Experimental Analysis of Automatic Irrigation System with Solar Energy

A thesis report submitted to the department of Mechanical Engineering, Sonargaon University (SU) for the partial fulfillment of the requirements for the award of the degree of
Bachelor of Science in Mechanical Engineering

Submitted by

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LETTER OF TRANSMITTAL

September- 2023

To
MD AHATASHAMUL HAQUE KHAN SHUVO
Assistant Professor
Department of Mechanical Engineering,
Sonargaon University.

Subject: Submission of Project Report.

Dear Sir,
We are pleased to submit the project report on ‘‘**Experimental Analysis of Automatic Irrigation System with Solar Energy’’.** It was a great experience to work on such an important topic. This project has been completed as per instruction of your supervision and according to the requirements of Sonargaon University.

We expect that the project will be accepted by the concerned authority. We will remain happy to further explanation that you may feel necessary in this regard.

Thank You
Sincerely yours,

Md. Rabbi Hossen
BME1802015058

DECLARATION

We do hereby solemnly declare that, the work presented then in this design report has been carried out by us and has not been preliminarily submitted to any university/ association for award of any degree or instrument.

We hereby ensure that the workshop that has been averted then doesn't transgress any being brand.

We further undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligation.

……..
Md. Rabbi Hossen
BME1802015058

Acknowledgement

First, we start in the name of almighty Allah. Then thanks to our parents for always taking care of us and supporting us.

This thesis is accomplished under the supervision of Assistant Professor Md. Ahatashamul Haque Khan Shuvo, department of Mechanical Engineering, Sonargaon University. It is a great pleasure to acknowledgement our profound gratitude and respect to our supervisor for this consistent guidance, encouragement, helpful suggestion, constructive criticism endless patience through the progress of this work. The successful completion of this thesis would not have been possible without his persistent motivation continuous guidance.

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Also, we are grateful to our honorable vice- chancellor professor Shamim Ara Hasan for her continuous guidance support.

Author

Abstract

Solar modules are devices that clearly convert sunlight into electricity and offer a practical solution to the problem of power generation in remote areas. This project involves the development of an automatic solar radiation tracker that could be further used for agriculture purpose, making use of GSM module as the control system. Fossil fuels are relatively short- term energy source consequently; the uses of alternative sources such as solar energy are becoming more wide spread. To make solar energy more variable, the efficiency of solar array systems must be maximized. This is a hybrid hardware/ software prototype, which automatically provides best alignment of solar panel with the sun and to get maximum output of electricity. The system will be implemented for irrigation purpose where in the irrigation system will be controlled using GSM technology. That's how we can control our irrigation through our mobile.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Distributing the water to the needed region is may be defined as irrigation system. The type of system is used will have an influence on the effectiveness of the irrigation. Since ancient times, the life on earth is depends on the husbandry. The type of irrigation system used will be the tool that makes better husbandry. In the world, numerous types of irrigation systems are in practice, in one or the other way each irrigation systems have encountering numerous problems. Actually, there are many ultramodern irrigation system which are in practice will substantially fail in one or the other way. The robotization in the area of irrigation will play a vital job; accordingly, masterminds battle to turn out with consolidated automated bias with the end thing to make complex systems that backing humans in its exercises so the system should process itself automatically with no mortal agreement.

For the irrigation system atomization is veritably important essential because of the deficit of water in soil and lack of rain. Automatic irrigation system with solar shadowing is the indispensable result for this type of situation. Agrarian system in world is always in need and depends on the presence of water in the soil. The nonstop pulling eschewal of soil water will reduce the humidity position of the soil. To overcome this issue intended irrigation system has to be followed. The better application of the available water will reduce the quantum of destruction of water significantly.

For this reason, automatic irrigation system is to be designed which will use the solar energy. The automatic irrigation with solar shadowing system receives sun light through print- voltaic cells. Thusly this system isn't dependent on electric power. This automatic irrigation with solar shadowing system uses solar energy to power the irrigation pump and the circuit comprises of detectors which will smell the soil for its dry or wet condition.

Programmable sense micro-controller is employed to control the automatic irrigation system. The detector available in the system will descry the position of humidity in soil and give the signal to the micro-controller unit connected to the pump. The signal from the detector entered from the comparator and it's reused by the micro-controller by the use of program stored. The pump remains off in wet condition of the soil and on in the dry condition.

A power creator grounded on seeing mechanical climate can be bedded in shells subordinated to constant stress and climate, and enclosed to cover it from hard terrain. It functions in a constant temperature field and does not depend on the rainfall. The most popular transducer for vibration energy is piezoelectric. The terrain that's presumably most subordinated to climate and stress is road face. The idea of this study is to probe and design a prototype and its pressman energy harvesting device circuit that could be bedded in irrigation system. The huge quantum of electrical power consumed in running pump motor, has to be reduced because the deficit of force power in those areas.

1.2 Objectives

- To design a solar based automatic irrigation system.
- To construct the solar based automatic irrigation system.
- To test the performance of solar based automatic irrigation system.

CHAPTER 2

LITERATURE REVIEW & HARDWARE DEVELOPMENT

2.1 Literature Review

N. Othman, (2013) et al. [1] aim of performance Analysis, Dual axis solar tracker system, It is better than the static solar panel in terms of power output.

Thirumuttam. J, Keong. A, (2017) [2] aim of design and development, Dual axis solar tracker system, Hybrid solar trackers are most efficient.

S. Kivrak, (2012) et al. [3] It is designed to track the sun with respect to the altitude, Dual axis solar tracker with photovoltaic cells panel trackers are most efficient, Performance difference between fixed and moving panels is about 64% in month of May.

S. Ozcelik [4] To track the sunlight and absorb energy to produce electricity Two axis solar tracker for maximum power generation, the system achieves 90% efficiency.

O.C. Vilela, N.Fraidenraich & C.Tiba (2003) [5] How the tracker plane and fixed plane affect water pumped by PV systems, photovoltaic Pumping System driven by tracking collectors, Irradiation collected by the tracker plane is 24% higher than the fixed plane.

A.K. Saxena & V. Dutta [6] To design a microprocessor based solar tracking controller, a solar tracker using a microprocessor, The controller is fully automatic and versatile for tracking and system control / monitoring application.

A. Yazidi, F. Betin July, 2006 [7] To design if a low-cost solar tracker with high precision positioning
A solar tracker using a microprocessor, Low-cost two axis solar tracker, Upto 40% extra power can be produced per annum using variable elevation solar tracker.

M.K Ramakrishna, Priya Prakash Parab (2016) [8] To design an economical Wireless sensor network- based solution for precision agriculture, a wireless Sensor Network Based Solution for Precision agriculture, The prototype is designed with GSM module and 8051 micro-controller which is energy efficient, cost efficient and accurate.

Hema N, Krishna Kant (2016) [9] This paper aims to develop a system which gives more precise and accurate results, Using Spatial Arrangement of Permanent Crop for Precision Irrigation, this paper solves the issue of WSN that is optimum sensor deployment using spatial arrangement of crops during
transplantation.

Sudheer Kumar Nagothu (2016) [10] This paper aims at making a smart sprinkler system, weather based smart watering system, this helps in reducing the use of water by the help of moisture sensors and integrating current weather report.

2.2 Components Name and Quantity

1. Arduino Nano - 1Pcs
2. Moister sensor - 2 Pcs
3. 16X2 LCD - 1 Pcs
4. Buzzer - 1 Pcs
5. 5w/12Volt Dc water Pump - 1 Pcs
6. 12v/4Ah Battery - 1 Pcs
7. 20w Solar panel - 2 Pcs
8. 2 channel 12V Relay Module - 1 Pcs
9. Power source (9v,2A and 5v,1A) 12 - 2 Pcs
10. Connecting Wire - As Require
11. Ebonite sheet (3.5*6.5) - 1Pcs
12. Water bottle - 2 Pcs
13. NO/OFF switch -3 pcs
14. Plastic pipe

2.3 Arduino Nano

The Arduino Nano is a microcontroller board grounded on the ATmega328. It has 14 digital input/ affair legs (of which 6 can be used as PWM labors), 6 analog inputs, a 16 MHz demitasse oscillator, a USB connection, a power jack, an ICSP title, and a reset button. It contains everything demanded to support the microcontroller; simply connect it to a computer with a USB string or power it with an AC- to- DC appendage or battery to get started. The Uno differs from all antedating boards in that it doesn't use the FTDI USB- to- periodical motorist chip. rather, it features the Atmega16U2 (Atmega8U2 up to interpretation R2) programmed as a USB- to- periodical motor. There are numerous other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Net media's BX- 24, Phi gets, MIT's Handy board, and numerous others offer analogous functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy- to- use package.

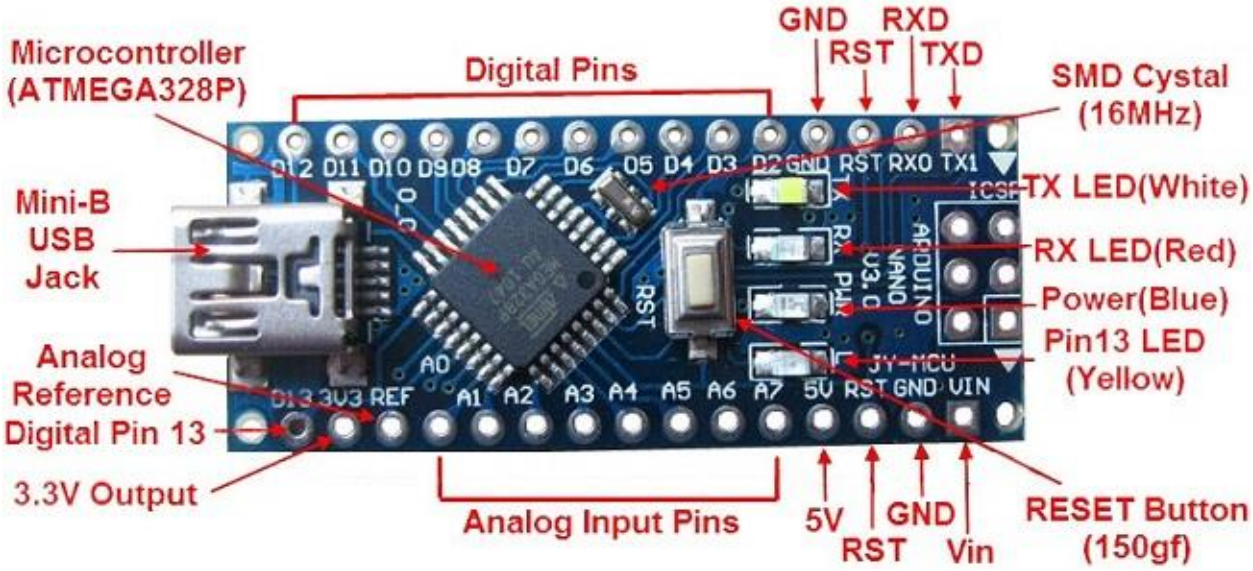

Figure 2.1: Top view of Arduino Nano

2.3.1 Technical Specification of Arduino

Table No 2.1: Technical Specification

Microcontroller	ATmega328
Architecture	AVR
Operating Voltage	5 V
Flash Memory	32 KB of which 2 KB used by boot loader
SRAM	2 KB
Clock Speed	16 MHz
Analog I/O Pins	8
EEPROM	1 KB
EEPROM	1 KB
DC Current per I/O Pins	40 mA (I/O Pins)
Input Voltage	7-12 V
Digital I/O Pins	22
PWM Output	6
Power Consumption	19 mA
PCB Size	18 x 45 mm
Weight	7 g

2.3.2 Pin Description of Arduino Nano

Each of the 14 digital legs on the Nano can be used as an input or affair, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each leg can give or admit an outside of 40 mama and has an internal pull- up resistor (dissociated by dereliction) of 20- 50kOhms. In addition, some legs have specialized functions

• periodical 0(RX) and 1(TX). Used to admi t(RX) and transmit (TX) TTL periodical data. These legs are connected to the corresponding legs of the FTDI USB- to- TTL periodical chip.
• External Interrupts 2 and 3. These legs can be configured to detector an intrude on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details.
• PWM 3, 5, 6, 9, 10, and 11. give 8- bit PWM affair with the analog Write () function.
• SPI 10(SS), 11(MOSI), 12(MISO), 13(SCK). These legs support SPI communication, which, although handed by the underpinning tackle, isn't presently included in the Arduino language.
• LED 13. There's a erected- in LED connected to digital leg 13. When the leg is HIGH value, the LED is on, when the leg is LOW, it's out.
The Nano has 8 analog inputs, each of which give 10 bits of resolution (i.e. 1024 different values). By dereliction they measure from ground to 5 volts, however is it possible to change the upper end of their range using the analog Reference () function. Analog legs 6 and 7 cannot be used as digital legs. also, some legs have specialized functionality
• I2C 4(SDA) and 5 (SCL). Support I2C (TWI) communication using the Wire library (attestation on the Wiring website).

There are a couple of other legs on the board,

• AREF. Reference voltage for the analog inputs. Used with analog Reference ().
• Reset. Bring this line LOW to reset the microcontroller. generally used to add a reset button to securities which block the bone on the board.

2.4 Soil Moisturizer sensor

Soil humidity detectors measure the volumetric water content insoil.Since the direct gravimetric dimension of free soil humidity requires removing, drying, and weighting of a sample, soil humidity detectors measure the volumetric water content laterally by using some other property of the soil, similar as electrical resistance, dielectric constant, or commerce with neutrons, as a deputy for the humidity content. The relation between the measured property and soil humidity must be calibrated and may vary depending on environmental factors similar as soil type, temperature, or electric conductivity.
Reflected microwave oven radiation is affected by the soil humidity and is used for remote seeing in hydrology and husbandry. movable inquiry instruments can be used by growers or gardeners.

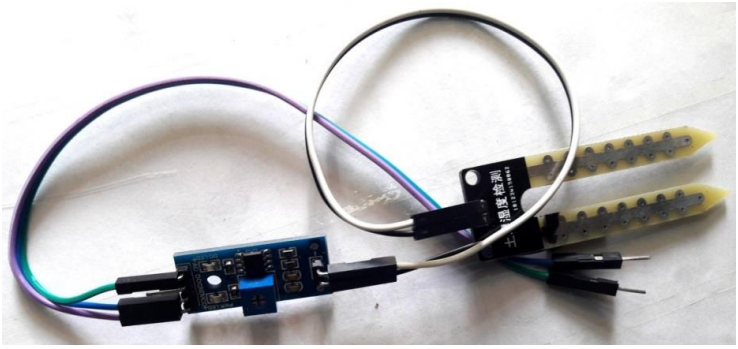

Fig 2.2: Soil moisture Sensor Front View

2.4.1 Hardware Features of Soil moisture sensor

Table 4.3: Hardware Features

Sensitivity	adjustable sensitivity
Module mode	Dual Output mode, a simple digital output, analog output more accurate.
Operating voltage	5v
With edge connector	
A0 small board analog output interface	

2.4.2 Technology

Technologies generally used to laterally measure volumetric water content (soil humidity) include)

• frequency sphere Reflectometry (FDR) The dielectric constant of a certain volume element around the detector is attained by measuring the operating frequency of an oscillating circuit.
• Time sphere Transmission (TDT) and Time Domain Reflectometry (TDR) The dielectric constant of a certain volume element around the detector is attained by measuring the speed of propagation along a buried transmission line.
• Neutron humidity gauges the prolocutor parcels of water for neutrons are employed to estimate soil humidity content between a source and sensor inquiry.
• Soil resistivity Measuring how explosively the soil resists the inflow of electricity between two electrodes can be used to determine the soil humidity content.
• Galvanic cell the quantum of water present can be determined grounded on the voltage the soil produces because water acts as an electrolyte and produces electricity. The technology behind this conception is the galvanic cell.

2.5 Relay Module

This is a LOW Level 5V 2-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.

- COM- Common pin.
- NC- Normally Closed, in which case NC is connected with COM when INT1 is set low and disconnected when INT1 is high.
- NO- Normally Open, in which case NO is disconnected with COM1 when INT1 is set low and connected when INT1 is high.

Terminal 2 is similar to terminal 1, except that the control port is INT2

- INT 1- Relay 1 control port
- INT 2- Relay 2 control port

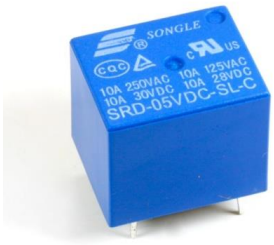

Fig 2.3: Relay Module Top View

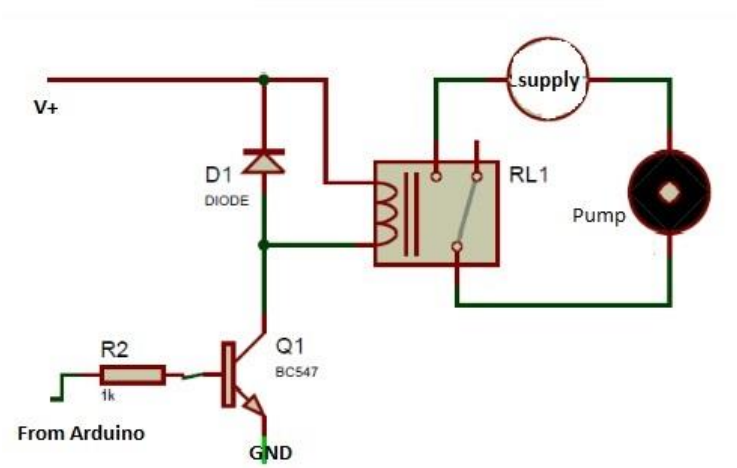

Fig 2.4: Relay Module circuit Diagram

2.6 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segment and other multi segment LCDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on, A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD, each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

Fig 2.5: 16*2 LCD display

Pin description as follows

Pin 7 to pin 14 all 8 pins are responsible for the transfer of data.
Pin 4-This is Rs i.e., register select pin.
Pin 5-This is R/W i.e., Read/Write pin.
Pin 6-This is E i.e., enable pin.
Pin 2-This is VDD i.e., power supply pin
Pin1-This is VSS i.e., ground pin.
Pin3-This is short pin.

2.7 Vero Board

Vero board is a brand of strip board, a pre-formed circuit board material of bobby strips on a separating clicked paper board as with other strip boards, in using Vero board, factors are suitably deposited and soldered to the operators to form the required circuit. Breaks can be made in the tracks, generally around holes, to divide the strips into multiple electrical bumps enabling increased circuit complexity.
This type of wiring board may be employed for original electronic circuit development, to construct prototypes for bench testing or in the product of complete electronic units in small volume.

Fig 2.6: Vero Board (Dot)

2.8 Buzzer

Piezo buzzer is an electronic device generally used to produce sound. Light weight, simple construction
and low price make it usable in colorful operations like auto/ truck reversing index, computers, call bells etc. Piezo buzzer is grounded on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It's the marvels of generating electricity when mechanical pressure is applied to certain accoutrements and the vice versa is also true. similar accoutrements are called piezo electric
accoutrements. Piezo electric accoutrements are either naturally available or manmade. Piezo ceramic is class of manmade material, which poses piezo electric effect and is extensively used to make slice, the heart of piezo buzzer. When subordinated to an interspersing electric field they stretch or compress, in agreement with the frequency of the signal thereby producing sound.

Figure 2.7: piezo buzzer

2.9 WATER PUMP

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. There are many varieties of water pumps used. This project employs the use of a small DC 6v water pump which is connected to a relay module.

Figure 2.8: water pump

A precise decision or action on water force for a particular area for crop product is veritably critical in perfection husbandry practices. This paper discusses the development of water pumping control system using a palpitation range Modulation (PWM) control fashion to support water force of crops grounded on perfection husbandry approach. The input parameters to the control system are soil humidity content, crop planting period, soil type, and climate. Grounded on these input parameters the control system determines the applicable quantum of water supplied, water pumping time and duration. The prototype of the pumping control system has been erected and tested and dissembled with real sets of data in Tasikmalaya, West Java, Indonesia. Grounded from the result of field test, it shows that the erected prototype has performed its functionalities rightly on ≥ 85 duty cycle of the PWM for both submersible and suction pumps. To operate on lower PWM duty cycle, submersible pumps can be used since these pump types can operate with minimum of 66 duty cycle.

A PV- powered automatic irrigation system is designed and enforced in this paper. Dominant factors of the system similar as the effect of solar radiation on motor power, current, and water discharge are considered in this study. The proposed system is enforced in the field to wash sludge factory(sludge) considering the optimum cock angle for Duhok megacity. A new system for measuring the humidity content in the soil and sufficient position of humidity demanded for normal growth of the crop is presented to design a timekeeper for the system to reduce the quantum of wasted water. humidity detectors are used to check the vacuity of water in the soil and to enable the microcontroller to control the operation status of the pump. The results show that the proposed irrigation system is more accurate and effective than the conventional irrigation styles in terms of the quantum of the water used for irrigation, and the delicacy of irrigating times grounded on changing original climate. The results easily demonstrate that the proposed system is further cost-effective way of irrigation and further environment friendly in terms of the quantum of water used in an area known for water failure. KEYWORDS DC motors; Agricultural Engineering; Climate Mitigation; Crops; Design engineering; Irrigation; Microcontrollers; humidity content dimension; Photovoltaic cells Detectors; Soil; Solar Radiation; water pumps; Climate Change; Energy conservation.

2.10 GSM Module

The GSM module plays a crucial role in the communication between devices and the GSM network. It is responsible for establishing and maintaining the communication link between the device and the network. The module also handles the encryption and decryption of data, which ensures the security of the communication. So here we using this for making network between our phone and our project so that we can control that with our phone.

Fig 2.9: GSM module

2.11 ON/OFF Switch

Specifications

- Voltage: 12V
- Switch Color: Red
- Switch Type: Rocker

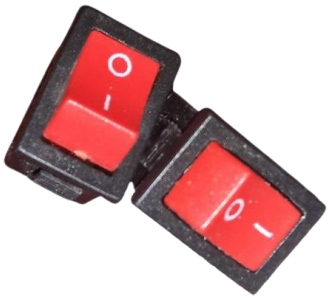

Figure 2.10: On/off switch

2.12 Battery

Lithium batteries are primary batteries that have metallic lithium as an anode. These types of batteries are also referred to as lithium-metal batteries. They stand apart from other batteries in their high charge density and high cost per unit. Depending on the design and chemical compounds used, lithium cells can produce voltages from 1.5 V (comparable to a zinc-carbon or alkaline battery) to about 3.7 V.

Disposable primary lithium batteries must be distinguished from secondary lithium-ion or a lithium-polymer, which are rechargeable batteries. Lithium is especially useful, because its ions can be arranged to move between the anode and the cathode, using an intercalated lithium compound as the cathode material but without using lithium metal as the anode material. Pure lithium will instantly react with water, or even moisture in the air; the lithium in lithiumion batteries is in a less reactive compound. Lithium batteries are widely used in portable consumer electronic devices. The term "lithium battery" refers to a family of different lithium-metal chemistries, comprising many types of cathodes and electrolytes but all with metallic lithium as the anode. The battery requires from 0.15 to 0.3 kg of lithium per kWh. As designed these primary systems use a charged cathode, that being an electro-active material with crystallographic vacancies that are filled gradually during discharge.

Figure 2.11: 3.7volt battery

2.13 Solar panel

Silicon wafers are the base of the most solar cells in the request moment, which is called the "first generation" technology. Material costs dominates the cost which becomes sprucely for this technology, this material dachas substantially silicon wafer that strengthened by low-iron glass cover distance, and those of other factors of the system. This trend is anticipated to continue as the photovoltaic assiduity continues to develop.

Transformation of the solar radiation into electricity is the most important and original step in order to understanding the conception of solar energy which occurs by the photovoltaic effect was first observed by Becquerel in the middle of 1950s. This system is principally defined as the emergence of an electric voltage between two electrodes which attached to a solid or liquid system with shining light onto this system. virtually all photovoltaic bias contains a pn-junction in a semiconductor where the print voltage happed and bettered.

These photo voltaic bias are also called as solar cells. The important thing about this semiconductor is that what material of this in order to absorb light. The semiconductor material has to be suitable to absorb a large part of the solar diapason. The immersion parcels of the material is directly related to the light is absorbed in a region more or less close to the face. When light is absorbed, electron hole dyads are generated and reach the junction where separated by an electric field.

Fig 2.12: Solar panel

Another thing is that semiconductors should be at near as possible as they can indeed for weakly absorbing semiconductors like silicon has most carriers are generated just near the face. Solar cells using for practical are packaged into modules which containing either a number of crystalline Si cells connected in series or a subcaste of thin- film material in series connected. This module has two main pretensions, first of all, it protects the solar cells from the environmental hazard and second, it generates an advanced voltage than a single cell which can delivers lower than 1 Volt.

Chapter 3

THEORETICAL MODEL

3.1 Flow chart

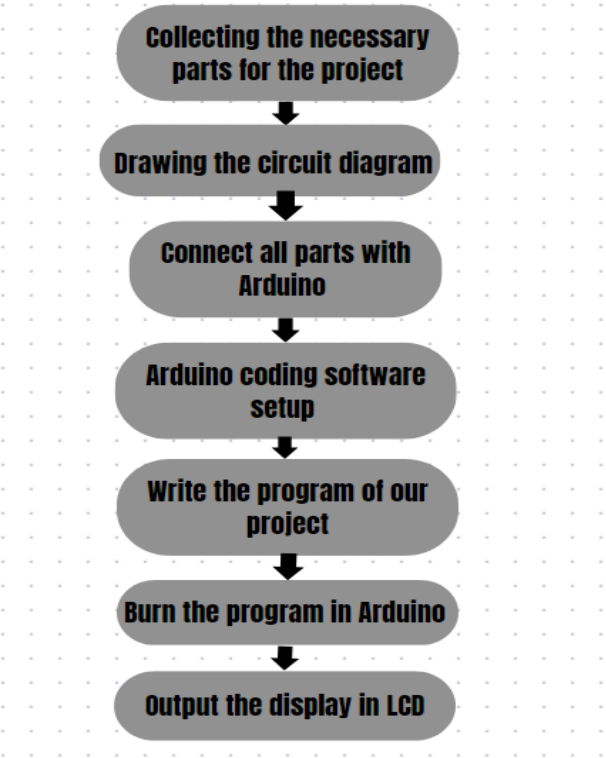

Fig 3.1: Flow chart of the Project

In this flow chart we can know about out project setup, what we did one after one. First we collect or manage all the equipment we need, then we draw a circuit diagram and then connect all the necessary parts with Arduino and we setup a Arduino coding software and then write the program for our project what we exactly need. Then we putted the program on Arduino then after testing our project finally we can see the output on the LSD display.

3.2 BLOCK DIAGRAM OF AUTOMATIC IRRIGATION SYSTEM WITH SOLAR ENERGY

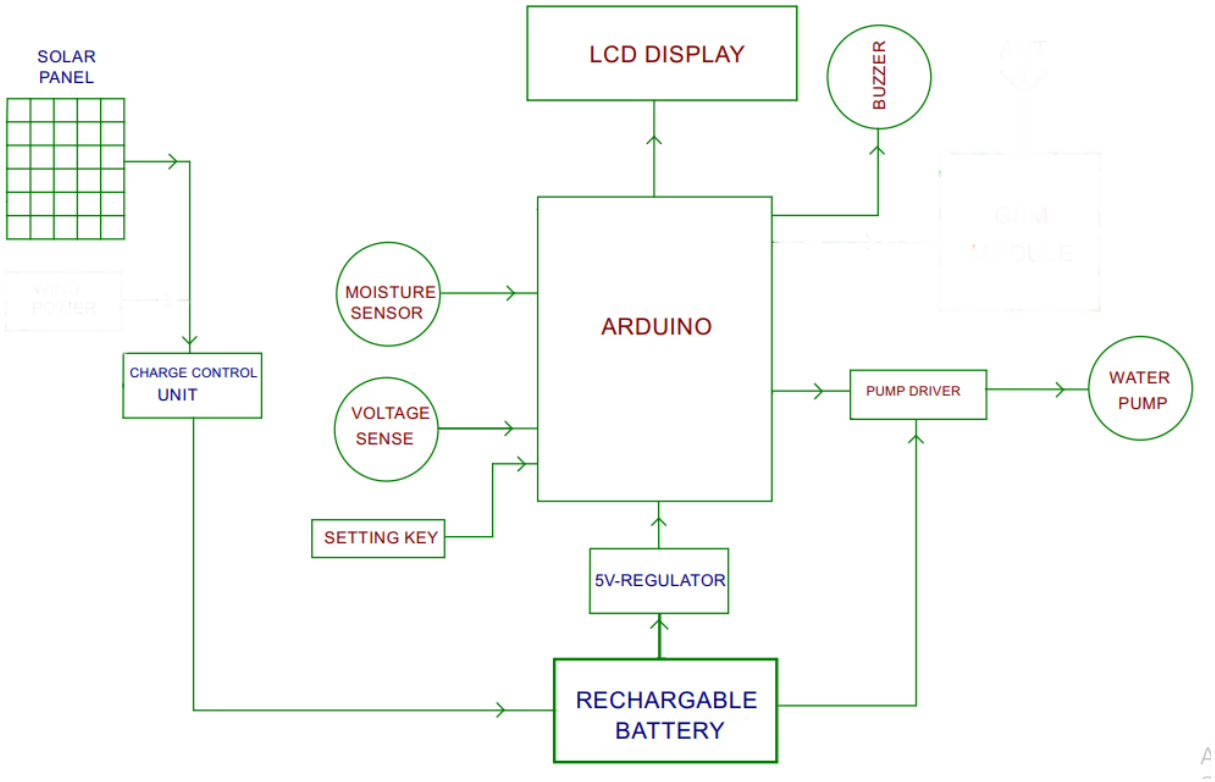

Fig 3.2: Block Diagram of automatic irrigation system with solar energy

Humidity detector detects the moister from the factory soil. It sends analog signal to Arduino. Arduino descry the signal, process and calculate the data. Arduino shoot data on TV. It shows us the data and we can also suitable to see the data. Every unit is connected to power force which is a prerequisite for operation.

3.3 CIRCUIT DIAGRAM OF AUTOMATIC IRRIGATION SYSTEM WITH SOLAR ENERGY

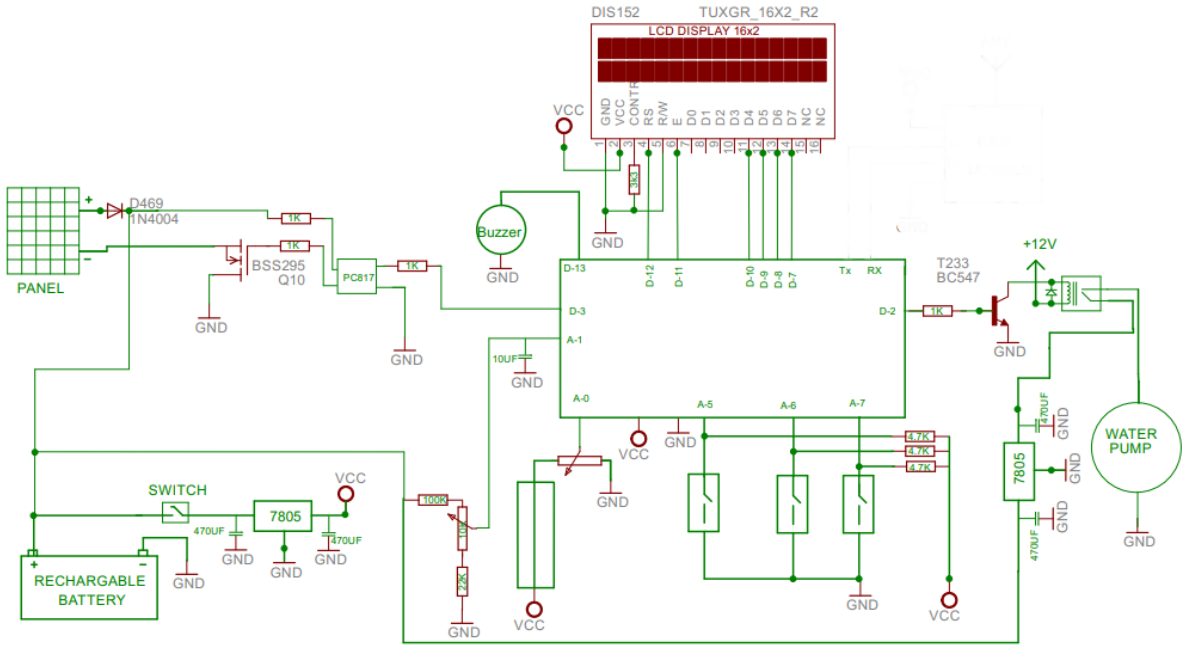

Fig 3.3: Circuit diagram of automatic irrigation system with solar energy

Connection of moister monitor using moister sensor, Arduino and Bluetooth module is very simple. Here a liquid crystal display (LCD) is used for display the moister which is sent though the moisture sensor. Data pins of LCD namely RS, E, D4, D5, D6, D7 are connected to Arduino digital pin number 7, 6, 5, 4, 3, and 2.0ne buzzer is connected in digital pin 10 and GND.

Moister sensor data is connected to analog A0 and A1 pin Arduino respectively. That entire component is powered by dc 5volt.

3.4 Working procedure of Solar-based automatic irrigation system

In our design, Arduino Nano is used to control the whole process, TV used to display damp position and water pump status. We place our damp detector into the soil, it detects humidity from soil and sends analog information in Arduino. Now Arduino admit the analog signal and process and check the condition and decide pump ON or Off, At the same time calculate the signal also it sends the calculated data to TV. We also used buzzer for a warning system when our system is ready to work.

CHAPTER 4

SOFTWARE ANALYSIS

4.1 Arduino IDE

Arduino is open sources physical processing which is grounded on a microcontroller board and an incorporated development terrain for the board to be programmed. Arduino gains many inputs, for illustration, switches or detectors and control a many multiple labors, for illustration, lights, machine and others. Arduino program can run on Windows, and Linux operating systems (zilches) contrary to utmost microcontrollers' fabrics which run only on Windows. Arduino programming is easy to learn and apply to newcomers and amateurs. Arduino is an instrument used to make a better interpretation of a computer which can control, interact and smell further than a normal desktop computer. It's an open- source physical processing stage concentrated around a straightforward microcontroller board, and an terrain for composing programs for the board. Arduino can be employed to produce interactive particulars, taking inputs from a different collection of switches or detectors, and controlling an multifariousness of lights, machines, and other physical labors. Arduino conditioning can be remaining solitary, or they can be associated with programs running on your machine. The board can be amassed by hand or bought preassembled; the open- source IDE can be downloaded free of charge. concentrated around the Processing media programming terrain, the Arduino programming language is an prosecution of Wiring, a relative physical computing platform.

Arduino IDE, which stands for Arduino Integrated Development Environment, is an open-source software platform used for programming and developing applications for Arduino microcontroller boards and other compatible hardware platforms. It provides a user-friendly interface that simplifies the process of writing, compiling, and uploading code to Arduino-based devices. Here are some key features and information about the Arduino IDE:

- Arduino IDE is available for multiple operating systems, including Windows, macOS, and Linux, making it accessible to a wide range of users.
- The IDE includes a code editor with features like syntax highlighting, auto-indentation, and code completion, which make writing and editing Arduino code more convenient.
- Arduino IDE comes with a Library Manager that allows you to easily browse, install, and manage libraries of pre-written code for various sensors, modules, and functions. This simplifies the process of integrating external components into your projects.
- Arduino IDE includes a collection of built-in examples that cover a wide range of tasks and components. These examples are helpful for beginners to learn how to use specific sensors or modules.
- The IDE includes a Serial Monitor tool that allows you to send and receive data between your computer and the Arduino board over the USB connection. This is essential for debugging and monitoring the behavior of your code.
- Once you've written your code, you can compile it within the IDE and upload it to your Arduino board via a USB connection. The IDE handles the compilation process and sends the compiled code to the board's microcontroller.

- Arduino IDE supports a wide range of Arduino boards, including the popular Arduino Uno, Arduino Mega, Arduino Nano, and many others. It also supports boards from other manufacturers that are compatible with the Arduino framework.
- Advanced users can customize their Arduino IDE by installing additional plugins, themes, or by modifying the configuration settings to better suit their preferences and needs.
- Arduino IDE is open-source software, which means that its source code is freely available for modification and redistribution under the terms of the GNU General Public License (GPL).
- Arduino has a vibrant and active community of users, and there are numerous tutorials, forums, and online resources available to help you learn and troubleshoot your projects.

Arduino IDE is a powerful and versatile tool for both beginners and experienced developers interested in creating a wide range of electronic projects, from simple LED blinkers to more complex robotics and IoT applications. It provides an accessible entry point into the world of microcontroller programming and hardware development.

Fig 4.1: Arduino IDE Download

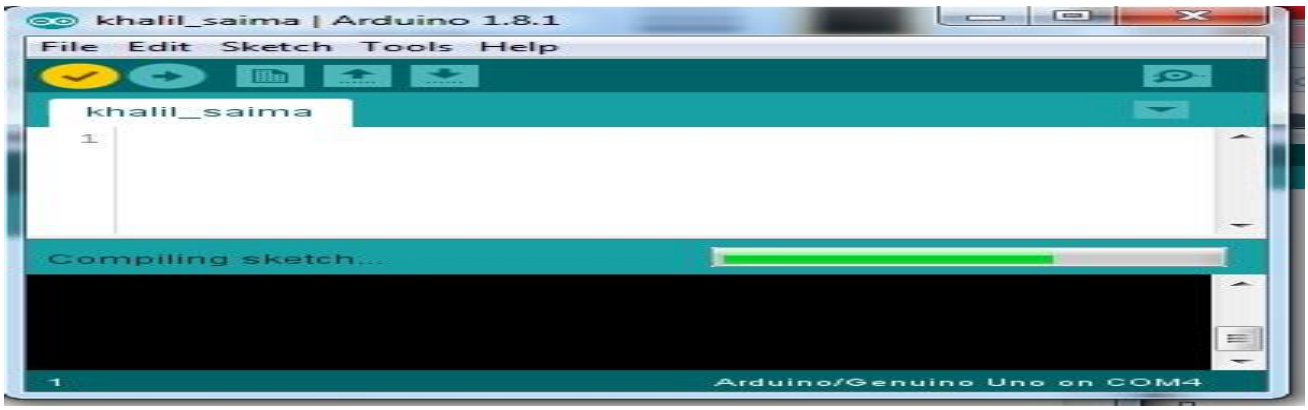

Fig 4.2: Arduino IDE Work area

CHAPTER 5

RESULT AND DISCUSSIONS

5.1 Discussion

While working on our project, we did face some difficulties as it is a very complex system but the end results, we came up with were quite satisfactory. We have put the whole system through several tasks to validate our work and also have taken necessary notes for future improvements. Some future recommendations that we have involves improvement in system design and wiring, adding features for more efficient.

5.2 Project Physical View

Figure 5.1: project physical view

5.3 Data & Result:

Applied on Land Area= 220mm × 220 mm

Pump on (moisture)	Pump off (moisture)	Duration (time)
30%	90%	14 sec
30%	80%	13 sec
30%	70%	12 sec
30%	60%	11 sec
30%	50%	10 sec

5.4 Advantages of this project

- Anyone can use this.
- Gardener and farmer can use this.
- Cost efficient.
- Saving time, power and water.
- Low power consumption.
- Easy to Setup. Etc.

5.5 Limitations of the work

In the cargo shadowing period the machine will be turn off and measuring process will also turn off automatically. By adding the battery backup, we can remove this problem. Accept it, we're getting some noise from our detector. By adding a better detector, we can remove this problem. This damp uptake system relies upon several hypotheticals and it has been shown that the results can diverge up to 10 from the true value.

5.6 Application

Our project has many application areas and actually we need to use it in many places to verified the exact person which have the proper access. Some of the application areas of the project has been pointed out below:

The system can be implemented to work on different projects such as on any roads requiring irrigation system. this can be implemented in indoor garden. It can be implemented in rooftop garden.

CHAPTER 6

CONCLUSIONS

6.1 Conclusions

The primary operations for this design are for gardeners and growers who don't have enough time to water-soak their crops shops. It also covers those growers who are extravagant of water during irrigation. The design can be extended to glasshouses where homemade supervision is far and many in between. The principle can be extended to produce completely automated auditoriums and spreads. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agrarian lands with severe deficit of downfall, this model can be successfully applied to achieve great results with utmost types of soil.

6.2 Future scope of the work

This design can be further developed in future by adding GSM module to make a textbook communication or phone call for alarm. Without it, we can enhance the point of this design by using solar technology for power force We can also measure water position of my reserve water tank can be covered using this technology.

REFERENCES

[1] S. V. Devika, Sk. Khamuruddeen, Sk. Khamurunnisa, Jayanth Thota, Khalesha Shaik Volume_4/10_October2014.

[2] Nagarajapandian, Ram Prasanth, Selva Kumar, Tamil Selvan
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http://www.aiktcdspace.org:8080/jspui/bitstream/123456789/1572/1/PE0127.pdf
http://gardenbot.org/howTo/soilMoisture

[4] Knight, J.H., 1992: Sensitivity of time domain reflectometry measurements to lateral variations in soil water content. Water Resources Research, 28, pp. 2345–2352.

[5] Prathyusha.K1, G. Sowmya Bala2, Dr. K. Sreenivasa Ravi, "A real time irrigation control system for precision agriculture using WSN in Indian agricultural sectors" International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol.3, No.4, August 20.

[6] A.K. Saxena & V. Dutta, to design a microprocessor based solar tracking controller, a solar tracker using a microprocessor.

[7] A. Yazidi, F. Betin July, 2006. To design if a low-cost solar tracker with high precision positioning
A solar tracker using a microprocessor, Low-cost two axis solar tracker.

[8] M.K Ramakrishna, Priya Prakash Parab (2016) To design an economical Wireless sensor network- based solution for precision agriculture, a wireless Sensor Network Based Solution for Precision agriculture.

[9] Hema N, Krishna Kant (2016) This paper aims to develop a system which gives more precise and accurate results, Using Spatial Arrangement of Permanent Crop for Precision Irrigation, this paper solves the issue of WSN that is optimum sensor deployment using spatial arrangement of crops during
transplantation.

[10] Sudheer Kumar Nagothu (2016) This paper aims at making a smart sprinkler system, weather based smart watering system, this helps in reducing the use of water by the help of moisture sensors and integrating current weather report.

Website:

1. https://www.arduino.cc/en/Main/ArduinoBoardUnoretrieved
2. https://www.arduino.cc/en/Guide/Introductionretrieved
3. https://en.wikipedia.org/wiki/Relay#History
4. http://electronicsforu.com/electronics-projects/automated-plants-watering-system
5. https://en.wikipedia.org/wiki/Soil_moisture_sensor
6. chttps://www.sunfounder.com/wiki/index.php?title=2_Channel_5V_Relay_Module
7. http://www.geeetech.com/wiki/index.php/2-Channel_Relay_module

APPENDIX

Program Description:

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(7, 6, 5, 4, 3, 2);

int relay1=8;
int relay2=9;

int buz=11;

void setup() {

   lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.setCursor(0,0);
  lcd.print("   Automatic");
    lcd.setCursor(0,1);
  lcd.print("irrigation Systm");
  delay(2000);
  lcd.clear();
    lcd.setCursor(0,0);
  lcd.print("Khalilur Rahman");
    lcd.setCursor(0,1);
  lcd.print("Saima Sultana");
  delay(2000);
    lcd.setCursor(0,0);
  lcd.print("ID: 133-33-1637");
    lcd.setCursor(0,1);
  lcd.print("ID: 133-33-1577");
  delay(2000);
  lcd.clear();

  pinMode(relay1,OUTPUT);
  pinMode(buz,OUTPUT);
  digitalWrite(buz,HIGH);
  delay(1000);
  digitalWrite(buz,LOW);
}

void loop()
{
  int sensorValue = analogRead(A0);
  int sensorValue2 = analogRead(A1);
  delay(100);


  // apply the calibration to the sensor reading
```

```
  sensorValue = map(sensorValue, 200, 1017, 100, 0);
  sensorValue2 = map(sensorValue2, 200, 1017, 100, 0);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Wet1=");
  lcd.setCursor(5,0);
  lcd.print(sensorValue);
     lcd.setCursor(8,0);
  lcd.print("%");
  lcd.setCursor(0,1);
  lcd.print("Wet2=");
  lcd.setCursor(5,1);
  lcd.print(sensorValue2);
     lcd.setCursor(8,1);
  lcd.print("%");


if ((sensorValue<80) && (sensorValue2<80)  )
{

  digitalWrite(relay1,HIGH);
  digitalWrite(relay2,HIGH);
  lcd.setCursor(10,0);
  lcd.print("M1=ON ");
  lcd.setCursor(10,1);
  lcd.print("M2=ON ");

}

else if ((sensorValue<80) && (sensorValue2>80))
{

  digitalWrite(relay1,HIGH);
  digitalWrite(relay2,LOW);
    lcd.setCursor(10,0);
  lcd.print("M1=ON ");
  lcd.setCursor(10,1);
  lcd.print("M2=OFF");
}

else if ((sensorValue>80) &&  (sensorValue2<80) )
{

  digitalWrite(relay1,LOW);
  digitalWrite(relay2,HIGH);
    lcd.setCursor(10,0);
  lcd.print("M1=OFF");
  lcd.setCursor(10,1);
  lcd.print("M2=ON ");
}
```

```
else if ((sensorValue>80)&&  (sensorValue2>80) )
{

  digitalWrite(relay1,LOW);
  digitalWrite(relay2,LOW);
    lcd.setCursor(10,0);
  lcd.print("M1=OFF");
  lcd.setCursor(10,1);
  lcd.print("M2=OFF");
}




else
{
//Serial.print("no match found");

}


}
```