WIND AND DUAL AXIS SOLAR AUTOMATED IRRIGATION SYSTEM

An Undergraduate CAPSTONE Project
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Fall Semester 2022-2023
January, 2023

Faculty of Engineering
American International University - Bangladesh

WIND AND DUAL AXIS SOLAR AUTOMATED IRRIGATION SYSTEM

A CAPSTONE Project submitted to the Faculty of Engineering, American International University - Bangladesh (AIUB) in partial fulfillment of the requirements for the degree of Bachelor of Science in their mentioned respective programs.

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DECLARATION

This is to certify that this project is our original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. Any material reproduced in this project has been properly acknowledged.

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APPROVAL

The CAPSTONE Project titled WIND AND DUAL AXIS 360 DEGREE SOLAR AUTOMATIC IRRIGATION SYSTEM has been submitted to the following respected members of the Board of Examiners of the Faculty of Engineering in partial fulfillment of the requirements for the degree of Bachelor of Science in the respective programs mentioned below on **January 2023** by the following students and has been accepted as satisfactory.

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ACKNOWLEDGEMENT

First and foremost, we want to express our gratitude to God Almighty for providing us with the ability to take on the project and successfully accomplish it. Our project would have failed without his leadership. Then, we would like to express our gratitude to our respected supervising, Associate Professor, **Mr.Kazi Firoz Ahmed** for his interest in this topic and our respected external supervisor, Senior Assistant Professor, **Dr. Md. Rifat Hazari** for providing us with useful advice regarding this research. Then, we wish to express our gratitude to the honorable Dean **Prof. Dr. ABM Siddique Hossain** and the honorable Vice Chancellor **Dr. Carmen Z. Lamagna** of American International University-Bangladesh for their approval of this thesis.

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ABSTRACT

Electrical power is the most crucial issue in the modern world. A hybrid system is a combination of different but complementary energy generation systems based on renewable or mixed energies. This paper describes a hybrid power system that uses wind energy and renewable power sources (solar and wind) is designed. A A hybrid system is a combination of different but complementary renewable energy generation systems or mixed energies. This paper describes a hybrid power system that uses wind energy and renewable power sources (solar and wind) is designed. . This system is control by Arduino Pro Mini controller. All of this power store in a battery. In this project we try to make a hybrid power generator system. This system also measures the soil condition and watering (irrigation) automatically with a soil moisture sensor and a pump motor The analysis demonstrates the optimal solution as well as the costs of system construction. The outcomes presented validate the efficacy of the proposed method, which could be regarded as a very useful tool in the design and analysis of a hybrid power generation system. Agriculture, along with its supporting industries, is a significant source of income for many people. This sector employs approximately 70% of the rural population and has been plagued by issues for example, energy and water management. We should develop technology to help farmers, as more than 20% of Indian farmers are farmers are affected by drought. The most significant has been the use of renewable resources. issue confronting this industry. There are several prototypes for the agricultural industry on the market, as well as their price and component count should be low. We describe a revolutionary agricultural system with a Solar Plate with Dual Axis Sun Tracking and an autonomous irrigation system in this study.

Chapter 1

INTRODUCTION

1.1 Overture

One of the most pressing global challenges is ensuring reliable, clean, and cost-effective energy world's major difficulties in this century. Renewable energy sources are becoming more popular. regarded as the most crucial and effective future solution. Wind and solar energy are regarded as the most effective of the various renewable energy resources, having made a rapid and significant breakthrough in the previous year. Solar energy is an infinite source that can be utilizing various techniques such as solar systems. Photovoltaic systems generate electricity. tried and true method with numerous applications all over the world the photovoltaic system can be integrated with the grid (grid-on) or it can be autonomous (grid-off). Photovoltaic systems typically include photovoltaic modules, storage batteries, inverters, and power control components, as well as Tracking systems can be mechanical or electronic. From a local standpoint, photovoltaic systems emit no greenhouse gases, making Environmentally friendly energy generation. In addition to the adaptability of the process, expand to meet rising energy demands, it is also reasonably priced and requires requiring little upkeep Wind power is a significant source of energy that is both economically and environmentally competitive, and it is expected to play an important role in meeting global clean energy and sustainable development challenges in the face of climate change. Since the first oil crisis, wind energy has been regarded as a medium that promotes energy independence, security, and decentralization of the power system by utilizing local resources.

1.2 Engineering Problem Statement

By using electricity, the world has progressed towards a lot of progress, compared to the destruction of electricity in terms of engineering. It can be seen that everyone has worked with many types of renewable energy, but if all these energies can be combined and utilized, then renewable energy will become a very

large field in electricity production, thereby making the energy for the country. To solve all kinds of problems, we are motivated to work with renewable energy. The conservation of nonrenewable energy resources is today's most pressing issue. a greater reliance on renewable energy like Solar, water, wind, and geothermal energy generators can also assist. to conserve nonrenewable sources of energy. Because nonrenewable sources of energy both expensive and limited, the goal of this project is to combine two of the cleanest and most environmentally friendly most dependable solar and wind energy sources hydroelectricity. The purpose of this article is to integrate two distinct systems, a dual-axis solar tracker and an irrigation system, into a single project. A dual axis solar tracker is used to maximize sunlight intake and generate Solar energy is used to generate electricity, whereas irrigation systems are used to conserve water. usage automatically when it comes to irrigation systems.[1]

1.3. Related Research Works

Traditional Energy resources are scarce, and pollute the surroundings. As a result, greater emphasis has been placed on the use wind energy, and other renewable energy sources cells, as well as solar energy, among others. Wind energy is the most rapidly expanding as well as a promising renewable energy source. Over the the previous two decades The high penetration of wind turbines in the power system has been linked to advancements in wind turbine technology and control methods. During such times, doubly-fed induction machines are gaining popularity as wind energy conversion systems. Wind turbines are divided into two types:

one horizontal axis and another one is vertical axis.

Wind energy extraction is limited by wind machine practical size, density, friction losses in rotating machinery, and conversion efficiencies from rotational energy to electrical energy. A windmill is operational. by converting the kinetic energy of the wind into rotary mechanical energy. Rotational energy is converted into electricity in more advanced models. Wind turbines use torque to Convert the wind's kinetic energy into mechanical energy.

1.3.1. Earlier Research

Nowadays, the Green Deal and growing nutritional demands are driving elements in human activity. Agriculture is an important economic sector that may benefit from the use of renewable energy sources by including off-grid, dry, and barren terrains. Power generated by hybrid water pumping systems is a way for addressing the stochastic nature of renewable energy sources. [2] Wind and solar 360 double-axis solar irrigation system has been more effective in the agriculture sector. Earlier research suggests that the tracking mechanism may track the solar cell based on the location in order for the sun to keep the solar panel orthogonal

to the ground.

the Sun's incident rays with greater accuracy

. This tracking system is different, more effective, and accepted in the market than any other tracking system since it is based on a solar operating system with low cost and material availability. [3] This tracking system is simpler and less expensive than any other tracking system since it uses only a basic sensor (LDR) and a driving circuit (op-amp), both of which are inexpensive. These characteristics distinguish this system, as consumers in developing nations seek economical utilities with maximum production. [4] Concentrated photovoltaic (CPV) trackers and regular photovoltaic (PV) trackers are the two types of solar trackers. Bangladesh, being a growing country, faces several challenges, one of which is a power issue. Electricity is essential to a country's progress.[5] Many other researchers have conducted 360 double-axis solar and wind power generation to improve their agriculture sector-based automatic irrigation systems. Wind power energy improves the system of power diversity in renewable power technology to consume more energy generated in the future. Progress should be like saving power consumption in terms of producing the effective phenomenon of new technology for renewable power resources.

1.3.2. Recent Research

Wind energy is a type of solar energy created by air movement relative to the surface of the Earth. Thistype of energy is produced by the uneven heating of he surface of the Earth caused by the Sun and is influenced by the Earth's rotation and surface topography.[6] See Sea wind for a general summary of the factorsthat regulate airflow. In new modern technology, the power concentration of electricity has been consumed more efficiently to achieve the power distinguish of the agriculture sector Although the Sun is a tremendously powerful energy source, and sunlight is by far the most powerful most important the source of energy received by Earth, as well as its intensity at the The Earth's surface is relatively low. [7] As a result of the vast radial radiation dispersion from the distant Sun, this is required. The energy of the most effective proportion in the power aggravation into the automatic system out of the modern technology by the insufficient tools or design process. Photovoltaic solar water pumping systems are a great alternative to electric as well as systems powered by diesel. Regarding the past fifty years, it has been a promising field of study. In the 1970s, Attempts were made to investigate and assess the financial viability and practicability of solar photovoltaic pumping systems for water. The dynamic system of the Photovoltaic Solar Water Pumping The system is made up of a motor as well as a pump. [8] It is employed to generate flow by pumping water. The engine converts electricity generated by the PV system to kinetic power, which the compressor then converts to water's hydraulic energy. The motor is powered by electricity from an inverter as well as converts it to mechanical power via permanent electromagnets. attraction and repulsion phenomena.[9] PV panels are made up consisting of one or more PV modules that are pre-wired

together, whereas a photovoltaic module is a combination of several solar cells that are linked in series or parallel toprovide higher levels of power. The battery storage of supply the power generation at the mov in topology by the solar and wind protection system covert on the AC to DC or DC to AC. We investigated a water-pumping system powered by wind turbines consisting of a wind turbine powered by a permanent magnet generator that is electrically connected via a motor-generator to a water pump conflagration. Starting with a brief review We will demonstrate how the startup's success is affected by the system's steady-state analysis. procedure and overall system efficiency are dependent on the correct selection characteristics of water pumps. The relationship between the start-up of the water pump procedure and the kinetic energy stored in the rotor of a wind turbine was investigated. [10] All of the new renewable energy technology made it easier to improve more monitoring systems that were preferable to the power generation prospect.

1.4. Critical Engineering Specialist Knowledge

Hybrid power generation system has been developed using many simple methods before but, in our system, we are using solar panels and wind to save energy. It is possible to store free energy, it does not require any additional oil consumption or any fuel. We have many changes in this system. Earlier, the traditional system used only solar or wind energy and stored such energy in the battery. By using both energies together, we can save energy in the battery and our system is equipped with a sensor to automatically determine the soil moisture of the land. If the amount of water in the soil is low, the water motor will automatically start and give water and when the amount of water is moderate, our system will be the same again. Our system works automatically hence from traditional method. This match's system is very advanced. This report investigates advancements in research in water pumping systems powered by renewable energy sources (RESWPSs). The reported investigations are as categorized into five major groups, which are as follows:
Solar photovoltaic water pumping systems are examples of renewable energy water pumping systems (SPWPSs), solar thermal water pumping systems (STWPSs), wind energy water pumping systems (WEWPSs), biomass water pumping systems (BWPSs), and hybrid renewable energy water pumping systems (HREWPSs).

1.5. Stakeholders

In the field of renewable engineering systems, the generation of hybrid power is a hot topic. This field has employed a large number of people. The following is a synopsis the most pertinent work in the literature. The optimal design of a hybrid solar-wind-diesel power system for rural electrification was designed in (Trazouei, 2013) using an imperialist competitive algorithm. There were also presented some artificial intelligence optimization techniques. The ultimate objective was to reduce the hybrid system's net price over a 20-year periodThe imperialist competitive algorithm was demonstrated being the quickest and most precise. [11]

Ouz (2012) presented an isolated hybrid wind-photovoltaic power system with battery storage that was designed to supply electricity to two laboratories with a total peak electrical load of 1072 W. Statistical comparisons were performed made in the middle of the energy produced as well as the amount of energy consumed. Monthly data was collected and compared, and the comparison revealed that the power generated exceeded the amount of energy consumed. [12] A hybrid solar-wind power system was demonstrated. in (Godson, 2013). A microcontroller was used to control the system. When compared to their individual modes of generation, this ensures optimal resource utilization and efficiency improvement. It also improves the system's dependability. [13] A diesel generator source system was hybridized with renewable energy sources investigated and demonstrated in (Anayochukwu, 2013). The findings indicated that renewable power could be used to replace diesel as a power source. This cross-pollination concept arose in order to reduce operating costs and air pollution. A hybrid solar and wind system was optimally designed for a remotely controlled drip irrigation system in (Shivrath, 2012The cost of the wind-solar hybrid system was optimized considered in order to develop functional guidelines for small-scale wind-solar hybrid system manufacturers. Renewable energy feasibility analysis [14] options for energy supply for It was demonstrated how to electrify a small hotel in (Anagreh, 2013). The paper looked into technical as well as economic issues. The paper demonstrated that The on-grid small wind turbine scheme was the most popular viable supply alternative. In addition, the paper demonstrated that as the carbon tax rises, grid-connected wind energy's Net Present Cost (NPC) schemes falls. The paper came to the conclusion that use wind and hybrid wind/solar energy resources will be developed become more common in the near future. [15]

1.6. Objectives

Our project objective we divide in two parts. Which is primary and secondary. Primary part is work for at the start position of our project and secondary objective work's will be after made this project.

This work's main goal is divided into two parts.

Primary Objectives

The goals of this project are:

- To study about **Wind and Double Axis 360 Degree Solar Automatic Irrigation System**.
- To store energy from solar energy and wind energy.
- To measure the soil condition and automatic watering in land.

Secondary Objectives

The objectives of this project are:

- To observe power storage in battery from our system.
- To ensure it gives energy to source.
- To test the performance of the hybrid power generation system.

1.7. Organization of Book Chapters

2. **Chapter 1: Introduction.** This chapter is all about overture, significance of the project / background study, engineering problem statement, objective classification, primary and secondary objective, compression with traditional method and organization of book chapter.
3. **Chapter 2: Project Management -** Here briefly describe about chapter introduction, related research work, validity and accuracy of work, wide range of research work and summary
4. **Chapter 3: Methodology and Modeling -** In this chapter we discuss about project block diagram, circuit diagram, working principle, flow chart and its summary of this chapter.
5. **Chapter 4: Project Implementation –** Here we describe our project required hardware instrument's part.
6. **Chapter 5: Result Analyses & Critical Design Review–** Here we describe our project required software simulation part. In this part we discuss about out project outcome result analysis, project advantages, application, discussion.
7. **Chapter 6: Conclusion** – Finally in this chapter we discuss about conclusion, limitations and future scope of work.

Chapter 2

PROJECT MANAGEMENT

2.1. Introduction

In the field of renewable engineering systems, The generation of hybrid power is a hot topic.. This field has employed a large number of people. The following is a synopsis the most pertinent work in the literature. The optimal [16] design of a hybrid solar-wind-diesel power system for rural electrification was designed in (Trazouei, 2013) using an imperialist competitive algorithm. There were also Some techniques for artificial intelligence optimization are presented. The ultimate objective was to keep the hybrid system's net cost as low as possible for the next 20 years. The imperialist competitive algorithm was demonstrated to being the quickest and higher accurate. Ouz (2012) presented an isolated hybrid wind-photovoltaic power system with battery storage that was intended to be [17] capable of supplying With a peak electrical load of 1072 W, electricity is supplied to two laboratories. Statistical comparisons were performed. made in the middle of the energy produced as well as the amount of energy consumed. Monthly data was collected and compared and the comparison revealed that the power generated exceeded the amount of energy consumedA hybrid solar-wind power system was demonstrated in (Godson, 2013). A microcontroller was used to control the system. When compared to their individual modes of generation, this ensures optimal resource utilization and efficiency improvement. It also improves the system's dependability. [18]

2.2. S.W.O.T. Analysis

SWOT analysis is a technique for strategic planning that is used to assess a project's strengths, weaknesses, opportunities, and threats. It requires deciding on the project's goal. It also includes identifying internal and external effects. Those components are beneficial and those are detrimental to achieving that aim. [19] It is vital to underline barriers and future possibilities while also recognizing defects and potential hazards so that steps may be doneto address them. SWOT analysis highlights each of these components.

2.2.1. Strengths

- Wind turbine and Dual axis 360 Solar which can be more effective to gain power for the agricultureirrigation system.
- There will be an automatic soil moisture sensor that has improved the soil moisture on a dry day togrow up the agricultural harvest.
- In this system, the update of solar, wind, and temperature information has been reaching mobile phones to control the irrigation system.
- Structured based fully on DC.

2.2.2 Weaknesses

There are some areas where the project lags.

- Wind energy requires an MPPT controller for optimal efficiency, which was unfortunately notincorporated into the project due to a lack of resources.
- The project may only charge for a limited duration within 24 hours. However, in terms of time, thegrid-based method remains much superior.
- Only fixed voltages use this term of view lags of the prototype project.

2.2.3. Opportunities

- Superior wind energy controllers may be implemented with adequate financing, resulting in asignificant increase in total voltage supply and efficiency.
- Sizing up wind turbines and solar panels is conceivable in a larger-scale deployment, removing theconstraint of not having enough sunshine or wind.
- The length of usage can be extended by including a more feasible storage option.

2.2.4. Threats

- Seasonal change or natural calamities pose a significant risk to the proposed station
- Dependency on the power consumption system may not be covered in the most irrigation system.
- As this project's larger scale requires a huge scale turbine implementation, which may not becomfortable for farmers in the agricultural sector.

2.3. Schedule Management

All previous energy generating projects lacked the same amount of validity and accuracy, and to be honest, it has been exceedingly difficult to extract energy from a small composition. Only solar system it may took huge time to produce more energy. We generate energy here using solar and wind energy. If there is a cloudy sky but there is wind, the energy can be generated energy from the wind energy, so the validity of our system is extremely high and we can produce energy in any weather.

Date and Program	16/04/22	09/05/22	11/08/22	08/09/22	22/09/22	20/11/22	27/11/22	28/12/22	14/01/23	18/01/23
Orientation	***									
Proposal submission		***								
Chapter 1 & 2 submission			***							
Progress defense				***						
Progress reflection report submission					***					
Lifelong learning report submission						***				
Draft project book submission							***	***		
Submission of final book									***	
Final defense										***

Figure 1: Gantt chart of our Project

2.4. Cost Analysis

The components of the project in the same ratio in case of purity at the most important section in the major component. In some maximum component has been uses of our project. There are

No	Components	Quantity	Costing
1	Arduino Uno	1	1200
2	Motor Pump	1	900
3	Servo motor	1	600
4	Solar Panel	1	200
5	LCD Display	1	400
6	Motor Drive	1	350
7	Capacitor	15	50
8	Resistor	20	50
9	Jumper wire	1	200
10	Power supply (Battery)	1	1000
11	Wind turbine	1	1500
12	Solar panel	2	200
13	Ultrasonic Sensor	1	900
14	Soil Moisture Sensor	1	900
15	Pipe	1	20
16	Others Electrical Equipment's	30	10000
	Total	7	18470 Taka

Mean,

X'= sum/n
X'= 18470/79
X'=234

Deviation= √ ∑(Xi-X')2/n-1
= √ ∑(18470-234) 2/n-1
=18236/78
=233

2.5. P.E.S.T. Analysis

We use a PEST analysis as a strategic tool to identify, evaluate, organize, and track macroeconomic factors that may have an impact on our project now and in the future. The framework investigates opportunities and threats brought about by political, economic, social, and technological forces. Electrical and diesel-powered water pumps are used in India. Devices are widely used in order to irrigate. The ongoing depletion of traditional sources of energy, as well as the environmental consequences, has sparked interest in using renewable energy sources (RESs) such to power water

pumping systems, such as solar-photovoltaic, solar-thermal, wind energy, producer gas, and biomass. [20] During the day, photovoltaic cells in the sun heat up.

energy conversion and because of solar radiation. Heat production has a substantial impact on system performance. To get optimal power output, photovoltaic cells must be kept at a constant temperature. The economic diversion has none profitable but also influences that can be more power consumption from wind and solar prospects. Wind energy has revoked the system majority to provide a backup indication by the nightfall attention in the systematic process for the irrigation system in the agriculture sector. According to the engineering problem solution of the solar and wind irrigation system out of the work, the process to be helpful in the modern technology solving recent problems by the engineers at the more compatible. [21]

Agriculture, on the other hand, is an industry sector with a modest contribution to the gross domestic product (approximately 4% on a worldwide basis during the last decade), but an extremely high relevance for humankind. According to the United Nations Food and Agriculture Organization, food production has grown by more than 100% in the previous 30 years. A further 60% rise is projected by 2050. [22-23] The main mechanism for increasing agricultural yields is irrigation. Solar plate tracking techniques are classified into two types. Depending on the level of liberty. The single-axis tracking system records the sun's movement from east to west in one degree of freedom. A dual-axis solar plate can move horizontally as well as vertically because it has two degrees of rotation. Dual-axis solar plate tracking has been developed received more attention in recent research than single-axis tracking systems due to its precision and higher output efficiency. There are two types of solar tracking systems: closed-loop monitoring systems and tracking systems with an open loop. Control algorithms and mathematical derivations are used to obtain results in an open-loop tracking system. [24]

2.6. Professional Responsibilities

Norms of Engineering Practice

The first recommendation was made and then followed, bearing in mind the professional obligations providedin the NSPE Codes of Ethics for Engineers. The objective was to design a **WIND AND DOUBLE AXIS 360DEGREE SOLAR AUTOMATIC IRRIGATION** that used solely renewable energy while also concentrating on public welfare to adhere to sustainable development ideals. To avoid plagiarism, all analysesand findings are made public. The short terms of the major indicate point of view have the social value can bemore important to the irrigation system in the agriculture sector. The technology of the system that has been power exhibited to the motor generator from wind power energy consumption represents the power source of the renewable power technology system using a smart monitoring system.

Individual Responsibilities and Function as Effective Team Member

While important to the success of any project, accountability does not imply that a project manager must micromanage or browbeat individuals into getting things done. Instead of being the only one keeping people accountable, such approaches frequently engender discord and hatred against the project manager, which is a preferable strategy the project manager might adopt. Our project team consists of four people, each of whom provided leadership for a distinct phase since we needed to go through numerous parts to make the project stand out. Because ours is a hardware-based project, we had to take many initiatives to operate as a team and produce a quality product. Our task was completed on schedule, and to perfection, thanks to everyone's equal

NAMES	RESPONSIBILITIES
GHOSH, DIPTA	• Reviewed papers for literature review • Wrote chapters 2,3 & 6 and parts of chapter 1 & 5 of book • Designed the 3D model • Worked on hardware implementation • Prepared the presentation slides
MD. FARHANISLAM	• Worked on literature review and report analysis research • Simulated the project • Did troubleshooting the result and Simulink design of it • Gathered all components and implemented hardware prototype model • Wrote chapters 1, 4 & 6 of the book
SHAFIN, MD. NAZMUN SHADAT	• Provided project idea • Simulated the project • Did troubleshooting the result and Simulink design of it • Prepared all calculations and set up project implantation Implemented hardware part of the project • Wrote chapters 1, 4 & 5 & parts of chapter 6 of the book • Measured all data input and output of the project
HARUN-AR-RASHID	• Solved simulation problem output to measure the output data • Reviewing papers for literature review • Wrote chapters 2, 5 & 3 of the book • Implemented hardware and prepared components for the project. • Researched project management

involvement and understanding of the working mentality. To make the project stand out, we had to go through proper planning from the beginning, such as inventing project ideas, holding a kickoff meeting, emphasizing the interconnectedness of tasks, obtaining public commitments on action items, publicly following up on action items, confronting performance issues, escalating performance issues as needed, hardware foundation works, book writing, book researching, researching required book template's points, properly arranging book, and avoiding plagiarism. Individual Accountabilities of each member of our team is now shown below, along with their leadership and equal performance:

2.7. Management Principles and Economic Models

For solar energy to be effective and sustainable, and practical applications useful Solar radiation applications necessitate technical considerations. For example, understanding how power density changes throughout the day and from season to season is critical in any solar energy-powered device design, as is the result of tilting a collector surface at an inclination to the horizontal. Practically, the majority of solar energy applications can be split into two types: direct (beam) radiation and dispersed or diffuse radiation.

[25] Agriculture is the primary source of income in a developing country like Bangladesh. Agriculture employs two-thirds of the population, either directly or indirectly. It provides a living for many individuals. Because it contributes the most to the national GDP, it must be mechanized because manual irrigation methods are inefficient. Water delivery may be more precise with an automated irrigation system. Although the technical foundation of sun trackers is not novel, the Internet of Things architecture is revolutionary, and it is doubtful

that the journal will take this approach. The architecture presented is appropriate for establishing integrations with ordinary Wi-Fi connections. The layout is also ideal for tiny sun trackers due to its tilted axis. [26] The irrigation system is a mechanism that artificially manages the delivery of water via pipelines, drains, and so on.

The primary goals of irrigation systems are to aid plant development, maintain landscapes, mitigate the effects of insufficient rainfall, and so on. Traditional irrigation technologies include DHEKLI and Rahat, while modern ones include sprinklers and flood-type systems. Water availability is critical to agricultural output. Frameworks for smart water systems guarantee enough water supply in the field at the right moment. Water is essential forall living things. Only the agricultural sector consumes over 70% of total water consumption, making it the greatest water user. [27] To raise the production of irrigation systems its basis on using new technology aboutthe soil, temperature, power, or water backup form. This proposed model is aimed to automate the irrigation system by measuring the moisture level of the soil and switching the motor pump ON/OFF. Irrigation is extremely significant in the agricultural area. So, by employing this prototype model, enough volume of watermay be assured in the field at the appropriate moment. The wind power system has been the most effective of the combined power system module in the automatic electricity backup system to use the emergency process for the agriculture sector which is more important to dependency. [28]

2.8. Summary

Currently, renewable energy technologies ensure a bigger contribution to the universe while emitting no CO2 into the environment. According to estimates, our planet currently has 161 gigatons (GW) of renewable energy- producing capacity, representing the most yearly rise ever witnessed in 2018. [29] Pumping water needs a lot of energy to run since it uses a lot of petroleum, gasoline, electricity, and other things. Solar photovoltaic (PV) and wind are alternative energies that are more promising for performing the same task with no energy costs. These newest renewable energies are more stable and well-suited to rural areas where transmission lines cannot be extended. Furthermore, these systems are ideal for situations when just a little volume of water has to be pushed for a specific period. Renewable energy sources, unlike traditional energy sources of electric power, are not dispatchable; their power production cannot be regulated.[30] A solar photovoltaic cell can convert incident solar radiation into electrical energyIn the SPV cell's analog circuit A diode is connected in parallel with an ideal current source. The PV and IV diagram at constant temperature and Adani Solar's irradiance is changing. (72 cells) PV, which was used in this study, is shown in Figure 1. [20] Natural resource depletion has been occurring at an alarming rate, posing a danger to life's sustainability. Every country in the globe is doing everything it can to mitigate the harm that the human race has brought to the Earth via various techniques, one of which is the utilization of renewable energy sources to create electricity. According to current generating figures, the solar, wind, and hydro account for the majority of generation. The installation and maintenance costs of wind and hydropower plants make them a less attractive alternative for most consumers. [31]

Chapter 3

METHODOLOGY AND MODELING

Introduction

If we look at the outside world, we will see that they are doing a lot of work on renewable energy and we are far behind. If we work on renewable energy, there will be less pollution and we can produce energy at no cost. It is difficult to produce energy by using from only solar or only wind energy, but it is very easy to produce energy by making hybrid system, so it is very easy to produce energy by using solar energy, wind energy, tidal energy and many more. A lot of progress in the country will be achieved by keeping pace with the outside world. All previous energy generating projects lacked the same amount of validity and accuracy, and to be honest, it has been very difficult to extract energy from a small composition. Only solar system it may took huge time to produce more energy. We generate energy here using solar and wind energy. If there is a cloudy sky but there is wind, the energy can be generated energy from the wind energy, so the validity of our system is very high and we can produce energy in any weather.

Block Diagram and Working Principle

All previous energy generating projects lacked the same amount of validity and accuracy, and to be honest, it has been very difficult to extract energy from a small composition. Only solar system it may took huge time to produce more energy. We generate energy here using solar and wind energy. If there is a cloudy sky but there is wind, the energy can be generated energy from the wind energy, so the validity of our system is very high and we can produce energy in any weather.

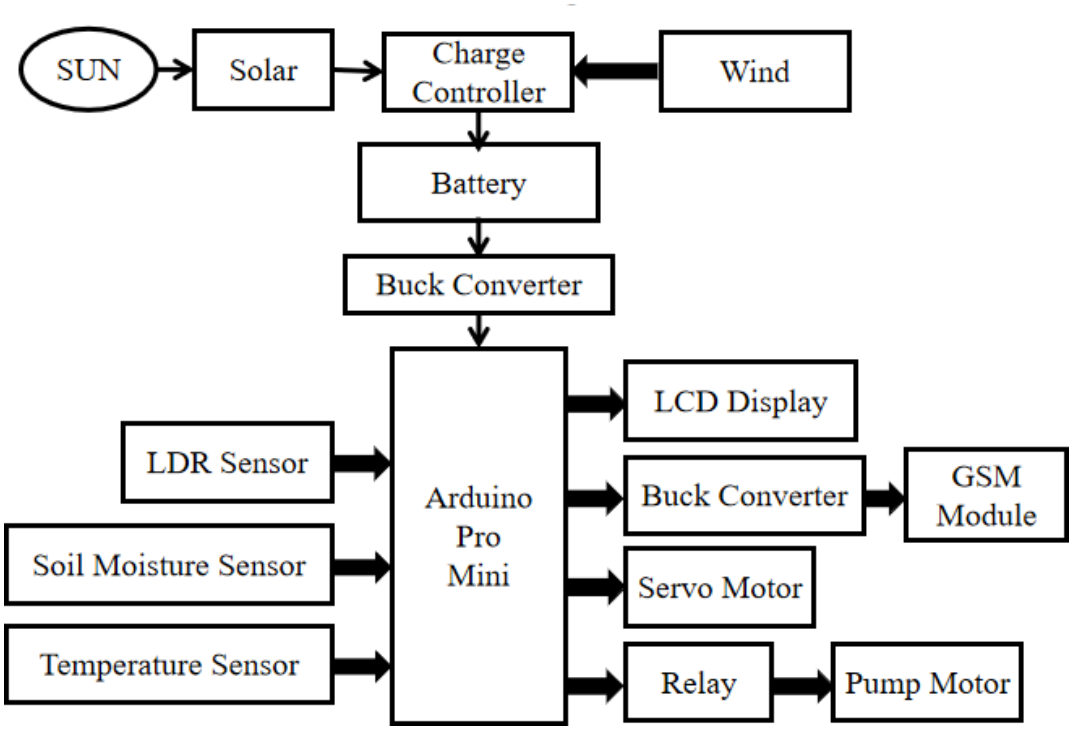


Figure 2: Block Diagram of Our System

This hybrid power generation system works on the principle of auto power generating from different sources. Here we use a vertical turbine and solar panel for power generating elements and restore it in a battery. In this project Solar takes sunlight and produces some energy and stores it battery with the help of a charge controller system. Beside this process here also store some power from wind turbine. Here inverter circuit is converted dc to ac current and supply power in load. This solar cell is controlled by the Arduino controller. LDR is connected with the controller and detects the sunlight and servo motor rotate solar panel angle (360 degree) with sunlight direction. All of this battery voltage and solar voltage percentage will be shown in LCD displays. This system also measures the temperature around of this land and shown in display. In land side here we use a soil moisture sensor which is measure the soil condition and sense it to micro-controller. Then micro- controller sends a signal to pump motor. If the soil condition is dry then pump motor will start automatically, after watering the pump motor will be off automatically. This soil condition will send text user mobile through GSM module This is the main procedure of our system.

Modeling

Here in that thing, there have a solar and wind turbine, who can be generate power and utilize whole power to run the motor pump. So here we implemented the model,

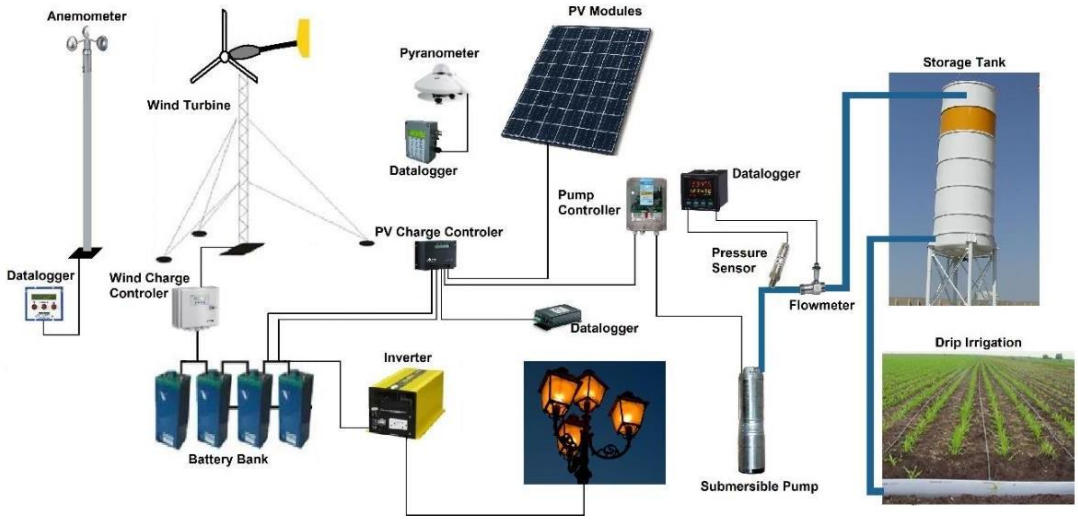


Figure 3: Implemented Model of Wind and Double Axis 360 Degree Solar Automatic Irrigation.

The schematic diagram here is representing the electrical circuit and the components of the hybrid power generation system. Here we have used standardized symbols and lines.

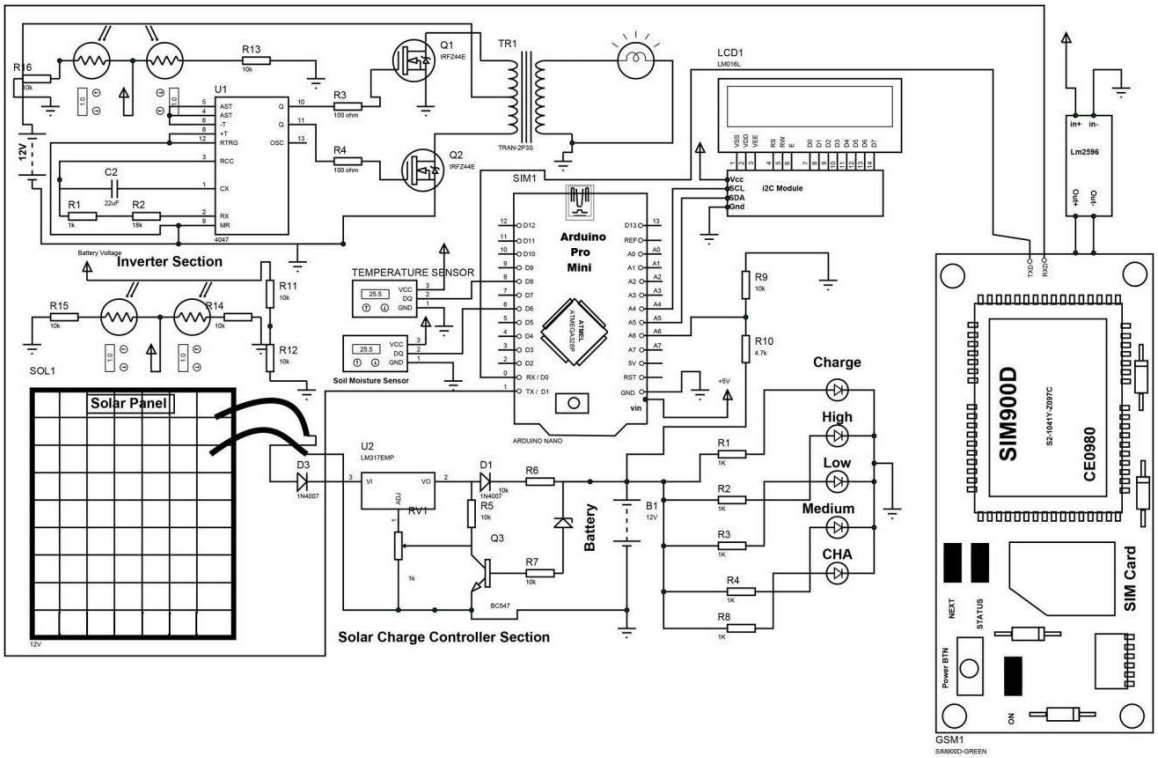


Figure 4: Schematic Diagram of Our System

Summary

In this chapter of system review we show all of the system circuit diagram, Block diagram, working principle of the included system. If we look at the outside world, we will see that they are doing a lot of work on renewable energy and we are far behind. If we work on renewable energy, there will be less pollution and we can produce energy at no cost. It is difficult to produce energy by using from only solar or only wind energy, but it is very easy to produce energy by making hybrid system, so it is very easy to produce energy by using solar energy, wind energy, tidal energy and many more. A lot of progress in the country will be achieved by keeping pace with the outside world. However, the sun does not always provide that amount of energy. As a result, irradiance levels are frequently quite low. The total number of peak sun hours are simply a rough estimate how many The irradiance during the day equals peak sun. The output of photovoltaic systems is valued during peak sunlight hours. The total number of hours in a day when a photovoltaic array will work at maximum power output is referred to as the the number of peak sunlight hours in a day.

Chapter 4

PROJECT IMPLEMENTATION

4.1. Introduction

In this section, we will discuss elaborately about our hardware design of "Wind and Double Axis 360 Degree Solar Automatic Irrigation System" and the component description, features, working procedure and cost analysis of our all equipment. The system hardware fabricates composed of micro controller unit, solar panel, charge controller, generator motor, LDR sensor, temperature sensor, GSM module, soil moisture sensor, pump motor, servo motor, LCD Display, Battery, and many more related components.

4.2. Required Tools and Components

Solar Panel

- ➢ Charge Controller
- ➢ Battery
- ➢ Generator Motor
- ➢ LDR Sensor
- ➢ Soil Moisture Sensor
- ➢ Arduino Pro Mini
- ➢ LCD Display
- ➢ Servo Motor
- ➢ Temperature Sensor
- ➢ GSM Module
- ➢ Buck Converter
- ➢ Relay
- ➢ Pump Motor
- ➢ Voltage Regulator
- ➢ Resistor

4.3. Implemented Models

Here in that thing there have a solar and wind turbine, who can be generate power and utilize whole power to run the motor pump. So here we implemented the model,

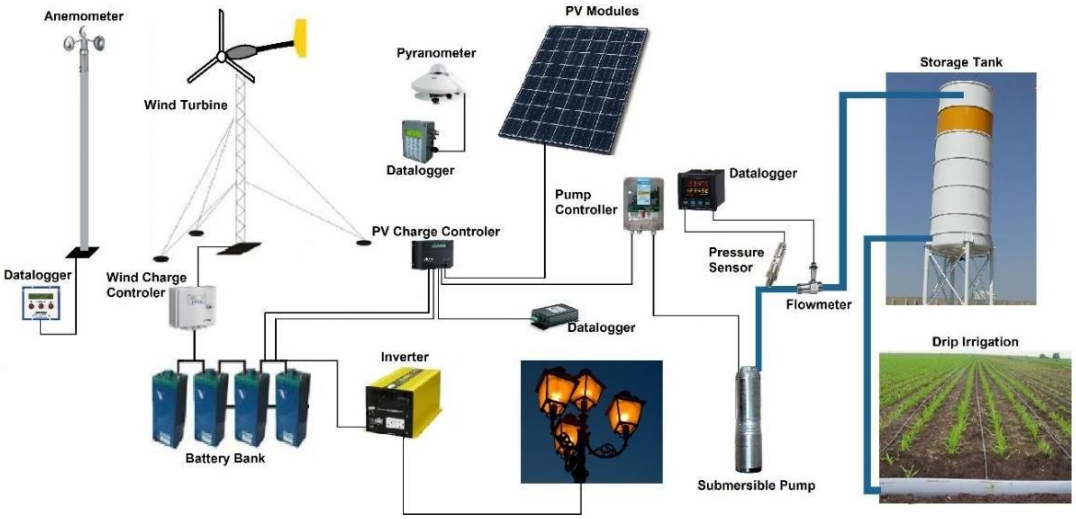


Fig: Implemented Model of Wind And Double Axis 360 Degree Solar Automatic Irrigation.

4.3.1. Simulation Model

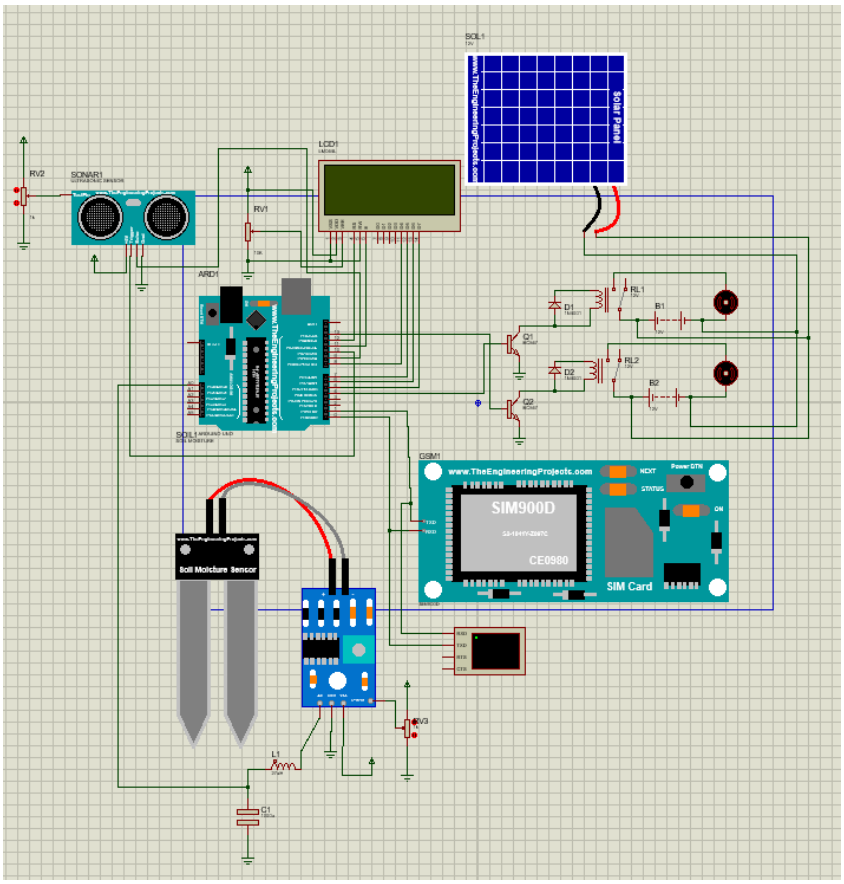


Fig: Simulation Model of the Wind And Double Axis 360 Degree Solar Automatic Irrigation.

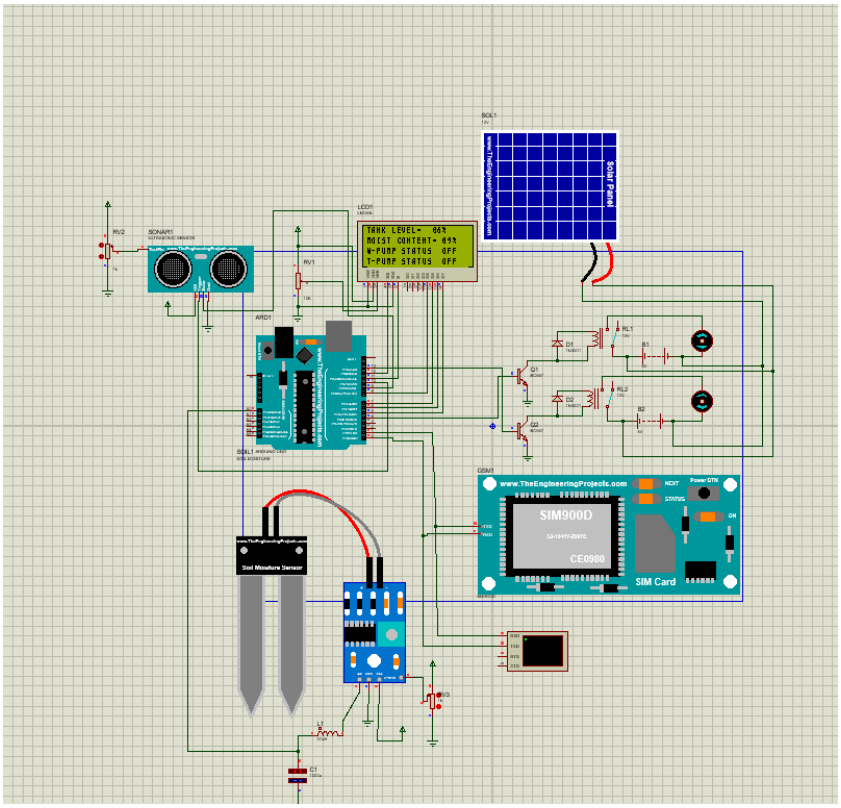


Fig: Simulation Working system(Off condition)

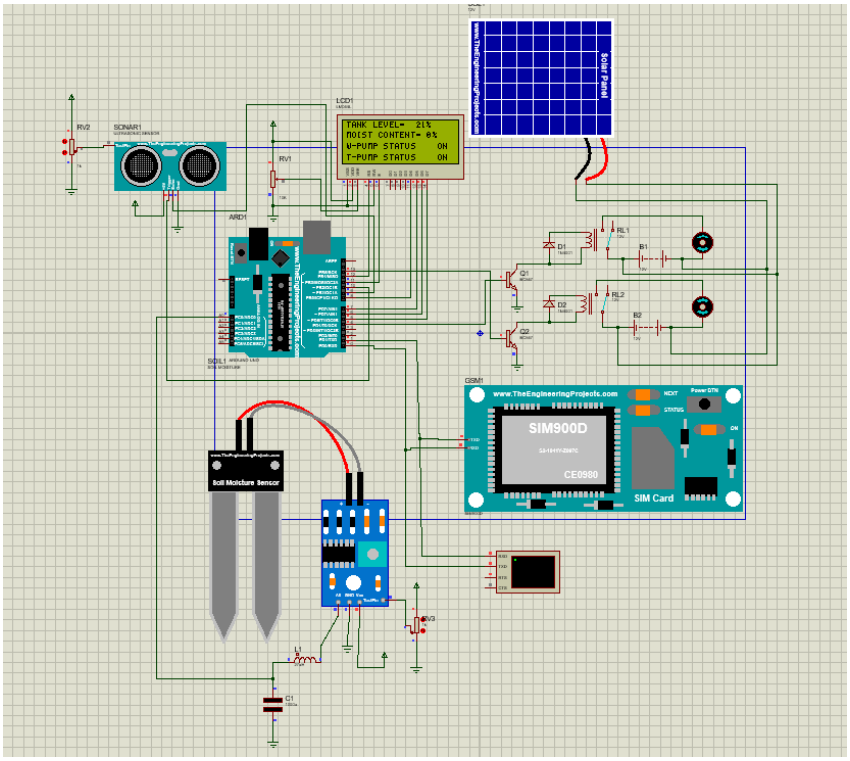


Fig: Simulation Working system(On condition)

4.3.2. Hardware Model

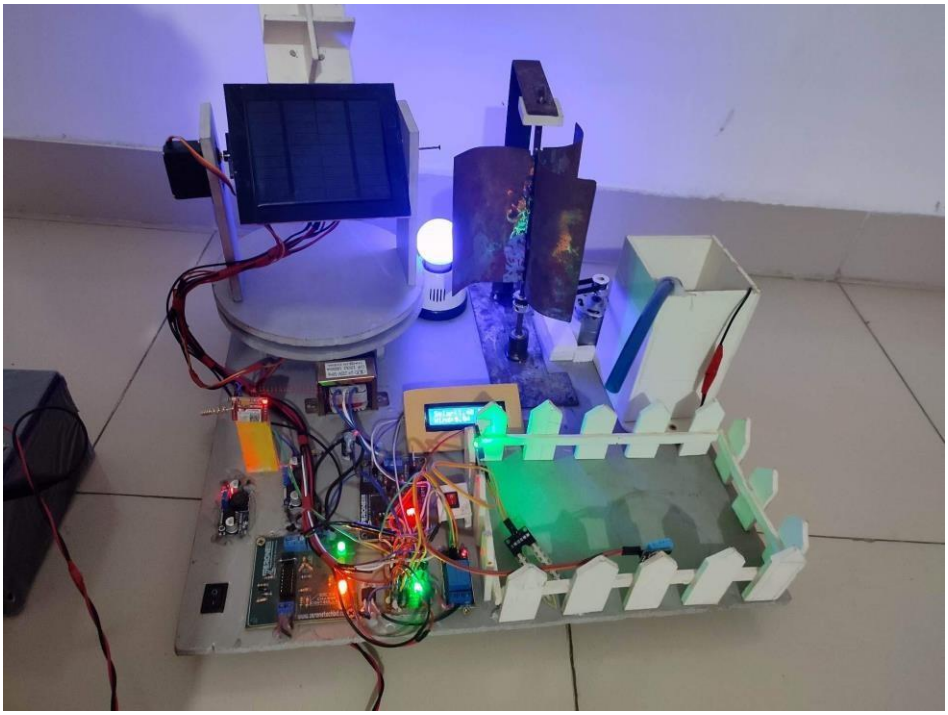


Fig: Hardware model of the Wind And Double Axis 360 Degree Solar Automatic Irrigation.

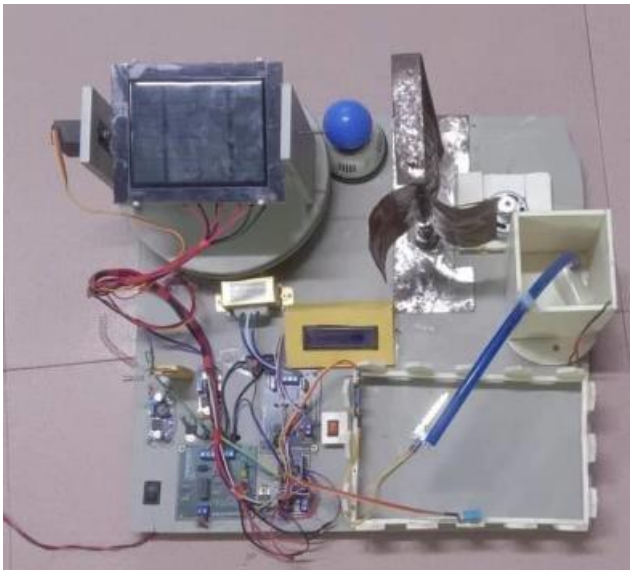


Fig: Top View of Our Project

Fig: Front View of Our Project

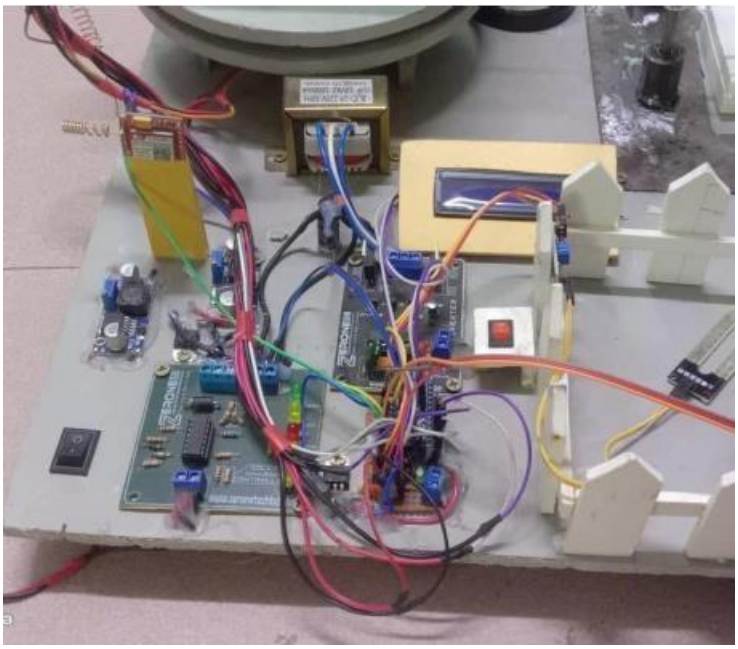


Fig: Circuit Part of Our Project

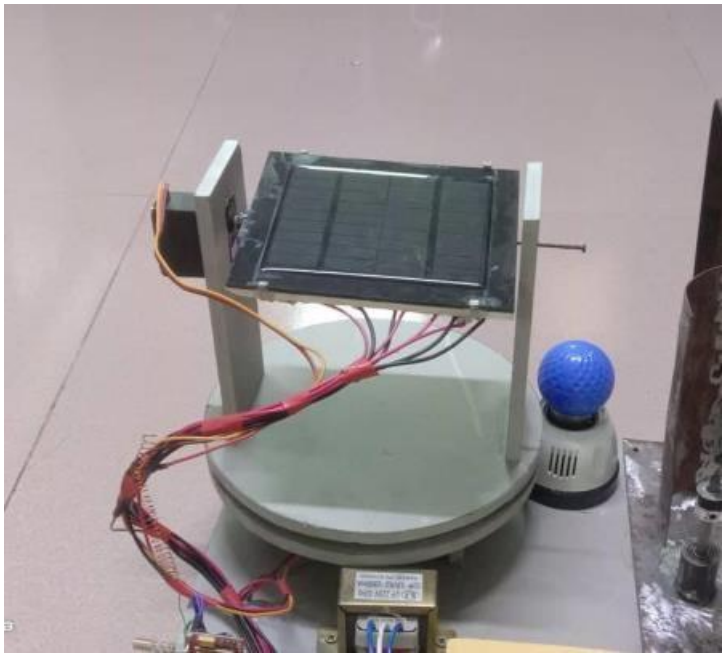


Fig: Solar Energy Panel of Our Project

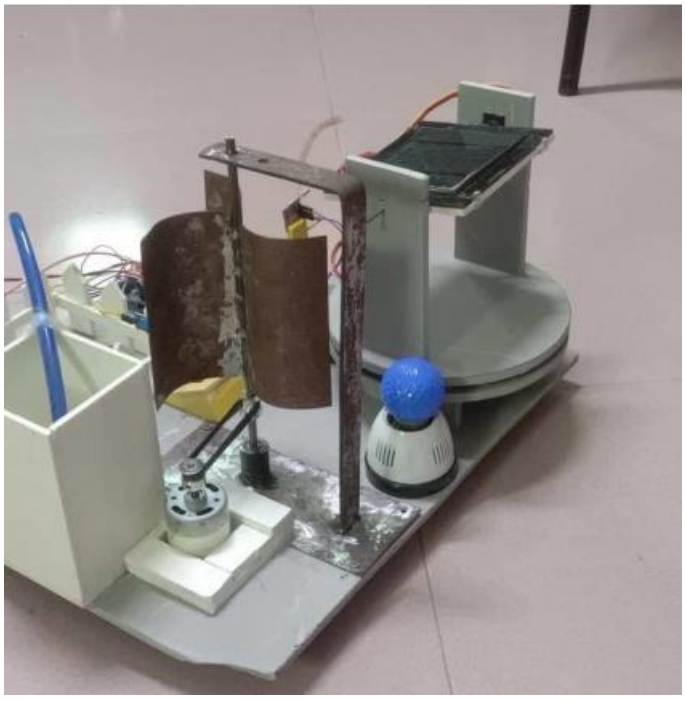


Fig: Wind Turbine Part of Our Project

4.4. Engineering Solution in accordance with professional practices

Government programs to achieve food independence have been extensively supported, and our nation, Nigeria, is one of them. Nigeria is a land of agriculture with wet and dry seasons. Food plants often do not require watering during the rainy season, but throughout the dry season, watering requirements

vary depending on soil moisture levels. Food plants are typically not grown by farmers during the dry season out of concern that the lack of rainfall will cause them to grow poorly. The Nigerian goal to achieve food self-sufficiency is hampered by the farmer's reliance on the rainy season, which lowers production. In order to solve this issue, an agricultural gadget based on information and communication technology is required. The goal of this study was to review existing literature on the design of a microcontroller chip that can be programmed to autonomously manage irrigation based on soil moisture levels sensed by a household soil moisture sensor. To determine whether the soil was dry or not, this instrument was utilized. The farmers were not always required to perform irrigation manually. The device could be deployed on plantations, seedbed nurseries, urban parks, hotels, workplaces, and houses in addition to assisting farmers.

4.5. Summary

Five main Component & some tools are used in this system to makes it. This Project is used to generate power from solar and wind both system and store the power in a battery. Our all component is very simple &available in our country market.

Chapter 5

RESULTS ANALYSIS & CRITICAL DESIGN REVIEW

5.1. Introduction

The system projected consists of three major procedure, solar panel and wind turbine with the micro controller. It uses AT Mega 328p that is an 8-bit micro controller. It finds wide application because of its features and low power. During In this chapter, we will talk about the tests our project. In thischapter we will discuss about our project result and outcome.

5.2. Results Analysis

Now, it's time to talk about the results. We have written our commands using the Arduino IDE and the following things can happen:

• This project is connected with the solar panel and a wind turbine system.

• When solar panel sense the sunlight then LDR will be active and follow the sunlight direction and movie this way.

• After wind turbine will move by the air flow and generated some power.

• Energy store in a battery.

• Soil moisture scene the soil condition and micro-controller on/off pump motor automatically.

• Land temperature will measure by a temperature sensor.

• Soil condition will send text to user phone through GSM module.

• All of this power

5.2.1. Simulated Results

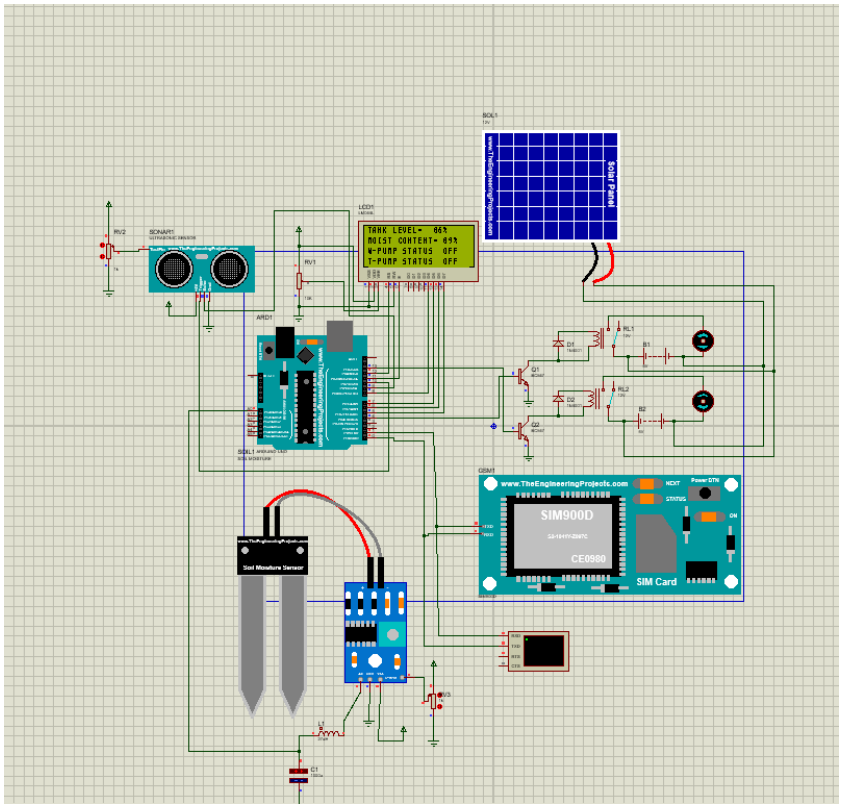


Fig: Simulation result for when the water pump is off

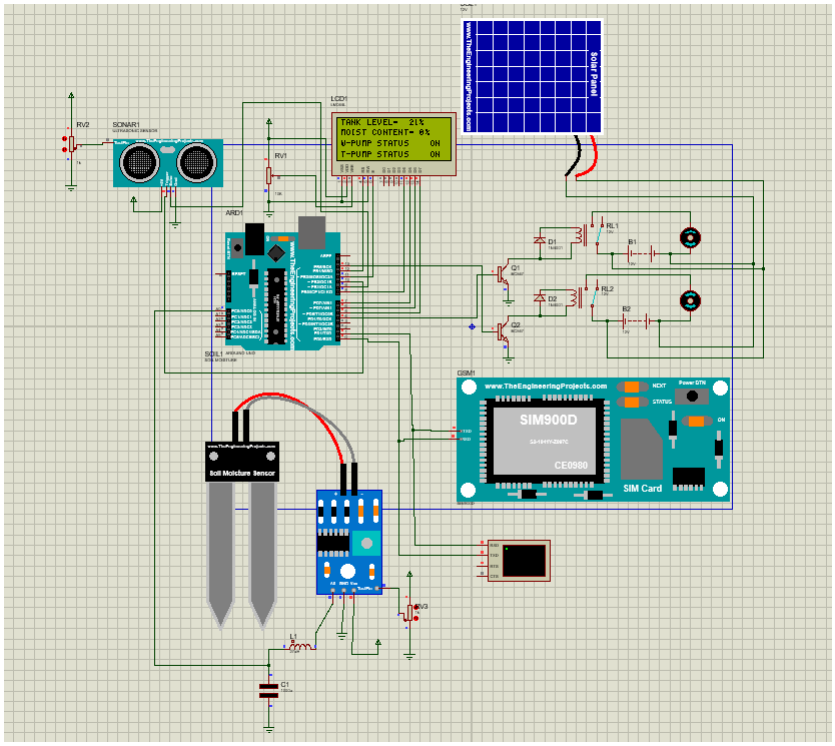


Fig: Simulation result for when the water pump is off

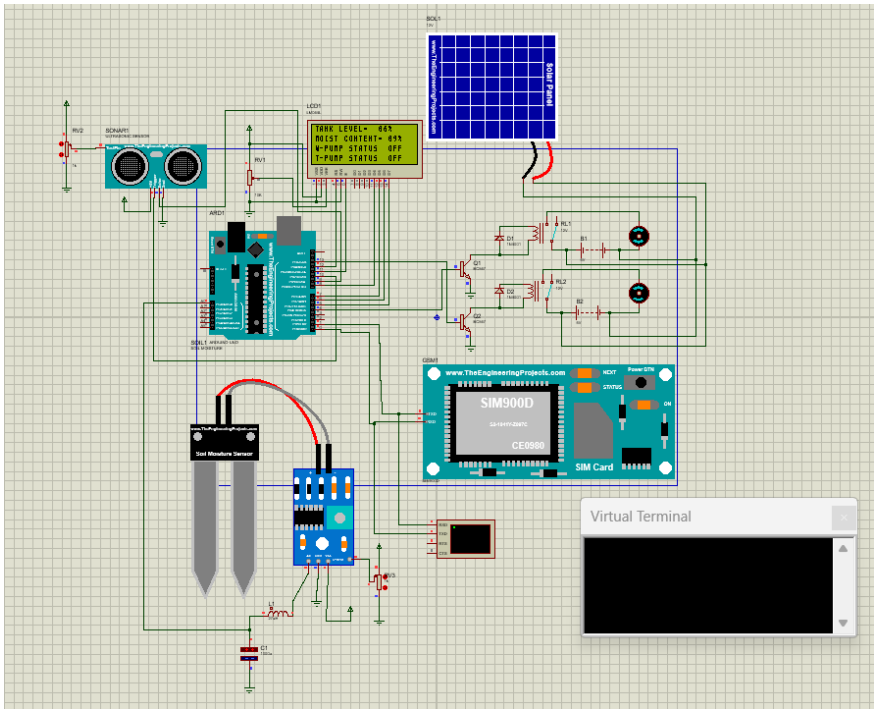


Fig: Final Simulation result of the Wind And Double Axis 360 Degree Solar Automatic Irrigation.

5.2.2. Hardware Results

Fig: Solar and wind turbine Power reading of the Hardware prototype model.

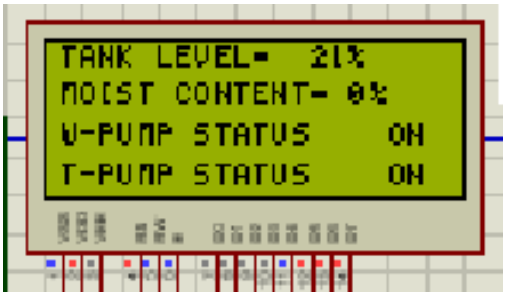
Fig: Solar and wind turbine changing Power reading of the Hardware prototype model.

Fig: Whole Hardware model of the Wind and Double Axis 360 Degree Solar Automatic Irrigation.

5.3. Comparison of Results

Agriculture is one of the world's oldest production methods. Crop production necessitates suitable conditions and adequate moisture. In this study, a smart irrigation control system is installed monitoring using a customized Internet of Things (IoT) platform the efficient and effective use of resources for water in agricultural areas. Sensors installed where the crop is grown in the agricultural field detect a variety of characteristics including Moisture in the soil, humidity, temperature, and rainfall. The information gathered is saved in the context of a cloud frameworkThe motor pump is replaceable. manually switched between ON and OFF states from a distance using the mobile application. Furthermore, assuming the system is set It estimates soil moisture when set to automatic. when the threshold is reached and the fields are irrigated it falls below it.

Comparison of the

Simulated result	Hardware result
 The estimated data from the simulation output	
The monitoring data we have use solar power 12V and Wind axis power 3.4V to turn on the process in simulation.	In the hardware monitoring data showing solar power 1.52 and wind 0.05 to execute the real data set exact value.
Agriculture is one of the world's oldest practices. Crop production requires appropriate conditions and adequate moisture. In this study, an To monitor the intelligent irrigation control system, an adapted Internet of Things (IoT) platform is used. the efficient and effective use of resources for water in agricultural fields. Sensors installed where the crop is grown in the agricultural field measure Moisture in the soil, humidity, temperature, and rainfall. The collected data is saved in the context of a cloud framework. The motor pump can be manually switched between ON and OFF states from a distance using the mobile application. Furthermore, if the system is set to automaticIt calculates the soil moisture. threshold and waters the crops when it is low. .	Solar panels are mounted on a wooden foundation that is moved by solar tracking systems throughout the day to follow the path of the sun. The plan is to continually monitor the four LDRs using location of the sun all through the day. With these LDRs start the motor, which will shift the mounting apparatus for orienting the solar panels so that they face the sun all day. Irrigation systems use a moisture sensor and a rain sensor to detect soil moisture content and rainfall autonomously.

5.4. Summary

A few tools and five main components are utilized to create this system. This project uses a solar and wind energy generation system to produce energy, which is then stored in a battery. Our entire product line is quite straightforward and easily accessible

Chapter 6

CONCLUSION

6.1. Summary of Findings

It was more difficult to connect a hybrid wind turbine/ PV system to the power grid than it was to combine a wind turbine use a solar PV array for a water pumping system outside the grid. The off-grid system presented extra challenges. to implement as a result of the voltage of wind turbine fluctuated significantly with wind speed and thus did not match the PV array's voltage, providing a constant voltage when run alone This mismatching was not an issue for wind/PV hybrid systems that operate on-grid because the wind turbine and PV panels were linked to the utility grid via inverters, which transformed the DC or three-phase, variable voltage AC power to the utility's constant-frequency, constant-voltage AC power. [39] On-grid systems, however, face additional challenges compared to off-grid systems,such as inverter Cost and loss of inverter efficiency, and the cost of utility grid extension. [40] If a wind turbine and solar panels array were combined for only water pumping in the Southern Great Plains, the water pumped in the summer would increase when demand was highest, while in the other seasons, more water would be pumped (e.g., fall, winter, and spring)unless the wind turbine was electrically braked (e.g., shorting phases of a wind turbine) (e.g., shorting phases of a wind turbine), nonetheless, this would require more upkeep. If the wind turbine was disconnected from the pump by means of an automated float switch The noise level increased when the controller's stock tank was full rose, and the increased Rotor blade speed put more strain on the wind turbine, decreasing the lifespan. Useing the surplus is another choice. wind turbine power for different reasons, such as lighting. [41] Two of the three hybrid off-grid wind turbine/ Less water was pumped by PV array installations. than if the wind turbine and PV arrays had been pumped separately. The conflict between the more powerful PV arrays (480 and 640 W) and wind turbine was brought about by a mismatch in voltage between the wind turbine and the PV array, according to our findings. Grundfos's control scheme makes use of an unregulated three-phase rectifier, which necessitates a voltage supply.

The wind turbine must have a voltage that is 0.7 V greater than the voltage of the solar array in order to supply the hybrid system with energy. [42]

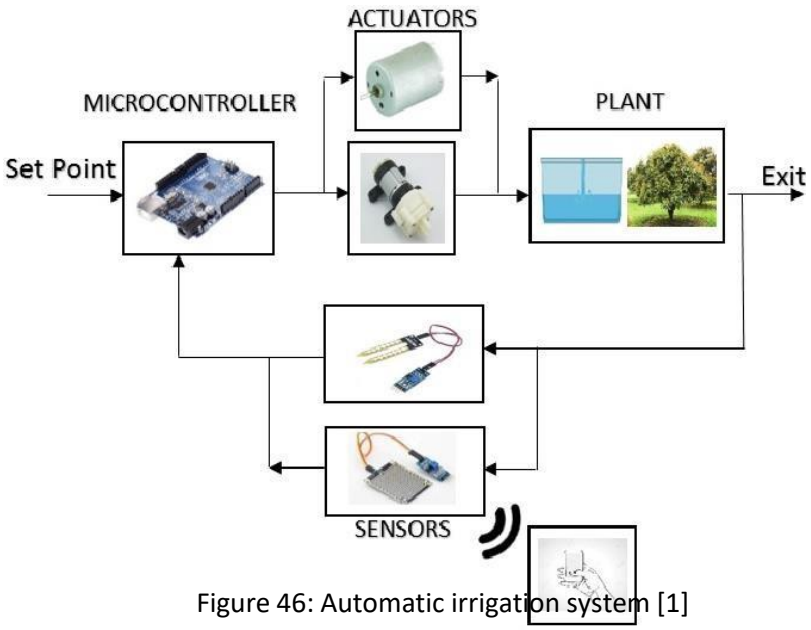


Figure 46: Automatic irrigation system [1]

6.2 Novelty of the work

When compared to diesel generators and water pumping systems linked to the grid, a well- built a water pumping system that uses renewable energy provides high efficiency and is cost-effective. Power electronic drives are commonly used in water pumping systems powered by renewable energy. As a resultenergy storage devices into the system, gaining MPPT for PV or wind, increasing motor dispatching capabilities with energy storage units, efficiency with variable speed operation,and so on, it ensures greater flexibility. [43] Because they can be carried in pieces and rebuilt at any other location, these parts of the system are also easier to transport than other standard power supplies.[44] In this project, theactual goal is a fully DC-based wind and dual axis 360-degree solar automatic irrigation system which is more important to the agriculture sector to improve the harvest system worldwide. It can also update the solar and wind information to get the actual data which data value is provided in another section. That has been also a unique system for moisture sensors to consume the power rate in wind turbine power modules during the night shift in any kind of situation by the monitoring system which can be the novelty of this project.

6.4 Cultural and Societal Factors and Impacts

These systems are intended to meet our energy requirements while also delivering exceptional dependability and the result of optimal clean water consumption. Water can now be obtained from a variety of sources, including agriculture, institutes of higher learning, industry, sanctuaries for wildlife, microirrigation, homes, garden fountains, and so on. [45] Despite the fact that PV and wind are excellent alternative energy sources, the primary challenges to overcome are PV's Unusual maximum power point tracking operation, nonlinear current-voltage (IV) characteristics, and poor energy conversion efficiency. To address the challenges and regulate the power provided by the wind turbine with solar array, the best control and energy management for water pumps powered by renewable energy systems are presented.[46] The cultural facts of the hybrid solar-wind power system have the most actual sector of the irrigation system that couldbe bounce the automatic base agriculture sector. Using the sensors of the temperature and moisture of the soil has benefited irrigation and can easier for the farmers to power according to the irrigation sector. The market policy of the agriculture irrigation system has financially effective progress in the upcoming future to reduce irrigation automatic system provocation. The functional system has been monitoring the temperature and solar-wind perfection can modify the circuit system to produce more power consumption. Several authors have already investigated the selection and control of of the solar-wind hybrid power system motors. An efficient motor can reduce the number of PV modules needed to meet the stated power requirement, as well as the capital cost. [47] The controller has a significant influence on system performance. The optimization of input voltage combination and current guarantee that the system runs at its peak efficiency by adjusting the output current of solar panels by modifying the load impedance. The PV module's maximum power point must be used. Maximum tracking of power points assists in system operation at PV cell most power points. It is critical to match load so that the PV module generates the most power. In addition, if an The system must be linked or an AC motor must be utilized to the grid, an inverter must be used. The use of a direct-coupled system reduces maintenance and load.

6.5 Limitations of the Work

Although our project has many applications and advantages but there are some limitations of the project as well and the good thing is that these limitations are minor and doesn't affect the efficiency of the system. Limitations are given below:

- The system needs to be more efficient to produce more energy.
- Due to using renewable energy sources, electrical energy production is less and most of the energy is not converted rather wasted.
- On rainy days and foggy weather, some problems may occur which can hamper energy production.

The system was designed with certain controllers necessary for wind energy in mind, however owing to their unavailability in our nation, these specific controllers were not incorporated in our hardware section. Furthermore, for a shorter and more cost-effective solution, a low-quality converter was employed, but a higher-quality converter would be required since excessive current going through would harm the component. Similar to this technique, if you desire to obtain a prototype, the components offered are insufficient to withstand a larger-scale measurement; industrial-level tools are required. Because the suggested method is primarily dependent on direct current, the battery empties fast and battery cells mutilate owing to excessive pressure. This solar and wind-based wind and double-axis 360-degree solar automatic irrigation system were brought to the table to improve the charging measures to adapt renewable energy and reduce dependency on the grid. However, there are some bottlenecksin implementing an only-renewable-based automatic irrigation system. Even with a mix of wind and solar energy, the planned station's service can last up to 15 hours. In this aspect, grid-based stations outperform the proposed approach in terms of lifespan and current output. [48]

6.5 Future Scopes

We are thinking about adding many features to our project in the future to get more desirable outcomes. Some of the steps that we are thinking about taking are given below:

- In future, we are looking forward to improving our whole system design to make it more efficient.
- In future, we are thinking about adding more features to the system such as cc cameras.
- In future, we are thinking about making the system IoT enabled so that wirelessly the whole system can be observed.

6.6. Social, Economic, Cultural and Environmental Aspects

6.6.1 Sustainability

Because there is no grid connection, our project is very affordable. Despite the fact that electricity and water are the primary drivers of agricultural productivity, the world is experiencing an water and energy crises. It is critical to increase food output per unit area to meet the world's growing population. As a result, sustainable methods are critical for ensuring food and energy security. One of the techniques for environmental sustainability is a water pumping system powered by solar energy. [49] The photovoltaic solar and wind water pumping system is expensive. It is usually made up of one polycrystalline silicon photovoltaic cell that converts solar energy from the sun into electrical energy. PV cells cost a lot yet their effectiveness in converting is only 18%. As a result, a large number of solar modules are required to satisfy the energy requirements of massive systems such as PV pumps, increasing the overall system's initial cost. The system's component selection and installation angle are critical to maximizing solar panel exposure to the sun's rays based on varying climatic conditions and the necessary head and discharge for certain locations and purposes. The addition of a tracking system can increase power production even more.[50] The PV system's dimensions had been calculated such that it could function during the month with the highest energy consumption, despite the low solar energy availability. Standard Test Conditions (STC) govern the choice of an appropriate PV system, which are based on an irradiance value of 1000 W/m2, also known as peak solar irradiance (PSH). [51] The complexity of the point in our approach to power automatic system more flexible and user demand of the entire global.

6.6.2. Economic and Cultural Factors

For small systems, many transferring water customers have converted to photovoltaic pumps to use solar energy. however, diesel generations remain prominent for pumping water around the worldIn comparison mechanical systems and solar windmills, small Since there are still few wind farms use for distant water pumping systems locations. The use of hybrid solar/wind power plants (PV/Wind turbine) enhances water pump daily pump dependability and enhances volume. [51] Several studies on customized water pumping systems for wind turbines and solar panels concentrated on dynamic performance, particularly the match between production and water supply. One of the most significant limitations of renewable energy applications is that there is no single source of solar or wind energy canprovide both dependability and cost-effectiveness owing to their intermittent nature. Furthermore, output volatility and time dependence are obstacles to renewable energy consumption. Demand management that is adaptable. The best solution to Using hybrid PV/WT systems is a difficulty.which maximize the development of wind and solar energy's contribution to meet continuous base requirements. A hybrid solar/wind system allows you to use solar energy when there isn't much wind and wind energy when there isn't much sun. [52] The hybrid system was discovered to deliver 28% greater power than either PV or wind aloneAn As a controller, an additional buck/boost converter was employed to optimize the hybrid water pumping system using PV/WT. [53] the methods for pumping water, as well as five distinct system configurations that use different energy sources include thermal, biomass, solar, wind, and hybrid PV/WT. They discovered use of renewable energy (solar, wind, or hybrid) reduces reliance on conventional energy while also having a positive environmental impact. [54]

6. Conclusion

This hybrid power generation system works on the principle of auto power generating from different sources. Here we use a turbine and solar panel for power generating elements and restore it in a battery. Another major component is solar irradiation. During low insolation intervals, the volume of water pumped is essentially minimal, yet vast quantities are accessible during high insolation intervals. It is critical to accurately estimate the strength of solar irradiation. Although it results in inaccurate prediction for a few hours of the day, LJ correlation is the most appropriate correlation for this purpose. The ambient temperature also has an effect on system performance. When the temperature reaches a certain threshold decreasing the output power proportionally. Furthermore, the temperature of the modules affects the performance and efficiency of a PV system. The efficiency of solar modules diminishes as module temperature rises. It also has an impact on the rate of thermal deterioration of PV cells. In this project Solar takes sunlight and produces some energy and stores it battery with the help of a charge controller system. Beside this process here also store some power from wind turbine. Here inverter circuit is converted dc to ac current and supply power in load. This solar cell is controlled by the Arduino controller. LDR is connected with the controller and detects the sunlight and servo motor rotate solar panel angle with sunlight direction. All of this charge percentage, current and voltage percentage will be so in LCD displays. The developed prototype exhibits the expected results. Further modifications and work constraints will elevate this work to the top tier of usefulness. This concept saves time and energy, resulting in more efficient work. Construction or infrastructure work necessitates an efficient and user-friendly system that generates energy from the sun and wind.

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Appendix

Micro-controller Programming Code:

```
#include <Servo.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,16,2);
#include <Servo.h>
#include <SoftwareSerial.h>
SoftwareSerial SIM900(6,5);

String textMessage;
char phone_no[] = "01705565536"; //01716115317
char msg;
 String message;
char str [15];
float input_voltage = 0.0;
float temp=0.0;

float input_voltage1 = 0.0;
float temp1=0.0;

Servo Servo1;
//defining Servos
Servo servohori;
int servoh = 0;
int servohLimitHigh = 160;
```

```
int servohLimitLow = 20;


int inpu = 2;

int output =4;

Servo servoverti;

int servov = 0;

int servovLimitHigh = 110;

int servovLimitLow = 20;

//Assigning LDRs


#include "DHT.h"

#define DHTPIN1 7

#define DHTTYPE DHT11  // DHT 11

DHT dht1(DHTPIN1, DHTTYPE);


// LDR pin connections

int ldrtopr = A3; // LDR top right

int ldrtopl = A2; // LDR top left

int ldrbotr = A1; // LDR bottom right

int ldrbotl = A0; // LDR bottom left


/*// LDR pin connections

int ldrTR = A0; // LDR top right

int ldrTL = A1; // LDR top left

int ldrBR = A2; // LDR bottom right

int ldrBL = A3; // LDR bottom left

*/
```

```
void setup ()
{
  Serial.begin(9600);
dht1.begin();
lcd.init();
lcd.backlight();
servohori.attach(10);
servohori.write(0);
servoverti.attach(9);
servoverti.write(0);
pinMode(2,INPUT);
pinMode(4,OUTPUT);
lcd.begin(16,2);
 lcd.clear();
servoverti.attach(9);
servoverti.write(0);
servohori.attach(10);
servohori.write(180);
lcd.init();
lcd.backlight();
lcd.clear();

 SIM900.begin(9600);
 delay(200);
 SIM900.print("AT+CMGF=1\r");
 delay(100);
 SIM900.print("AT+CNMI=2,2,0,0,0\r");
```

```
 delay(100);
SIM900.println("AT+CNMI=2,2,0,0,0");// AT Command to receive a live SMS
Serial.println("AT+CNMI=2,2,0,0,0");
   Serial.print("SIM900 ready...");
lcd.setCursor(0,0);
lcd.print("SIM900 ready...");
delay(500);
 }

void loop()
{
 int analog_value = analogRead(A6);
   int analog_value1 = analogRead(A7);
float t1 = dht1.readTemperature();
Serial.println(t1);
lcd.setCursor(10,0);
lcd.print(" Temp");
lcd.setCursor(11,1);
lcd.print(t1);

input_voltage = (analog_value * 5.0) / 1024.0;
input_voltage1 = (analog_value1 * 5.0) / 1024.0;
float batteryvoltage = input_voltage1*8;
lcd.setCursor(0, 0);
lcd.print("Solar: ");
lcd.setCursor(6, 0);
lcd.print(input_voltage      );
```

```
 lcd.setCursor(0, 1);
lcd.print("Wind: ");
lcd.setCursor(5, 1);
lcd.print(input_voltage1);

int moisture = digitalRead(2);
if(moisture == HIGH){
digitalWrite(4,HIGH);
lcd.setCursor(10,0);
lcd.print(" Temp");
lcd.setCursor(11,1);
lcd.print(t1);
  smson();
delay(2000);
}

if(moisture == LOW){
 digitalWrite(4,LOW);

}
 servoh = servohori.read();
 servov = servoverti.read();
 //capturing analog values of each LDR
 int topl = analogRead(ldrtopl);
 int topr = analogRead(ldrtopr);
 int botl = analogRead(ldrbotl);
 int botr = analogRead(ldrbotr);
```

```
// calculating average
int avgtop = (topl + topr) / 2; //average of top LDRs
int avgbot = (botl + botr) / 2; //average of bottom LDRs
int avgleft = (topl + botl) / 2; //average of left LDRs
int avgright = (topr + botr) / 2; //average of right LDRs

if (avgtop < avgbot)
{
  servoverti.write(servov +1);
  if (servov > servovLimitHigh)
   {
    servov = servovLimitHigh;
   }
  delay(10);
}
else if (avgbot < avgtop)
{
  servoverti.write(servov -1);
  if (servov < servovLimitLow)
{
  servov = servovLimitLow;
}
  delay(10);
}
else
```

```
{
  servoverti.write(servov);
}

if (avgleft > avgright)
{
  servohori.write(servoh +1);
  if (servoh > servohLimitHigh)
  {
  servoh = servohLimitHigh;
  }
  delay(10);
}
else if (avgright > avgleft)
{
  servohori.write(servoh -1);
  if (servoh < servohLimitLow)
   {
   servoh = servohLimitLow;
   }
  delay(10);
}
else
{
  servohori.write(servoh);
}
delay(100);
```

```
}



void smson(){
  SIM900.print("AT+CMGF=1\r");
   delay(20);
   SIM900.print("AT+CMGS=\"");
   SIM900.print(phone_no);
   SIM900.println("\"");
   delay(20);
   SIM900.print("Field is dry");
   delay(20);
   SIM900.println((char)26);
   delay(20);
   SIM900.println();
      delay(200);

}
```