement can be done every second.

It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin

The DHT11 measures relative humidity. The relative humidity is the amount of water vapor in air vs. the saturation point of water vapor in the air. At the saturation point, water vapor starts to condense and accumulate on surfaces forming dew.

The saturation point changes with air temperature. Cold air can hold less water vapor before it becomes saturated, and hot air can hold more water vapor before it becomes saturated.

The DHT11 detects water vapor by measuring the electrical resistance between two electrodes. The humidity sensing component is a moisture holding substrate with electrodes applied to the surface. When water vapor is absorbed by the substrate, ions are released by the substrate which increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity.

Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes. The DHT11 measures temperature with a surface mounted NTC temperature sensor (thermistor) built into the unit

The DHT11 uses just one signal wire to transmit data to the Arduino. Power comes from separate 5V and ground wires. A 10K Ohm pull-up resistor is needed between the signal line and 5V line to make sure the signal level stays high by default.



Figure 4.4.2.3 Serial Monitor Output of Humidity Temperature

4.4.3 LED DISPLAY

- i. LCD (Liquid Crystal Displays) are used in embedded applications for displaying various parameters and status of the system.
- ii. LCD 16x2 is a 16-pin device that has 2 rows that can accommodate 16 characters each.
- iii. LCD 16x2 can be used in 4-bit mode or 8-bit mode.
- iv. It is also possible to create custom characters.
- v. It has 8 data lines and 3 control lines that can be used for control purpose

4.4.4 CLOUD

NodeMCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol. In addition, by providing some of the most important features of micro-controllers.

ESP8266 can be used as an external WiFi module, using the standard AT Command set Firmware by connecting it to any micro-controller using the serial UART, or directly serve as a WiFi-enabled micro controller, by programming a new firmware using the provided SDK. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things) solution!

4.5 FLOW DIAGRAMS

The process of executing project is explained in the below diagram.

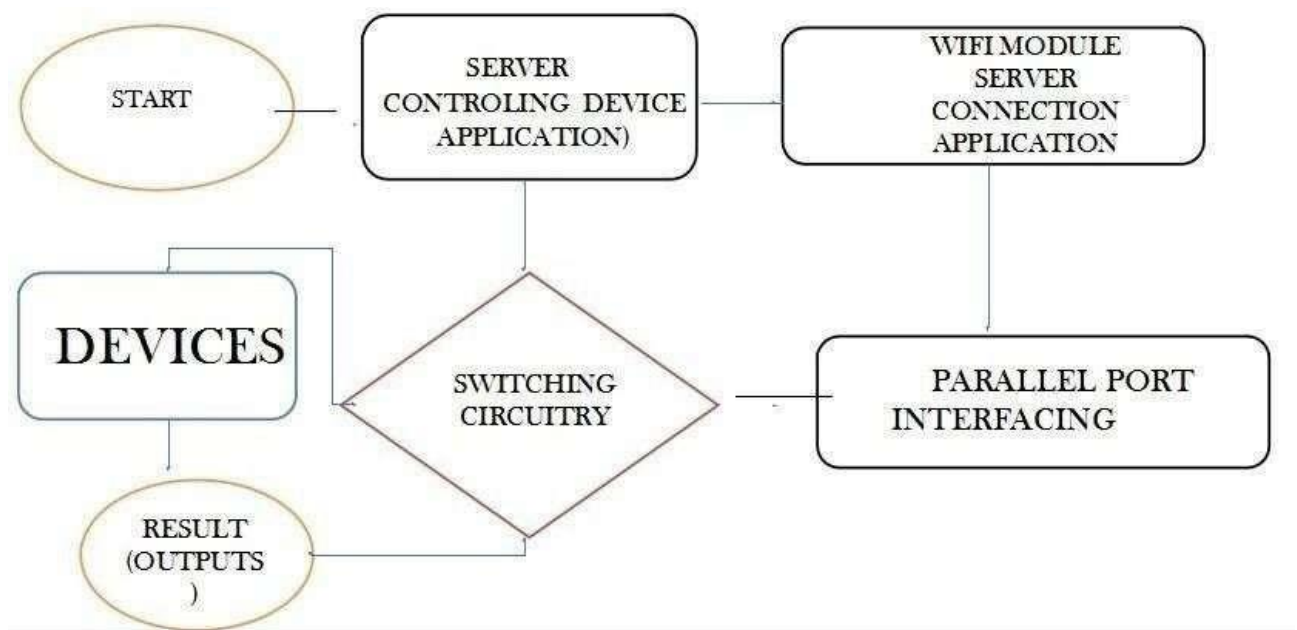


Figure 4.5.1 Executing Process Flow Chart

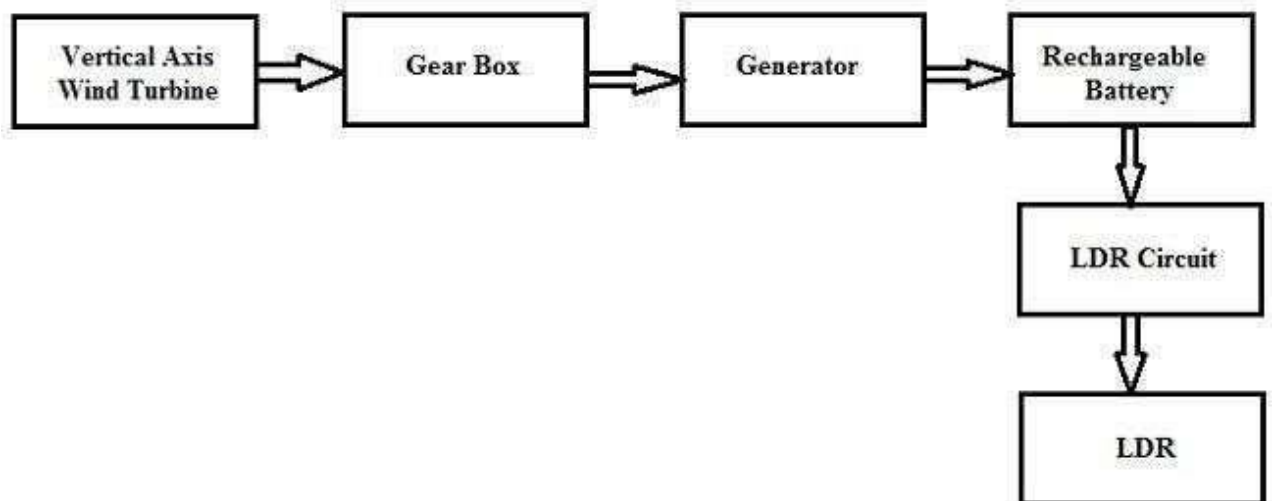
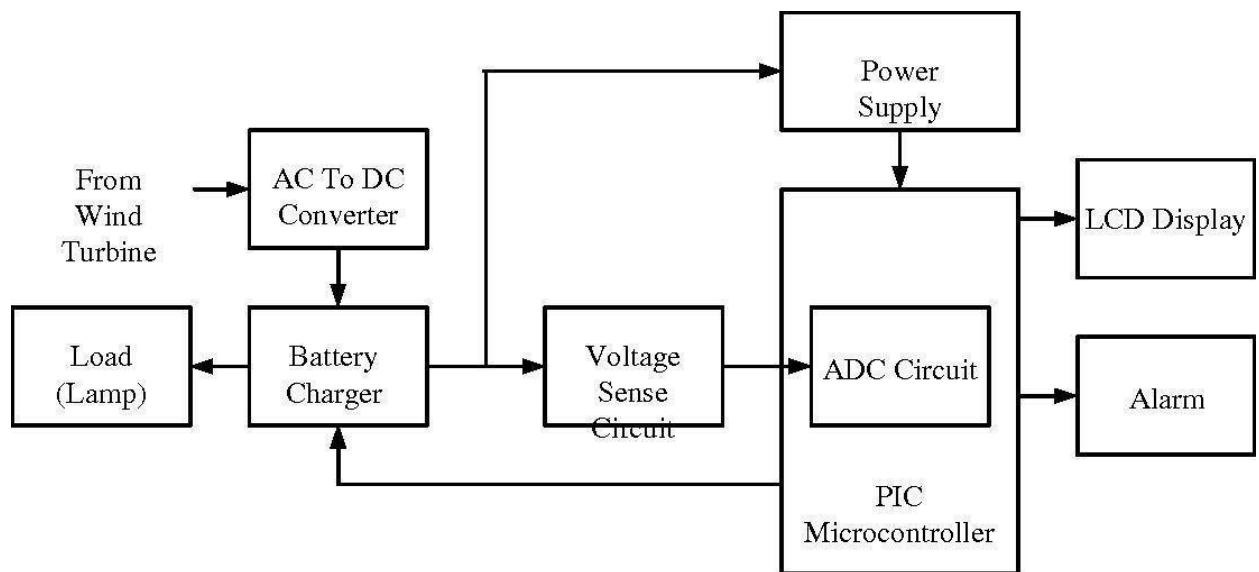


Figure 4.5.2 Working Block Diagram

CHAPTER 5

RESULTS AND DISCUSSIONS

The drag force acts in the direction of the fluid flowing. Drag occurs due to the viscous friction forces on the airfoil surfaces, and the imbalanced pressure on surfaces of the airfoil. Drag as a function of the relative wind velocity at the rotor surface, is the difference between the wind speed and the speed of the surface, the lift and drag coefficient values are usually achieved experimentally and correlated against the Reynolds number for analysis purpose. This work uses a CFD code to predict these coefficient values over a range of operating conditions. The amount of power generated by the vertical axis wind turbine will be analyzed through code. The lift force is one of the major force components exerted on van airfoil blade section inserted in a moving fluid. It acts normal to the fluid flow direction. This force is a consequence of the irregular pressure distribution between the upper and lower blade surfaces.

The working of vertical axis wind turbine is simple. Whenever wind flow through the turbine blades, it exerts some force on the blades. This imparts the movement of blades in the direction of wind flow, which ultimately results in the rotation of turbine. As our vertical axis wind turbine comprises of guide blades and magnets to create repulsion force in the direction of rotation of turbine, these gives benefits in the performance.

When wind flows to the turbine, first it has to flow through the casing. As the casing blades are kept 30° inclined to the tangent drawn to inner diameter of casing disc, they direct the wind directly to the turbine blades.

This gives better impact of wind on turbine blades which results in increasing the applied force by wind on the turbine blades and hence torque has also increased. In the mean time, it helps to increase the speed of wind flow. In the current attempt, the magnets are used. Magnets are arranged at 30° inclined to tangents of inner circle of casing as well as turbine circle both. Magnets are placed on turbine outer and casing inner circle in such way that same poles of magnets are always facing each other. This creates the repulsion force in the direction of rotation of turbine. Due to this force, the turbine rotates or tends to rotate.

This repulsion force also reduces the force required to start the rotation of turbine further. Hence, the wind speed required for self starting of turbine gets lowered. In this way, casing guide blades and magnetic repulsion helps turbine to rotate at faster speed and with less self starting wind speed as compared to other normal turbine. This rotational motion of turbine can be used for electricity generation if generator is coupled to the shaft. Many Sensors and cloud servers are added in order to monitor and combine each and every turbine from the control room where the real time data is been transmitted and stored in data backups for future use

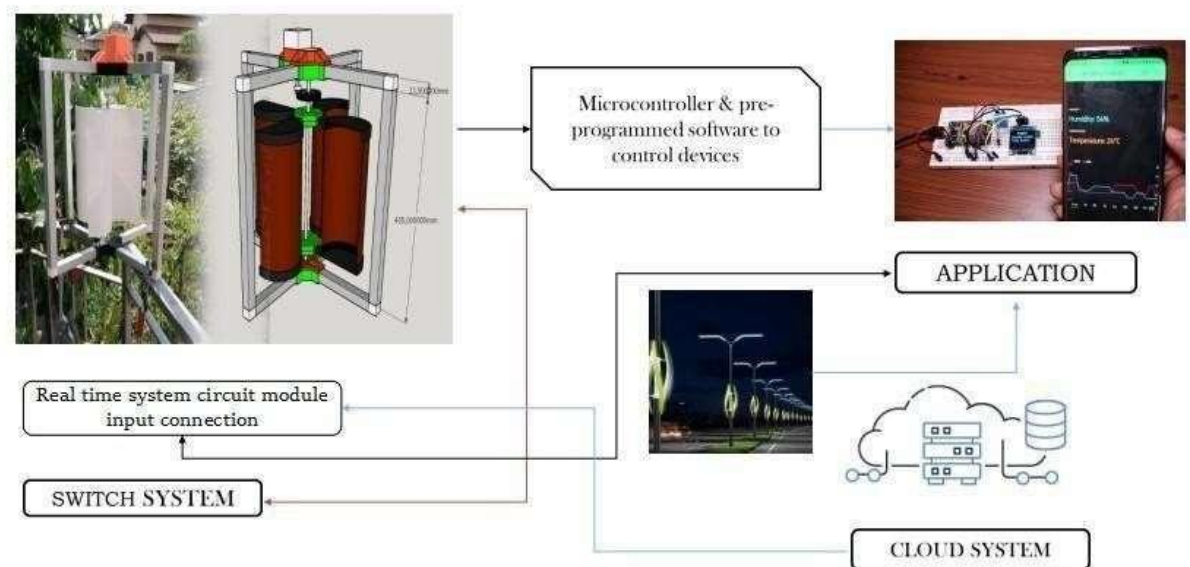


Figure Output Roadmap



Figure Cloud Output

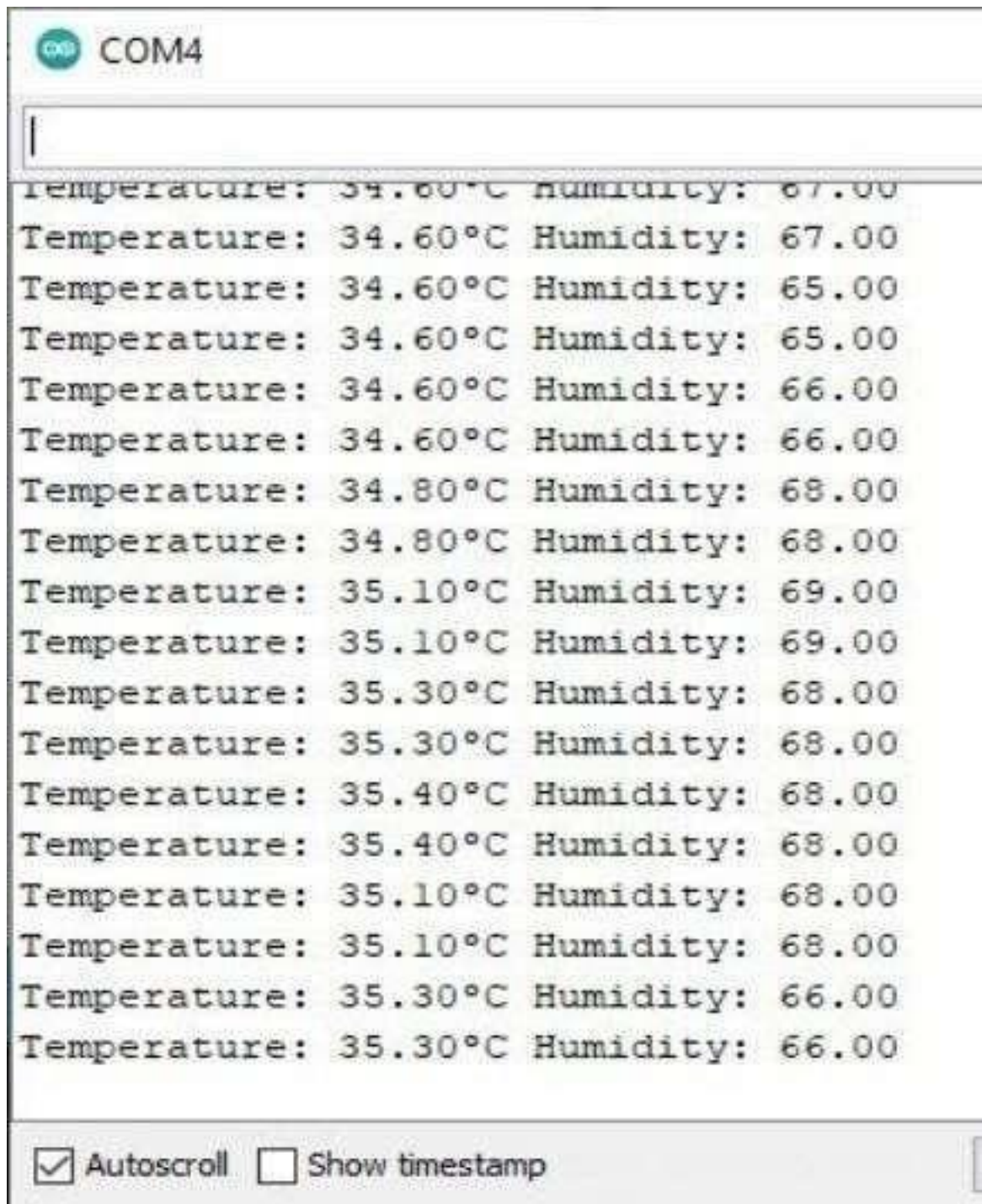


Figure Serial Monitor Output of Humidity Temperature

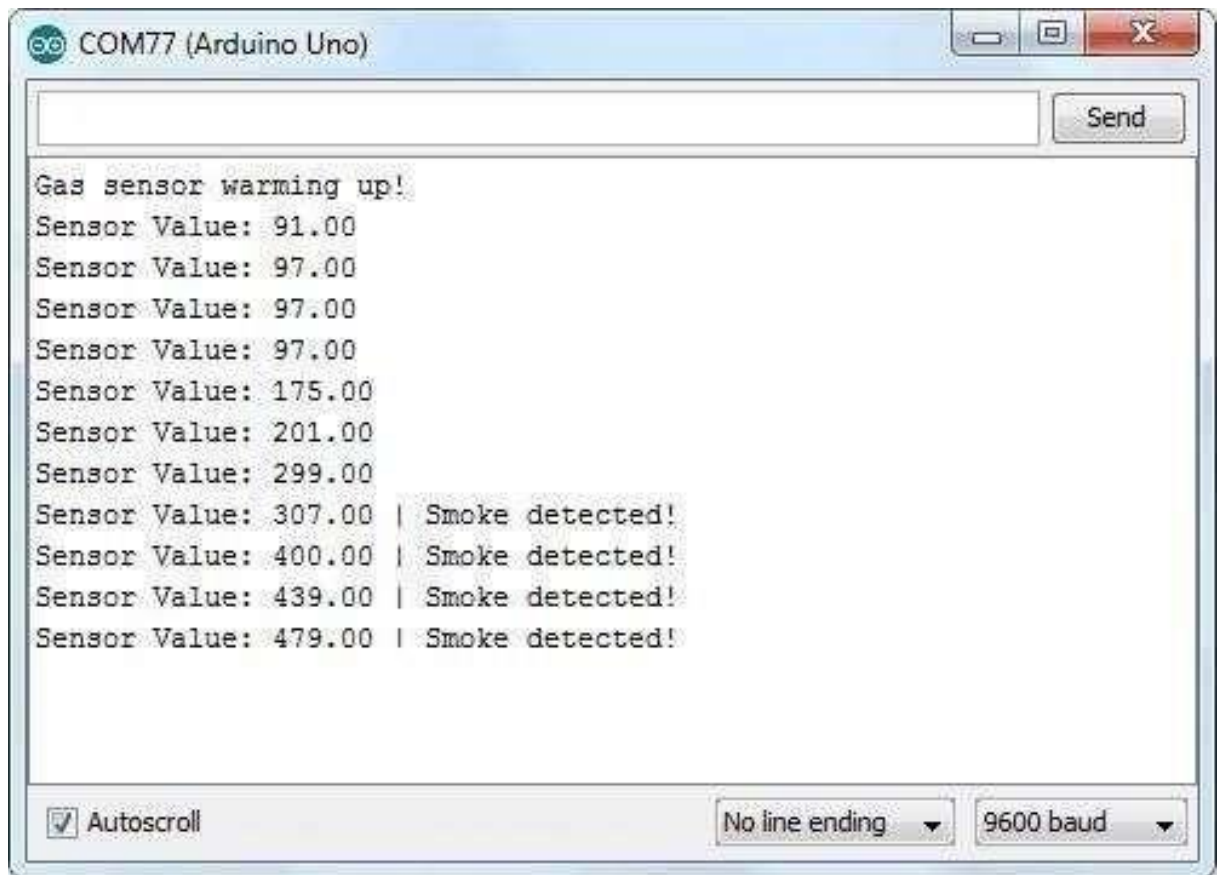


Figure Output of Smoke Sensor

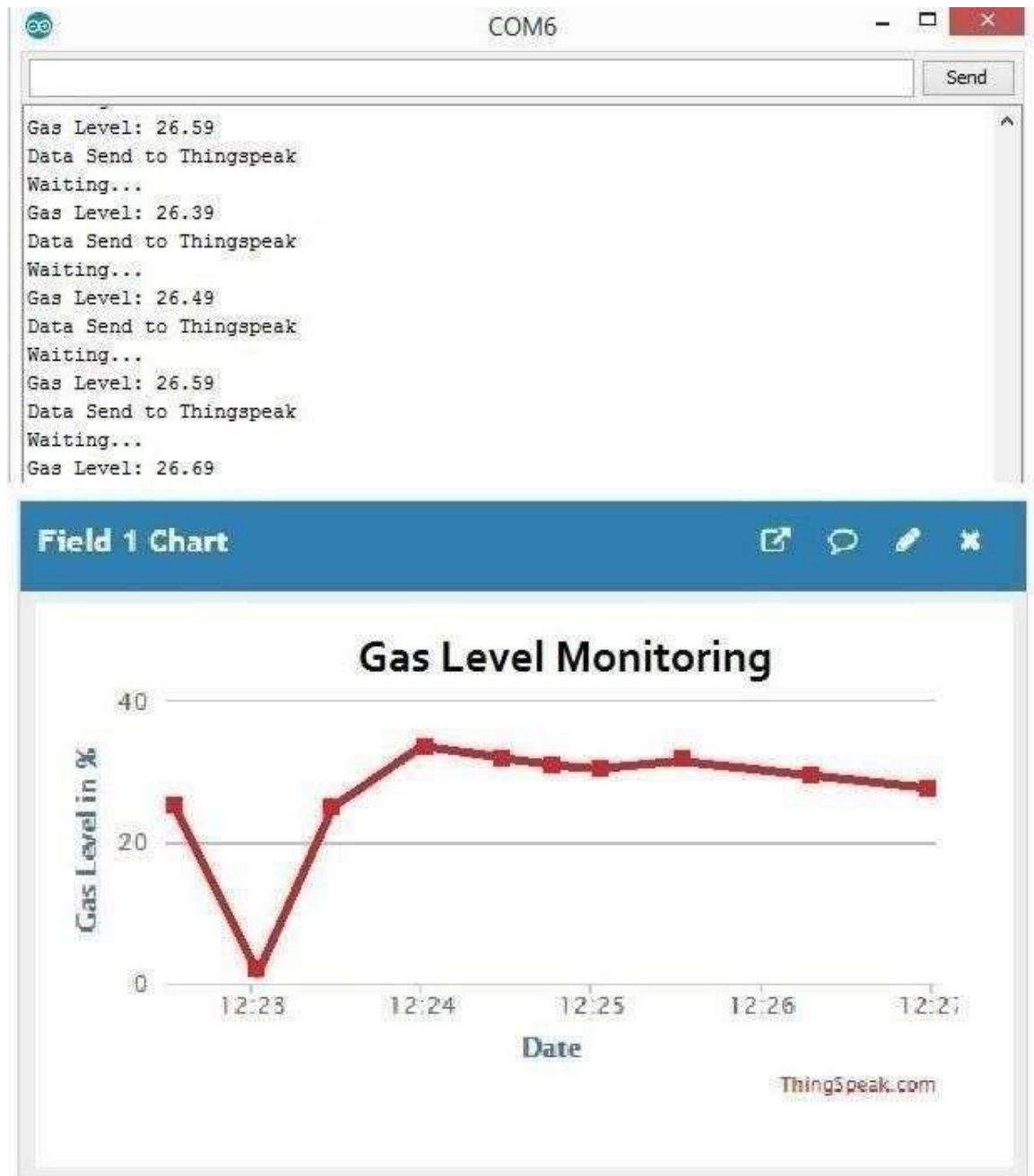


Figure Values displayed at cloud

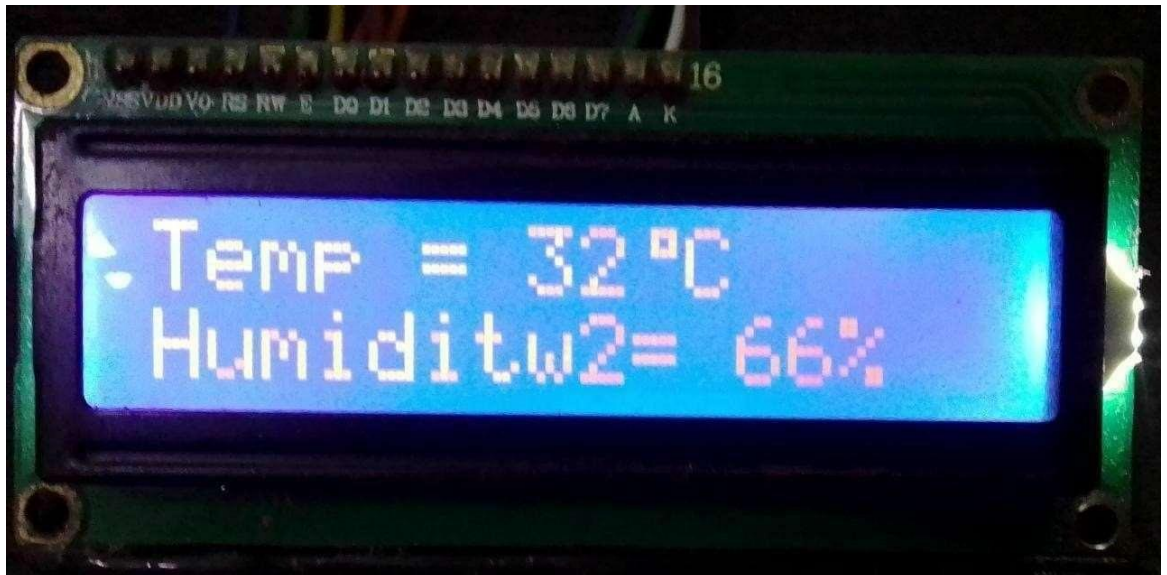


Figure Output LED Screen



Figure Project Working Model

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

Our work and the results obtained so far are very encouraging and reinforce the conviction that vertical axis wind energy conversion systems are practical and potentially very contributive to the production of clean renewable electricity from the wind. All the efforts were made to develop the model which can generate the output even at low wind speed.

Parts were developed and fabricated with light materials. Many Sensors were added and tested successfully to monitor each wind turbine from control room and prevent damage which deters the working of wind turbines. Finally, the testing of the model was the main area towards the success of project and outcome of the project of input decided while designing and development of the product.

Wind energy technology requires implementation of novel strategies that originate from technology improvement in computation, control and communication. Next-generation wind energy systems will be more intelligent thanks to M2M communications and the monitoring of wind turbine that works together with other energy sources for a smart energy concept. In this study, a cloud based IoT remote monitoring system is proposed and implemented for a small-scale standalone wind energy system.

The designed system is flexible and inexpensive for real-time data monitoring and cloud data storage. Analysis of real-time sensor data provides faster decision making that avoids damage to the system and can boost total energy output. Reliable operation and real time performance monitoring by using an IoT based concept can provide easy supervision.

The developed system can not only monitor and measure the required data but can also be remotely analyzed. This monitoring system provides the advantage of flexibility in data collection. In addition, this remote monitoring system can be regarded as a low cost monitoring system and can be used for other renewable applications.

We Believe that our work might contribute and bring a little change in generation of clean and green electricity which protects the earth and its resources from pollution. We Ought to bring many Eco friendly methods of power generation in future which might overcome energy crisis across the world and bring down price of electricity per unit which benefits many households and commercial industries.

6.2 FUTURE SCOPE

Incredible advances in wind turbine design have been possible due to developments in modern technology. With this upgraded technology wind turbine can be designed for its optimum power generation at comparatively less cost. Blade design plays critical role for performance and energy extraction from turbine.

With the assumption of placing the turbine in a location with moderate wind availability with optimized blade parameters and design specifications, high power generation is achieved with vertical axis wind turbine and can be serving as energy generation unit for remote areas

Many Enhancements can be done to present project model. We can generate more units with less rpm of generator using light weighing blades for turbines. We can increase the capacity of cloud server which gives accurate results while monitoring at real time and data can be stored for future purposes and quick action can be taken if turbines need any technical support.

Huge Generation of Electricity takes place with huge number of turbines placed at highway. Generated Electricity can be used for highway lights, toll plazas and supplied to villages lying nearby highways.

REFERENCES

- [1] Bavin Loganathan, Harun Chowdhury, Israt Mustary and Firo Alam
"An experimental study of a cyclonic vertical axis wind turbine for domestic scale power Generation, School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University, Melbourne, 3083, Australia
- [2] G.M. Joselin Herberta, S. Iniyamb,_, E. Sreevalsanc, S.Rajapandiand "A review of wind energy technologies; Department of Mechanical Engineering, St. Joseph's College of Engineering, Chennai-119,India
- [3] K. Pope, I. Dincer, G.F. Naterer "Energy and exergy efficiency comparison of horizontal and vertical axis wind turbines, Faculty of Engineering and Applied Science, University of Ontario Institute of Technology, 2000 Simcoe Street North, Oshawa, Ontario, Canada
- [4] Muhammad Mahmood Aslam Bhutta, Nasir Hayat, Ahmed Uzair Farooq,Zain Ali, Sh. Rehan Jamil, Zahid Hussain "Vertical axis wind turbine - A review of various configurations and design techniques|| Renewable and Sustainable Energy Reviews 16 (2012) 1926- 1939 Department of Mechanical Engineering, University of Engineering and Technology Lahore, G.T. Road, Lahore, Punjab 54890, Pakistan
- [5] Young-Tae Lee, Hee-Chang Lim "Numerical study of the aerodynamic performance of a 500 W Darrieus-type vertical-axis wind turbine, School of Mechanical Engineering, Pusan National University, San 30, JangjeonDong, Geumjeong-Gu, Busan 609-735, South Korea

APPENDIX

ARDUINO CODE FOR GAS DEDUCTION

```
#include <LiquidCrystal.h> // Include LiquidCrystal Library
#include <dht.h>           // Include DHTlib Library- Download from Description.
#define outPin 2

LiquidCrystal lcd(7, 8, 9, 10, 11, 12); // Create an LCD object.dht DHT; //
Create a DHT object

void setup() {

  lcd.begin(16,2); // Initialize the LCD
}
void loop() {
  int readData = DHT.read11(outPin);

  float t = DHT.temperature;float h = DHT.humidity;

  lcd.setCursor(0,0); lcd.print("Temp.: ");lcd.print(t);
  lcd.print((char)223);//shows degrees characterlcd.print("C");
  lcd.setCursor(0,1); lcd.print("Humidity.: ");

  Lcd.print(h);
```

```
lcd.print("%");
```

```
delay(1000);  
}
```

WIFI CLOUD MODULE

```
#include <ESP8266WiFi.h>
```

```
String apiKey = "HOC4G1VPJBBLKJDX"; // Enter your Write API key from  
ThingSpeak
```

```
const char *ssid = "Abc"; // replace with your wifi ssid and wpa2 key  
const char *pass = "12345678";
```

```
const char* server = "api.thingspeak.com"; WiFiClient client;
```

```
void setup()
```

```
{  
  Serial.begin(115200); delay(10); Serial.println("Connecting to ");
```

```
  Serial.println(ssid); WiFi.begin(ssid, pass);
```

```
  while (WiFi.status() != WL_CONNECTED)
```

```
  {  
    delay(500); Serial.print(".");
```

```
  }  
  Serial.println(""); Serial.println("WiFi connected");
```

```
}  
void loop()
```

```
{  
  float h = analogRead(A0);
```

```

if (isnan(h))
{
  Serial.println("Failed to read from MQ-5 sensor!");return;
}
if (client.connect(server, 80)) // "184.106.153.149" or api.thingspeak.com
{
  String postStr = apiKey;postStr += "&field1=";
  postStr += String(h/1023*100);postStr += "\r\n";
  client.print("POST      /update      HTTP/1.1\n");      client.print("Host:
  api.thingspeak.com\n");client.print("Connection: close\n");
  client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n"); client.print("Content-
  Type: application/x-www-form-urlencoded\n"); client.print("Content-Length: ");
  client.print(postStr.length());client.print("\n\n"); client.print(postStr);
  Serial.print("Gas Level: "); Serial.println(h/1023*100);
  Serial.println("Data Send to Thingspeak");
}
delay(500); client.stop();
Serial.println("Waiting...");

// thingspeak needs minimum 15 sec delay between updates.delay(1500);

```

```

}
if (client.connect(server, 80)) // "184.106.153.149" or api.thingspeak.com
{
String postStr = apiKey;postStr += "&field1=";
postStr += String(h/1023*100);postStr += "\n";
client.print("POST      /update      HTTP/1.1\n");      client.print("Host:
api.thingspeak.com\n");client.print("Connection: close\n");
client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n"); client.print("Content-
Type: application/x-www-form-urlencoded\n"); client.print("Content-Length: ");
client.print(postStr.length());client.print("\n\n"); client.print(postStr);
Serial.print("Gas Level: "); Serial.println(h/1023*100);

Serial.println("Data Send to Thingspeak");
}
delay(500); client.stop();

Serial.println("Waiting...");

// thingspeak needs minimum 15 sec delay between updates.delay(1500);
}

```

HIGHWAY WIND TURBINE MONITORING USING IOT AND CLOUD

Dr.M.Sumathi

Electronics and communication.
Sathyabama institute of science
and technology.
Chennai,India.

Sumagopi206@gmail.com

Padala Satyanarayana

Electronics and communication.
Sathyabama institute of science
and technology
chennai.India.

satyapadala2793@gmail.com

M. likith kumar

Electronics and communication.
Sathyabama institute of science
and technology
Chennai,India.

likhithkumar3235@gmail.com

Abstract— *Wind energy is one of the non-conventional forms of energy and it is available in affluence. Electricity can be generated with the help of vertical axis wind turbine. This projects aims of utilizing this wind energy in most effective manner to get the maximum electric output, and therefore we selected highway as our installation site where we can take the advantage of the moving vehicles on both the sides of the road. In the present work, turbine is design and fabricated as per the specifications. The power generated is stored in battery and then can be used for street light, signal or toll. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution,green house effect and global warming. Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe Our Proposed Work also includes various sensors to monitor operations of wind turbines such as fire sensor, smoke sensor, humidity sensor and temperature sensor which constantly monitors the values and transmits it to control room via cloud technology.*

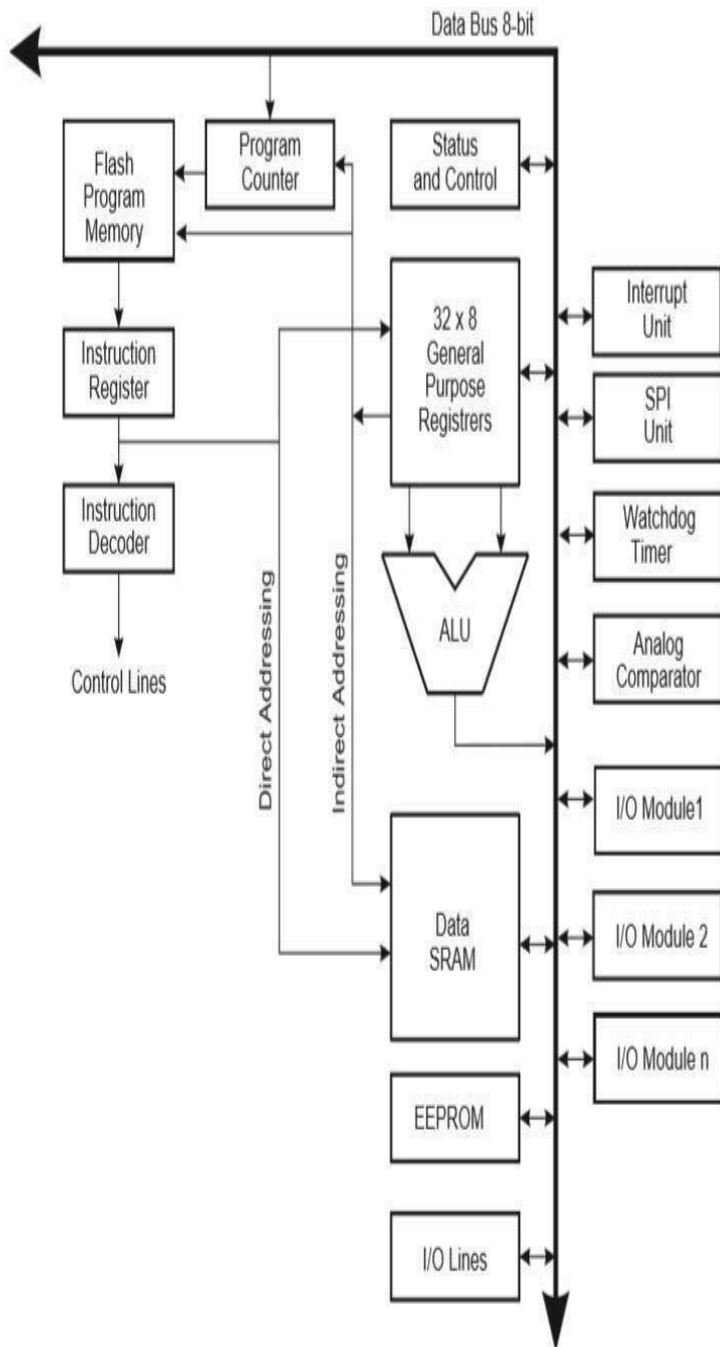
Keywords— *Windturbine,IOT,Arduino,Microcontroller,smoke sensor,fire sensor*

I. INTRODUCTION

In the meantime, Wind is caused due to uneven heating of earth's surface, atmosphere, irregularities of earth's surface and rotation of the earth about its own axis. The amount of wind flow depends on various factors such as earth's rotation speed and difference in temperature of places. Energy produced by this blowing wind is called as wind energy. Electricity plays a vital role for development of the country, so the production of electricity is one of the main aims of the country. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming. Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe. As we already discussed earlier that the project is a combination of more than two

features, where each feature is different from one another but has one single point of contact that is cloud system. So, the features are fire sensor, smoke sensor, temperature and humidity sensor. To do this project, we used Arduino IDE and Embedded C code, which is platform independent. This app plays a very important role in monitoring and alerting control room when there is a fire accident or natural calamities occurred at wind turbines, which is also its main use. This feature, Wind Turbine Monitoring system is developed in order to view the information to the control room about the fire, temperature and humidity along with power generated details. This feature also has a web page in which, real-time cloud. In this feature, it requires internet and so in that. Thus this application helps to monitor and repair the broken or damaged wind turbines instantly using IP address of the turbine. The main aim of developing this application is to reduce the time to a great extent that is spent in searching for the broken or damaged turbines. Thus this application provides the required information in no time and also helps in quicker decision making. Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all devices working is based on micro-controller that are programmed by embedded C. The processor of an embedded system is considered to be the soul of the respective embedded system, example the micro-controller microprocessor, Complex Programmable Logic Device (CPLD), DSP or Field Programmable Gated Array (FPGA) can be considered as processors. Code gets compiled into raw binary executable which can be directly loaded into memory and executed. C provides optimized machine instructions for the given input, which increases the performance of the embedded system. Most of the high-level languages rely on libraries, hence they require more memory which is a major challenge in embedded systems.

II. ARCHITECTURE DIAGRAM



III. METHODS

A. Arduino

Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board micro-

controllers and micro-controller kits for building digital devices.

A pre-assembled Arduino board includes a micro-controller, which is programmed using Arduino programming language and the Arduino development environment. In essence, this platform provides a way to build and program electronic components. Arduino programming language is a simplified form of C/C++ programming language based on what Arduino calls "sketches," which use basic programming structures, variables and functions. These are then converted into a C++ program.

Arduino UNO is a micro-controller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro-controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

B. Cloud

"The cloud" refers to servers that are accessed over the Internet, and the software and databases that run on those servers. Cloud servers are located in data centers all over the world. By using cloud computing, users and companies do not have to manage physical servers themselves or run software applications on their own machines. ESP8266 is a wifi SOC (system on a chip). 11 ESP8266 can be used as an external WiFi module, using the standard AT command set. Firmware can be connected to any micro-controller using the serial UART, or directly serve as a WiFi-enabled micro controller, by programming a new firmware using the provided SDK. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things) solution!

C. MQ Smoke Sensor

MQ2 smoke sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. MQ2 smoke sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the smoke. This change in the value of resistance is used for the detection of smoke. MQ2 Gas sensor works on 5V DC and draws around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and CarbonMonoxide concentrations anywhere from 200 to 10000ppm.. Connecting the MQ2 Gas sensor module to the Arduino is pretty easy. start by placing the sensor on to your breadboard. Connect VCC pin to the 5V pin on the Arduino and connect GND pin to the Ground pin on the Arduino. Connect D0 output pin on the module to Digital pin#8 on the Arduino and A0 output pin on the module to Analog pin#0 on the Arduino. To work with the sensor we need to power the sensor first, for that we are using the 5V and GND pin of the Arduino UNO Board and we are connecting the output pin of the sensor to A0 pin of the Arduino. The main job of this op-amp is to convert the incoming analog signal to digital signal. Other than that we also have an onboard 10K potentiometer that is used to adjust the sensitivity of the MQ-2 Gas Sensor module or the triggering voltage of the module.

D. Humidity and Temperature Sensor

The DHT11 sensor is able to measure temperatures from 0 to + 50 °c with an accuracy of +/-2 °c and relative humidity levels of 20 to 80% with an accuracy of +/-5%. A measurement can be done every second. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. The DHT11 measures relative humidity. The relative humidity is the amount of water vapor in air vs. the saturation point of water vapor in the air. At the saturation point, water vapor starts to condense and accumulate on surfaces forming dew. The saturation point changes with air temperature. Cold air can hold less water vapor before it becomes saturated, and hot air can hold more water vapor before it becomes saturated.

The DHT11 detects water vapor by measuring the electrical resistance between two electrodes. The humidity sensing component is a moisture holding substrate with electrodes applied to the surface. When water vapor is absorbed by the substrate, ions are released by the substrate which increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes. The DHT11 measures temperature with a surface mounted NTC temperature sensor (thermistor) built into the unit. The DHT11 uses just one signal wire to transmit data to the Arduino. Power comes from separate 5V and ground wires. A 10K Ohm pull-up resistor is needed between the signal line and 5V line to make sure the signal level stays high by default.

E. Infrared flame sensor

The IR flame sensor is used to detect the presence of fire or other infrared source (Flame or a light source of a wavelength in the range of 760 nm to 1100 nm can be detected). It can be used in fire fighting robot or heat seeking robot. These sensors operate by using an infrared band. A small thermal imaging camera in these detectors can instantly detect the presence of hot gasses released anywhere near the infrared detector. In certain cases, other sources of hot gas that occur near the infrared flame detector. To test the Flame Sensor and ensure that it is working correctly connect the VCC to a 5v power source and GND. Move a flame source within a foot of the front of the Ir sensor and the D0-LED should light up. If holding a flame within 1.5 feet in front of the sensor; "case 0" will be activated and " ** Close Fire ** " will be sent to the serial monitor. If holding a flame between 1.5 feet and 3 feet in front of the sensor; "case 1" will be activated and " **Distant Fire** " will be sent to the serial monitor. If no flame is detected in front of the sensor; "case 2" will be activated and " No Fire " will be sent to the serial monitor.

System Implementation:

The drag force acts in the direction of the fluid flowing. Drag occurs due to the viscous friction forces on the air foil surfaces, and the imbalanced pressure on surfaces of the air foil. Drag as a function of the relative wind velocity at the rotor surface, is the difference between the wind speed and the speed of the surface, the lift and drag coefficient values are usually achieved experimentally and correlated against the Reynolds number for analysis purpose. This work uses a CFD code to predict these coefficient values over a range of operating conditions. The amount of power generated by the vertical axis wind turbine will be analysed through code. The lift force is one of the major force components exerted on a vertical axis wind turbine blade section inserted in a moving fluid. It acts normal to the fluid flow direction. This force is a consequence of the irregular pressure distribution between the upper and lower blade surfaces.

The working of vertical axis wind turbine is simple. Whenever wind flow through the turbine blades, it exerts some force on the blades. This imparts the movement of blades in the direction of wind flow, which ultimately results in the rotation of turbine. As our vertical axis wind turbine comprises of guide blades and magnets to create repulsion force in the direction of rotation of turbine, these give benefits in the performance.

CONCLUSION

Our work and the results obtained so far are very encouraging and reinforce the conviction that vertical axis wind energy conversion systems are practical and potentially very contributive to the production of clean renewable electricity from the wind. All the efforts were

made to develop the model which can generate the output even at low wind speed.

Parts were developed and fabricated with light materials. Many Sensors were added and tested successfully to monitor each wind turbine from control room and prevent damage which deters the working of wind turbines. Finally, the testing of the model was the main area towards the success of project and outcome of the project of input decided while designing and development of the product.

Wind energy technology requires implementation of novel strategies that originate from technology improvement in computation, control and communication. Next-generation wind energy systems will be more intelligent thanks to M2M communications and the monitoring of wind turbine that works together with other energy sources for a smart energy concept. In this study, a cloud based IoT remote monitoring system is proposed and implemented for a small-scale standalone wind energy system. The designed system is flexible and inexpensive for real-time data monitoring and cloud data storage. Analysis of real-time sensor data provides faster decision making that avoids damage to the system and can boost total energy output. Reliable operation and real time performance monitoring by using an IoT based concept can provide easy supervision.

The developed system can not only monitor and measure the required data but can also be remotely analyzed. This monitoring system provides the advantage of flexibility in data collection. In addition, this remote monitoring system can be regarded as a low cost monitoring system and can be used for other renewable applications.

We Believe that our work might contribute and bring a little change in generation of clean and green electricity which protects the earth and its resources from pollution. We Ought to bring many Eco friendly methods of power generation in future which might overcome energy crisis across the world and bring down price of electricity per unit which benefits many households and commercial industries.

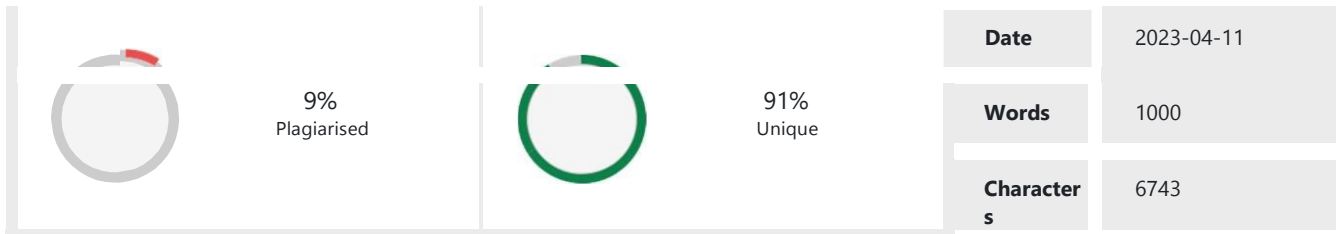
A variety of deep learning techniques are used for the detection and classification of tomato leaf disease. The CNN model outperformed other transfer learning methods like

ResNet50 and InceptionV3 in terms of disease detection in tomato crops. The proposed model has an accuracy in testing of 82.17% and a training accuracy of 98%. Farmers don't truly need to follow plant scientists to solve their problems with plant identification. They may improve the quality and yield of their tomato crops, as well as their profitability, by using this to quickly treat diseases that affect tomato plants. We intend to update the model in the future using a new crop. To further increase test accuracy, we will attempt to optimise the same model using the same dataset.

REFERENCES

- [1] Bavin Loganathan, Harun Chowdhury, Israt Mustary and Firo Alam —An experimental study of a cyclonic vertical axis wind turbine for domestic scale power Generation, School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University, Melbourne, 3083, Australia
- [2] G.M. Joselin Herberta, S. Iniyanb, E. Sreevalsanc, S. Rajapandiand —A review of wind energy technologies; Department of Mechanical Engineering, St. Joseph's College of Engineering, Chennai-119, India
- [3] K. Pope, I. Dincer, G.F. Naterer —Energy and exergy efficiency comparison of horizontal and vertical axis wind turbines, Faculty of Engineering and Applied Science, University of Ontario Institute of Technology, 2000 Simcoe Street North, Oshawa, Ontario, Canada
- [4] Muhammad Mahmood Aslam Bhutta, Nasir Hayat, Ahmed Uzair Farooq, Zain Ali, Sh. Rehan Jamil, Zahid Hussain —Vertical axis wind turbine – A review of various configurations and design techniques, Renewable and Sustainable Energy Reviews 16 (2012) 1926–1939, Department of Mechanical Engineering, University of Engineering and Technology Lahore, G.T. Road, Lahore, Punjab 54890, Pakistan
- [5] Young-Tae Lee, Hee-Chang Lim —Numerical study of the aerodynamic performance of a 500 W Darrieus-type vertical-axis wind turbine, School of Mechanical Engineering, Pusan National University, San 30, Jangjeon Dong, Geumjeong-Gu, Busan 609-735, South Korea

PLAGIARISM SCAN REPORT



Content Checked For Plagiarism

The following textbook discusses the use of wind energy and its significance as a safe and eco-friendly source of power generation, particularly when compared to fossil energies. It describes a design that employs Arduino IDE and Bedded C law to cover wind turbines for incidents similar as fires or natural disasters, and warn the control room. The design utilizes colorful detectors, including fire, bank, temperature, and moisture detectors. also, it makes use of pall systems to bear real-time information to the control room and aid in the form of damaged wind turbines. Bedded C programming is also bandied, emphasizing its critical part in electronics and its capability to enable processors to perform specific functions. The textbook highlights the benefits of using C programming over high- position languages, including optimized machine instructions and increased system performance. The Arduino platform, an open- source tackle and software company, is also introduced, along with its UNO board. The board contains all the necessary factors to support themicro-controller and can be painlessly connected to a computer via USB or powered using an AC- to- DC appendage or battery. The textbook also delves into the conception of pall computing and its advantages. pall computing allows druggies to pierce waiters via the internet and run software operations on those waiters without demanding to manage physical waiters themselves.

The ESP8266 wifi SOC system on a chip is also bandied. It can serve as an external WiFi module using standard ATC command set firmware or function as a WiFi- enabled microcontroller with a recently programmed firmware using the handed SDK. The module has a potent on- board processing and storehouse capability, allowing it to be integrated with detectors and other operation-specific bias via its GPIOs with minimum development up- front and lading during runtime. The following textbook discusses the use of wind energy and its significance as a safe and eco-friendly source of power generation, particularly when compared to fossil energies. It describes a design that employs Arduino IDE and Bedded C law to cover wind turbines for incidents similar as fires or natural disasters, and warn the control room. The design utilizes colorful detectors, including fire, bank, temperature, and moisture detectors. also, it makes use of pall systems to bear real- time information to the control room and aid in the form of damaged wind turbines. Bedded C programming is also bandied, emphasizing its critical part in electronics and its capability to enable processors to perform specific functions. The textbook highlights the benefits of using C programming over high- position languages, including optimized machine instructions and increased system performance. The Arduino platform, an open- source tackle and software company, is also introduced, along with its UNO board. The board contains all the necessary factors to support themicro-controller and can be painlessly connected to a computer via USB or powered using an AC- to- DC appendage or battery. The textbook also delves into the conception of pall computing and its advantages. pall computing allows druggies to pierce waiters via the internet and run software operations on those waiters without demanding to manage physical waiters themselves. The ESP8266 wifi SOC system on a chip is also bandied. It can serve as an external WiFi module using standard ATC command set firmware or function as a WiFi- enabled microcontroller with a recently programmed firmware using the handed SDK. The module has a potent on- board processing and storehouse capability, allowing it to be integrated with detectors and other operation-specific bias via its GPIOs with minimum development up- front and lading during runtime.

Our work and the results attained so far are veritably encouraging and support the conviction that perpendicular axis wind energy conversion systems are practical and potentially veritably contributive to the product of clean renewable electricity from the wind. All the sweats were made to develop the model.

Detectors were added and tested successfully to cover each wind turbine from control room and help damage which deters the working of wind turbines. Eventually, the testing of the model was the main area towards the success of design and outgrowth of the design of input decided while designing and development of the product. Wind energy technology requires perpetration of new strategies that appear from technology enhancement in calculation, control and communication. Next- generation wind energy systems will be more intelligent thanks to M2M dispatches and the monitoring of wind turbine that works together with other energy sources for a smart energy conception.

In this study, a pall grounded IoT remote monitoring system is proposed and enforced for a small- scale standalone wind energy system.

The designed system is flexible and affordable for real- time data monitoring and pall data storehouse. Analysis of real- time detector data provides briskly decision making that avoids damage to the system and can boost total energy affair. Reliable operation and real time performance monitoring by using an IoT grounded conception can give easy supervision. The advanced system can't only cover and measure the needed data but can also be ever anatomized. This monitoring system provides the advantage of inflexibility in data collection. In addition, this remote monitoring system can be regarded as a lowcost monitoring system and can be used for other renewable operations. We Believe that our work might contribute and bring a little change in generation of clean and green electricity which protects the earth and its coffers from pollution. We shall to bring numerous Eco friendly styles of power generation in future which might overcome energy extremity across the world and bring down price of electricity per unit which benefits numerous homes and marketable diligence. Different deep literacy ways have been employed for relating and grading conditions in tomato leaves, with convolutional neural network(CNN) arising as the top pantomime in comparison to transfer literacy models similar as ResNet50 and InceptionV3. The proposed CNN model achieved a testing delicacy of 82.17 and a training delicacy of 98

Matched Source

Similarity 4%

Title: [Is the ESP8266 WiFi Module the Right Choice for You?ESP8266 for IoT: A Complete Guide](#)

Sep 17, 2020 — The ESP8266 WiFi module is a powerful, yet cost-effective, surface-mountable WiFi module with an embedded ESP8266 system on chip (SoC). It's one ...Aug 10, 2020 — The ESP8266 is a system on a chip (SOC) Wi-Fi microchip for Internet of Things (IoT) applications produced by Espressif Systems.

<https://www.nabto.com/is-esp8266-wifi-module-right-choice-for-you/>

Similarity 6%

Title: [EXPERIMENTAL ANALYSIS OF COMMERCIAL VERTICAL ...](#)

Our work and the results obtained so far are very encouraging and reinforce the conviction that vertical axis wind energy conversion systems are practical and.

<https://www.jetir.org/papers/JETIRCU06105.pdf>

Similarity 5%

Title: [IoT and Cloud Based Remote Monitoring of Wind Turbine](#)

Dec 30, 2019 — In. this study, a cloud based IoT remote monitoring system. is proposed and implemented for a small-scale stand-. alone wind energy system.

https://www.researchgate.net/publication/338236727_IoT_and_Cloud-Based_Remote_Monitoring_of_Wind_Turbine