# Smart Irrigation and Monitoring System

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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**DHAKA, BANGLADESH**

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# APPROVAL

This Project titled "**Smart Irrigation and Monitoring System**", submitted by **Methia Akther Nowshin , Habibullah Habib** and **Nawshin Jahan Saba** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **2 January, 2022.**

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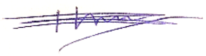

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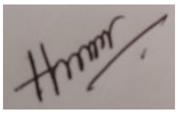

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# DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Fahad Faisal, Assistant Professor,Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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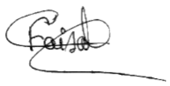

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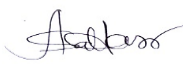

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# ABSTRACT

The world population is growing at a rapid pace, with a projected population of 9 billion people by 2050. As a result, agricultural consumption will rise as well. Annual cereal production will need to increase by more than 200 million tons to reach 470 million tons, up from 2.1 billion tons now.The application of new technology in agriculture, such as automation, has the potential to address several large and minor difficulties. The projects' goal is to create an embedded system that can supply all of the essential information for irrigation of various crops efficiently, making the entire process automatic, cost-effective, environmentally benign, and meeting all other environmental concerns. It will also offer rain information, and an app database will assist us in deciding whether to use manual control or automatic control.A low-cost soil moisture sensor was installed and tested to provide precise and dependable results. In the field, a tool is used to detect rain. The goal is to increase farm output and the efficiency with which water and other nutrients are used in the soil.The entire system would propel Bangladesh's agriculture sector to new heights, with automated processes that are also cost-effective and environmentally beneficial.

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# CHAPTER 1
# Introduction

## 1.1 Overview

Bangladesh is well-known for its rivers and agriculture. Agriculture is the primary source of food and other resources for humanity, it is regarded as the foundation of our existence. It is critical to the country's economic development. Agriculture development is critical to the country's economic success. Unfortunately, many farmers still practice old farming methods. The majority of irrigation systems in our country are operated manually. Aside from cultivating crops, the irrigation system must also be taken into account. Crops need to be properly irrigated at regular intervals to grow healthy. Agriculture is a field in which labor is extremely important and in high demand. The explanation for the decrease in labor force was that young people were not interested in working in agriculture and did not see many opportunities. Bangladesh is a country where it rains a lot.

## 1.2 Background and Present State

According to a survey a huge Electrical Energy in Bangladesh is used for agricultural pump sets and connections per year are installed with average capacity 5HP. Total annual consumption in agriculture sector is a big part of our total electricity. Sometimes farmers can not get water in their fields at the right time because of another vital problem which is load shedding in our country. Power distribution is another big problem in our country. 2 Two of the most common problems with irrigation systems have to do with irrigation scheduling. Irrigation scheduling is simply answering the questions of “When do I water?” and “How long do I water?”. Starting an irrigation cycle too early or running an irrigation cycle too long is considered overwatering. At the very least this practice wastes water and money. However, overwatering can cause crop damage if done on a prolonged basis. Likewise, starting an irrigation cycle too late or not running the system for a long enough period is considered under watering and can cause reduced yields and poor crop quality which can affect price. Looking at these problems in depth is the key to minimizing their financial and practical impact on crops. Our farmers spend a vital part of time of their day on irrigation, sometimes they waste their all day for irrigation in their field. That’s why they have not enough time for family and their life. Our farmers do not get enough amount of money by selling their irrigated products, compared to the amount of money they spend by hiring people for irrigation. For that, our farmers lost their interest in irrigation today.

## 1.3 Statement of the Project

The goal of the project is an easy-to-use autonomous watering system employing wireless sensors. The automated irrigation 4 infrastructure is powered by a smart microprocessor. Soil moisture sensors put on the fields give data to the microcontroller in real-time . In most cases, a "moisture/temperature range" is established, and when the actual values fall outside of this range, the microcontroller turns on the water pump that is mounted on it with output pins. The microcontroller also includes a solenoid valve to ensure that the pipes are watering the fields consistently, preventing clogging or dry spots. A dedicated mobile application allows the end-user to handle the complete system. Temperature sensors, which often employ sophisticated Resistance Temperature Detector components to accurately detect soil temperature levels.

## 1.4 Summery

Water scarcity is a major worry for farmers these days. This project assists farmers in efficiently irrigating farmland using an automated irrigation system depending on soil moisture. Smart Irrigation and Monitoring System is an automatic irrigation system that collects air humidity, air temperature, and, most crucially, soil moisture using sensors and transmits the raw data to the user's device. Temperature, moisture, and humidity readings are continuously monitored by the sensors, and the data are relayed to the given IP address. The Android application regularly collects data from the assigned IP address. A cell phone or other handheld device can be used to control the system.

## 1.5 Objectives

This project's major goal is to install ab automatic irrigation system that will save time, money and water. Human intervention may be reduced with this automatic irrigation system. Solar-powered sensors are a low-cost option for lowering energy costs. The Bangladeshi farmer will benefit from this system. A water pump and an automatic water flow control system with a moisture sensor are included in this system. It is the recommended answer to Bangladeshi farmers' current labor shortage. By decreasing water losses, this technology conserves water. Our goal is to create a wirelessly controlled smart irrigation system that will deliver automatic plant irrigation while conserving water and money. Using various sensors, the main purpose is to use the system to improve the soil's and hence the plant's health. The system will be able to get the actual field condition in real-time. One central node is utilized to control the other nodes. The established smart irrigation system is practical and cost-effective. This irrigation technique improves sustainability by allowing farming in water-scarce areas. The designed smart irrigation system demonstrates that water consumption may be reduced for a given amount of fresh biomass production. Wi-Fi module is used to create a real-time irrigation system. The technology is extremely adaptable and cost-effective. It is so simple and reliable that it does not require anyone to be on duty.

# CHAPTER 2
# Literature Review

## 2.1 Overview

Various studies have been conducted to see how soil irrigation might be made more efficient. Depending on the state of the soil and the amount of water available, the researchers tried various approaches. The researchers explained the many technologies used and the system's design. The goal of this research is to reduce water waste and labor costs associated with irrigation. The proposed system is designed to monitor moisture levels. The sensor regulates the soil's water level. If the water level does not remain stable, the user will receive a message via the mobile application.

## 2.2 Related Available Application

There are many works on the application of automatic irrigation systems, where Zigbee is used to monitor the condition of a long span bridge after taking into account the disadvantages of currently used wire and cable for data communications, such as high communication installation costs, sensor power supply, and so on. Short-range communication is accomplished via Zigbee.

## 2.3 Proposed System

Smart Irrigation and Monitoring System is an automatic irrigation system that collects air humidity, air temperature, and, most crucially, soil moisture using sensors and transmits the raw data to the user's device. Temperature, moisture, and humidity readings are continuously monitored by the sensors, and the data are relayed to the given IP address. The Android application continuously collects the data's assigned IP address. The motor is operated by the relay, which is connected to the microcontroller when the soil moisture levels exceed the specified limit. The Android app is a simple menu-driven app with only a few options. This provides motor status, moisture, temperature, and humidity figures, as well as a weather prediction and other data. The farmer can also change the device's state. A communication device will be included in the processing unit. A higher-level communication device, such as a Wi-Fi module, will be used to do this. The data from the central module is transformed into usable information and transmitted to the user. To study the data and administer the system, a handheld device, such as a mobile phone, can be utilized. This project assists farmers in efficiently irrigating farmland using an automated irrigation system depending on soil moisture.The dada processed by the central module is converted to meaningful dada and relayed to the user.[2] In our project, we use a wide range of mechanical, electrical, and software components.

## 2.4 Mechanical Components

### 2.4.1 Project Board:

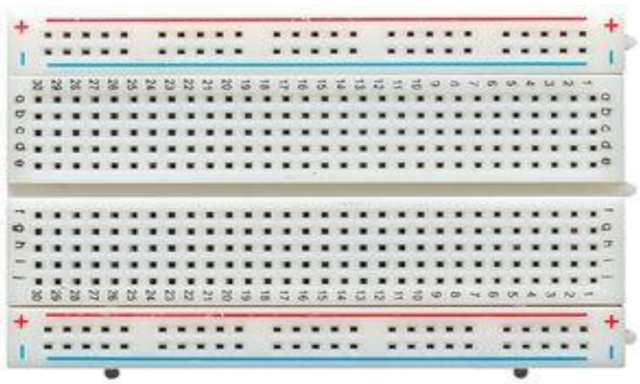

Figure 2.1 Project Board

A breadboard is a lacking solderdevice. It is used to prototype electronics. The leads or terminals of most electronic components in electronic circuits can be inserted into the holes to connect them. Metal strips link the breadboard to the rest of the circuit. The top and bottom rows of holes are horizontally joined and split in the middle.

### 2.4.2 Solenoid Valve:

Figure 2.2: solenoid valve

A solenoid[6] valve is a type of electromechanical valve. It's used to control flow of liquid. The plunger closes off a small aperture in the rest part.It pulls the plunger upwards, opening the aperture.

### 2.4.3 Water Pump:

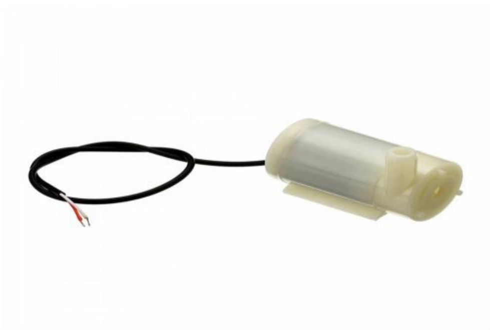

Figure 2.3: Water Pump

A water pump is a device that is tightly connected to the pump body. Overflow in the pumped fluid is one of the conventions. Pump cavitation, which is generated by a large elevation difference between the pump and the fluid surface, is avoided. A DC 3-6V Mini Submersible Water Pump is utilized in this project. It runs on 3 to 6 volts, according to the datasheet. The outside diameter of the water outflow is 7.5mm, while the internal diameter is 4.5mm. The water inlet is 5mm in diameter. It can pump up to 120 litres of liquid or water each hour.

## 2.5 Electrical Components

### 2.5.1 Microcontroller:

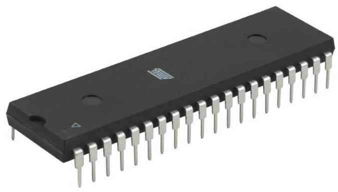

Figure 2.4 Microcontroller

A microcontroller is an integrated circuit (IC) that controls other components of an electronic system, most commonly a microprocessor unit (MPU) and memory. They are embedded inside other devices that can have greater power.

#### 2.5.1.1 Central Processing Unit:

It is one kind of central processor. The CPU associated with arithmetic calculations manages data flow and generates control signals. The designer is blind to the highly complex circuitry required for CPU operation.

#### 2.5.1.2 Memory:

The data that the processor receives and uses to respond to instructions are stored in microcontroller memory. A microcontroller has two types of memory: program memory, which stores long-term data, and data memory, which stores data for a short period.

#### 2.5.1.3 I/O Peripherals:

It is a type of gadget that connects the CPU to the rest of the world.

### 2.5.1.4 ADC:

It's a digital-to-analog converter (ADC). It's an analog-to-digital converter circuit. It also enables the microcontroller's central processor to interface with external analog devices such as sensors.

### 2.5.1.5 DAC:

An Analog to Digital Converter transforms analog signals into digital signals (ADC). It allows the central CPU of the microcontroller to interact with external analog devices such as sensors.

### 2.5.1.6 Serial Port:

A serial port is an I/O connection that allows the microcontroller to communicate with external components. A USB or parallel port is similar, but they exchange data in different methods. The Atmaga8 microcontroller is utilized in this project. It's an 8-bit AVR microcontroller with a 28-pin PDIP interface that's based on RISC CMOS technology. The program memory is 8K Flash, with 1K and 512 bytes of RAM and EEPROM, respectively. Embedded and industrial automation systems are the most common applications for them.

### 2.5.2 NodeMCU:

Figure 2.5 NodeMCU

NodeMCU is a low-cost open-source IoT platform. For NodeMCU, open source prototype board designs are available. The two terms "node" and "MCU" are combined to form "NodeMCU" (micro-controller unit). The term "NodeMCU" refers to the firmware rather than the accompanying development kits. The firmware, as well as the prototyping board designs, are both free sources.

## 2.5.3 Transistor:


Figure 2.6 Transistor

A transistor is an electrical device that regulates current or voltage flow by acting as a switch or gate. Transistors are made up of three layers of semiconductor material, each of which is responsible for transporting a current. It also contains two PN diodes that are connected back to back. It consists of three terminals: emitter, base, and collector. In this project we use C1815 Transistor. C1815 is a widely used transistor. it is used in commercial and educational projects.

## 2.5.4 Transformer:


Figure 2.7 Transformer

A transformer is an electrical device that transfers electrical energy from one circuit to another in an impartial manner. It is most commonly used to set up or set down voltage levels between circuits. These can be used 'backward' or 'forwards'. We use 220v ac to 12v and 6v step-down transformer in this project. The 12v transformer has 1000mA and 6v transformer has 600mA current supply. So we can get 12v or 6v from each line at a time.

### 2.5.5 Capacitor:

Figure 2.8 Capacitor

A capacitor is a component that can store energy in an electrical charge, which results in a potential difference. A capacitor is made up of two closely spaced conductors separated by a dielectric. The positive charge builds up on one plate, while the negative charge builds upon the other. Several capacitors, such as a 100uF 50V aluminum electrolytic capacitor and others, are used in this project.

### 2.5.6 Rectifier:

Figure 2.9  Rectifier

A rectifier is an electrical device that converts alternating current (AC) to direct current (DC), which only goes in one direction. Because the circuit is designed for less than 1A, we employ this in circuits.

## 2.5.7 IC:

A compact chip that may act as an amplifier, oscillator, timer, microprocessor, or even computer memory is known as an integrated circuit. An integrated circuit is a compact silicon wafer.

### 2.5.7.1 Regulator IC:


Figure 2.10 Regulator IC

The output voltage of a voltage regulator IC is kept constant. It's an integrated circuit whose primary function is to regulate an unregulated input voltage and output a constant, regulated voltage.

### 2.5.7.2 Encoder IC & Decoder IC:

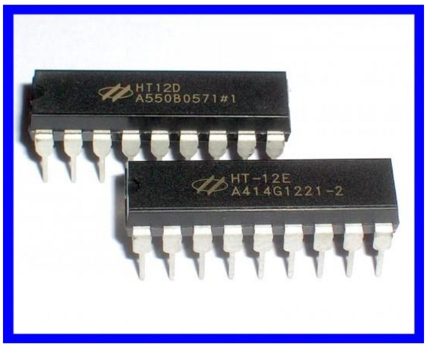


Figure 2.11 Encoder IC & Decoder IC

The HT 12E Encoder ICs are a set of CMOS LSI designed for use in remote control systems. They can encode 12 bits of data in 12 bits.
The HT 12D ICs those a set of CMOS LSIs intended for use in remote control systems. These are matched. For proper importance an encoder/decoder set with the same amount of addresses and data format should be chosen.

### 2.5.8 LED:

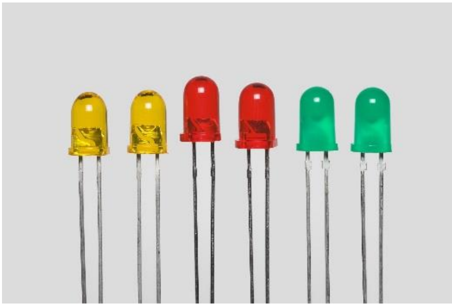

Figure 2.12 LED

When current travels through a light-emitting diode (LED), it emits light. Photons are produced When electrons in a semiconductor recombine with electron holes, energy is released.

### 2.5.9 Resistor:

Figure 2.13 Resistor

Resistors are electronic components that have a constant electrical resistance. The resistance of a resistor in a circuit hinders the flow of electrons. Resistors are usually used to complement active components like op-amps, microcontrollers etc.

### 2.5.10 LCD Display:

Figure 2.14 LCD Display

A liquid-crystal display (LCD) is a flat-panel display that modulates light through polarizers. Rather than generating light directly, a backlight and reflector are used to create monochromatic pictures and liquid crystals. To create another image, they use liquid crystals.

### 2.5.11 Radio Module:

Figure 2.15 Radio Module

An RF module is a small electronic device used to transmit or receive radio signals[7] allows two devices to send and receive radio signals.

## 2.5.12 Solar Panel:

Figure 2.16 Solar Panel

Its solar collectors gather the sun's rays and convert them to electricity or heat. A solar panel is a collection of solar cells that use the photovoltaic effect to create electricity. The most important advantage of any solar panel installation is that it will save money on other sides.

## 2.5.13 Relay Module:

Figure 2.17 Relay Module

A relay is a switch that is turned on and off by electricity. A collection of input terminals for a single or many control signals is included.

## 2.5.14 Battery:

Figure 2.18 Battery

A storage battery is a repackable battery that may be used again and over again. It's a rechargeable electric battery that comes fully charged and must be destroyed after use.

### 2.5.14 Rain sensor:

Figure 2.19 Rain Sensor

By connecting a microcontroller to a rain sensor, a simple rain detection system may be simply developed. Any rainfall that falls on the sensor will be detected by the Arduino board. Rainfall detection can be used to regulate irrigation automatically.

### 2.5.15 Water Sensor:

Figure 2.20 Water Sensor

There are ten exposed copper traces on sensor five which have five power traces. These traces are linked so that per two power traces there is one sensory trace. When submerged, these traces are usually not connected but are bridged by water.

**2.6 Software Components:**

1. Arduino IDE
2. Bascom AVR
3. Extreme Burner
4. BLYNK APP

## 2.6.1 Arduino IDE

For Windows, macOS, and Linux, the Arduino Integrated Development Environment (IDE) is written in C and C++ functions. It is also a cross-platform application.It's used to write and upload programs to Arduino-compatible boards.

This software is used to create programs and upload them to the NodeMCU Wi-Fi module. We can develop and upload programs to the nodemcu because it is an Arduino compatible board. Sketches are programs created with Arduino software. These drawings are created in a text editor. It is also available cutting, pasting and searching also for replacing text. This section indicates faults and provides feedback while storing and exporting. The Arduino Software (IDE) text to the console, which includes all the details and errors.The configured board and serial port also displayed on the windows corner. upload programs, generate, open, and save sketches, and open the serial monitor using the toolbar buttons all of programs will be validated. Verify runs a check on your code to see if there are any mistakes before compiling it. When it's complete then upload all of your code to the configured board when it has been compiled.

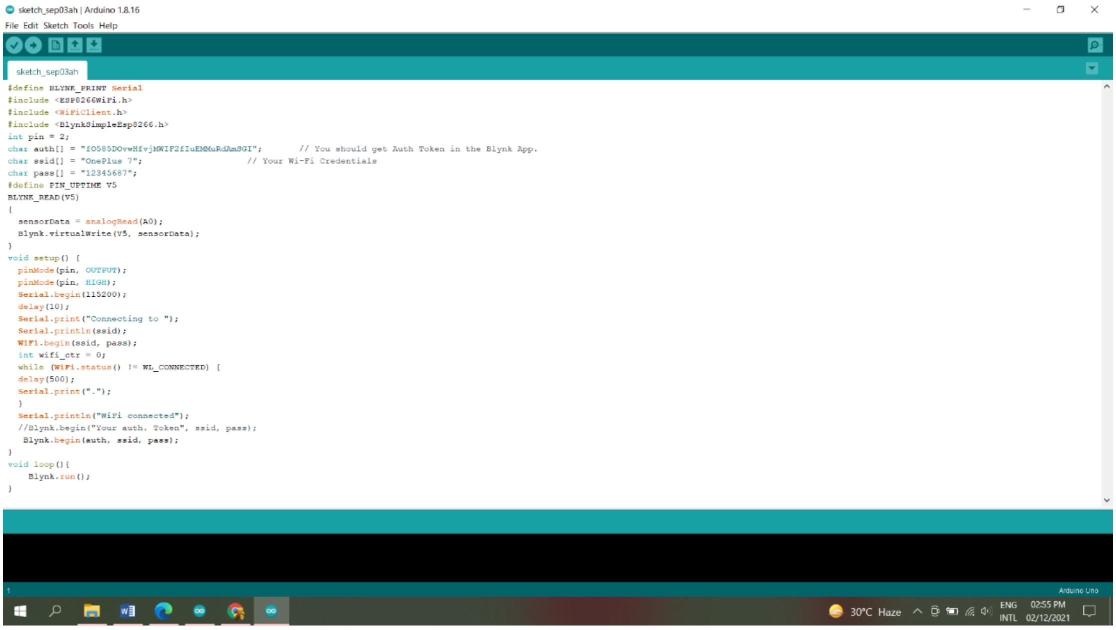


Figure 2.23 Arduino IDE GUI

This software is used to program the NodeMCU Wi-Fi module and upload the program. We can develop and upload programs to the Nodemcu because it is an Arduino-compatible board. Sketches are programs that are created with the Arduino Software (IDE). Those sketches are created in a text editor and stored as a file. Pasting and replacing text is possible with this editor. While storing, exporting, or showing mistakes, the message section provides feedback. The Arduino Software (IDE) outputs text to the console, which includes all error warnings and information. The configured board and serial port are shown in the bottom right corner of the window. The toolbar buttons, on the other hand, allow you to validate and upload programs, generate, open, and save sketches, and launch the serial monitor, among other things. Finally, after building the code, it is checked for faults. Then it uploads the code that has been compiled.

## 2.6.2 Bascom AVR

Bascom AVR is one of the most widely used Basix compilers for AVR microcontrollers in the world. Bascom programming is simple since it usually comes with a large library of functions for dealing with peripheral modules incorporated into the microcontroller (such as an AC converter, easy setup and I/O port line control, serial transmission support, and EEPROM memory support). The library of functions in Bascom AVR provides support for the most often used chips in microprocessor systems, such as character and graphical LCD displays, systems with SPI, I2C, UART, and 1-Wire interfaces (software and hardware), PC keyboards, and matrix keyboards. The TCP / IP stack used by the W3100A system is one of the advanced characteristics worth mentioning.

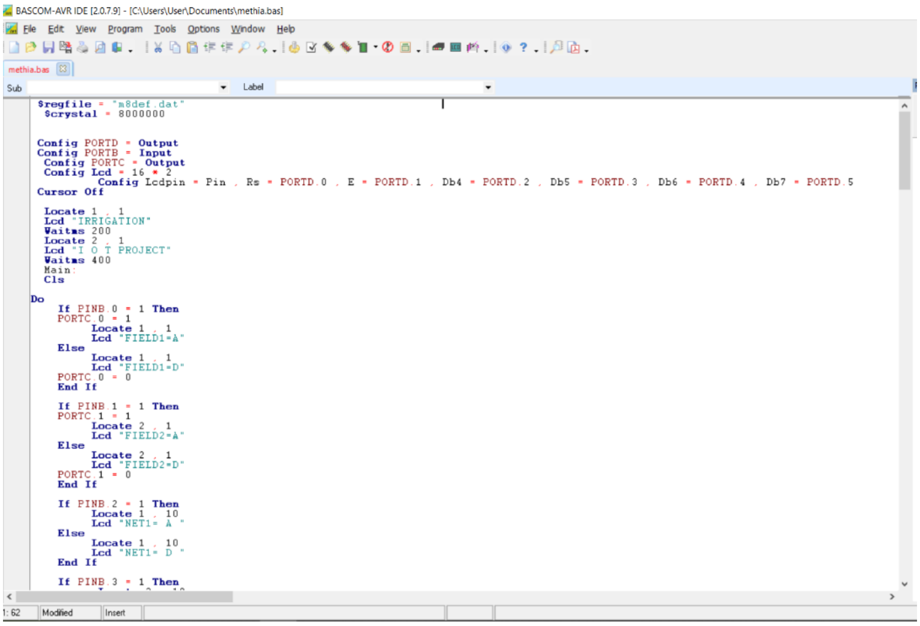


Figure 2.21 Bascom AVR GUI

## 2.6.3 Extreme Burner

Extreme Burner is a popular front-end GUI for the AVR dude program, which is used to program ATMEL AVR microcontrollers (MCU). In the name of this tool, the second 'X' is capitalized! No, it's not a typo on my part. Other GUI tools include the Khazama programmer and Bit Burner AVR programmer, among others. I used Extreme Burner for my AVR practice and it worked great with the Atmega 328, 168, Atmega8 or 8A, and other common microcontrollers. However, I ran into a difficulty one day when I utilized a new chip, the ATTINY44A. There are others as well (in various AVR forums have reported this and abandoned Extreme Burner going in search for other GUI programs for AVR dude or going down to the command line and using AVR directly with its options.). This is due to a lack of knowledge of Extreme Burner's intrinsic flexibility. After all, why would you learn another GUI once you've been used to one that can read your AVR flash memory, EEPROM, and FUSES? Here I show you how to make extreme modifications to your Extreme Burner Tool. Your tool will act in the manner you want it to, not in a way that is inconvenient or doesn't work in a certain MCU.

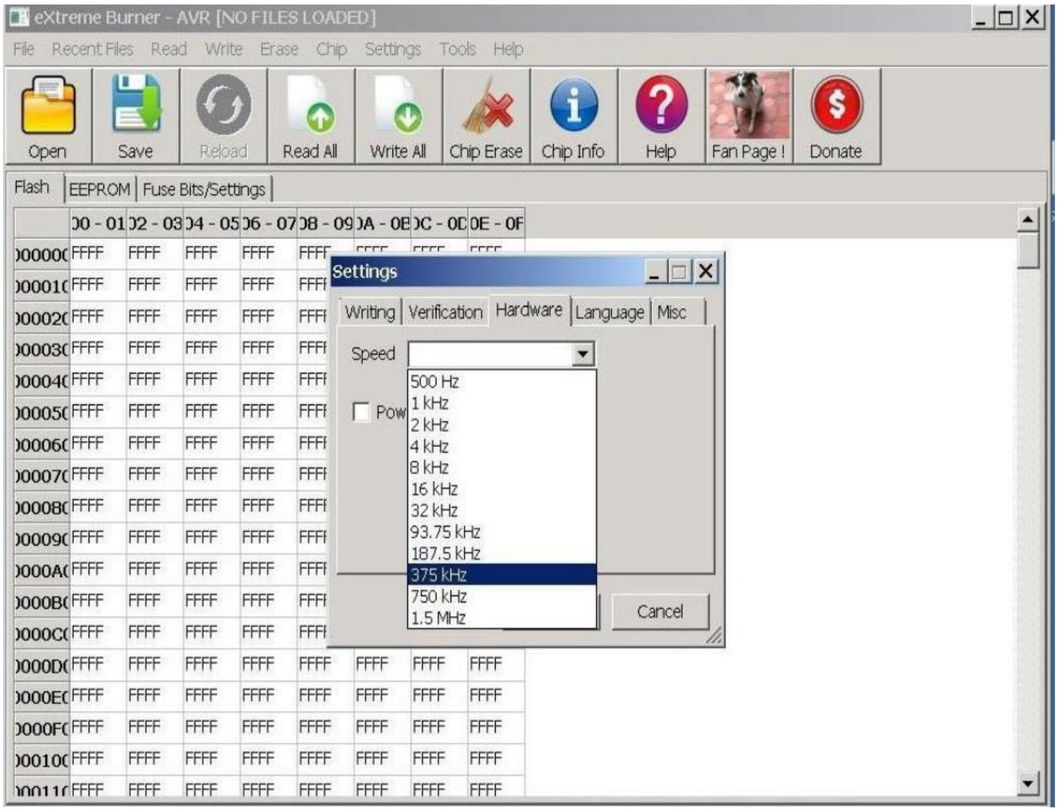


Figure 2.22 Extreme Burner GUI

### 2.6.4 BLYNK

Blynk was designed with IoT in mind. It can remotely manage devices, display sensor data, save and visualize data, and conduct several other functions. Three main components make up the platform:

• Blynk App - by mixing our widgets, you may create attractive interfaces for your projects.

• Blynk - This server is in charge of all communications between smartphones and hardware. We can use Blynk Cloud or operate our own Blynk-Its server locally. It's free and open-source, and it can even operate on a Raspberry Pi.

• Blynk- Libraries connect to the server and execute all incoming and outgoing commands on all popular hardware platforms.


Figure 2.23 Blynk App GUI

## 2.7 Summary

The Bangladeshi farmer will benefit from this system. This system includes a water pump as well as an automatic water flow control system that utilizes a moisture sensor. It is the recommended answer to Bangladeshi farmers' current labor shortage. By decreasing water losses, this technology conserves water. Our goal is to create a wirelessly controlled smart irrigation system that will deliver automatic plant irrigation while conserving water and money. The major goal is to use the system to improve soil and plant health by using several sensors. The system will operate in real-time and retrieve the exact field condition. One central node is utilized to control the other nodes. The established smart irrigation system is practical and is also cost-effective in maximizing water resources for agriculture productivity. The irrigation technique improves sustainability by allowing farming in water-scarce areas. The designed smart irrigation system demonstrates that water consumption may be reduced forgiven amount of fresh biomass production. Wi-Fi module is used to create a real-time irrigation system.

# CHAPTER 3

# System Design

## 3.1 Overview

The Block Diagram of Smart Irrigation and Monitoring System is an overall diagram for automatic irrigation system which consist three sensors in each field that are connected to the transmitter and these sensors are sent to the main base station.

## 3.2 Block Diagram

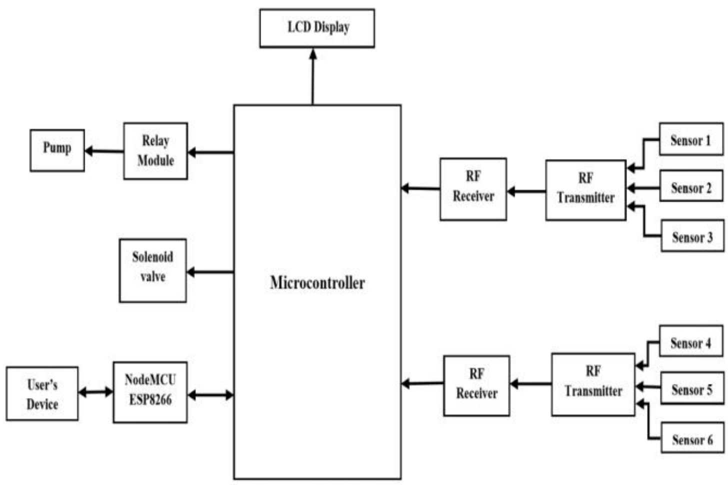


Figure 2.24 Block Diagram of Smart Irrigation & Monitoring System

Figure 3.1 shows a Block Diagram of a smart irrigation system. It is controlled by an ATmega8 microcontroller, which serves as the system's brain. Both the moisture and temperature sensors are linked to the controller's input ports. The water pump and the servo motor are connected via the output pins. The controller initiates the pump when the sensors go outside of the predetermined range. The servo motor adjusts the angular position of the pipe, ensuring that water is evenly dispersed throughout the soil. The state of the pump is indicated by an LED indication. The proposed irrigation system is made up of two primary modules: solar pumping an autonomous irrigation. A solar panel with the relevant specifications is installed near the pump set in the solar pumping module. The battery is then charged using a control circuit. The water pump, which is immersed inside the well, receives electricity from the batteries via a converter circuit. The water is then pumped into an above-ground storage tank before being discharged into the field. The system used a smartphone application named Blynk for remote monitoring and tracking of the sensors. Blynk is a simple mobile graphical interface that allows the user to interact with the system. The flow chart of how the irrigation system operates is shown in Figure 3.1. It begins with the user's initialization of the mobile app and the system's main controller being turned on. Temperature and rain sensors, moisture sensors, and water tank level sensors will all collect data. Setpoint values within threshold limits have been established for the water pumps to work. The collected data will be transferred to the mobile application which will allow the user monitor the system using the Wi-Fi module. Users can manually control the system using their own devices only. This technique has the potential to be used on a large scale in agriculture, making it more advantageous. To conserve water, optimum irrigation schedules should be created, particularly in farms, due to current conditions and water scarcity.

# CHAPTER 4
# Working Procedure

## 4.1 Overview

The smart irrigation system is operated manually and or autonomous to control the irrigation system or monitor the agricultural land by gathering various information. There are several things related to working procedures. They are….

## 4.2 Control Mechanism

An IoT-based automated irrigation control system employs a rain gun irrigation system. It was suggested that an automatic microcontroller based on a rain gun irrigation system may be utilized, with irrigation taking over when there was a large water demand, thus conserving a lot of water. They built an Android software stack for mobile devices, which includes an operating system, middleware, and key apps, revolutionizing the way field resources are managed. The Android SDK provides you all the tools and APIs you'll need to get started developing Android apps in Java. Mobile phones have almost become an inseparable part of our life, fulfilling a wide range of human needs. This application uses the GPRS feature of a mobile phone as an irrigation control system. These systems only covered a tiny amount of farmland and were not financially feasible. They used a strategy that produces leaching and nutrient loss in the soil by using under irrigation and over-irrigation. The Microcontroller used can extend the life of the system while reducing power usage. Their technique can only automate irrigation systems and has no other capabilities. Our invention creates an IoT-based Automatic Irrigation Control System for effective resource utilization and crop planning using an Android mobile capability.

The major parts are-

## 4.3 Automatic Control

An Arduino ATMega8 microcontroller is used to program an autonomous plant watering system that uses the motor driver module to transmit interrupt signals to the motor. The soil sensor monitors the moisture content in the soil and is connected to the Arduino board's A0 port. When the moisture content of the soil reduces, the sensor detects the change in humidity and sends a signal to the microcontroller, which turns on the motor. As a result, the method can be used to automate an existing plant watering system. The circuit includes a Microcontroller ATMega8 board, a soil moisture sensor, a 5V motor pump, a Motor driver HT12C (IC1), and a motor driver IC to run the water pump. The microcontroller board can be powered by a 12v wall wart, a plugin adaptor, or a solar panel. A 12v battery will be required for the pump motor.

## 4.4 Manual Control

Agriculture has been the most important practice in human civilization since the dawn of time. Traditional irrigation technologies, such as overhead sprinklers and flood irrigation, are not very efficient. They waste a lot of water can also cause diseases such as fungal production in the soil due to too much moisture. Because water is such a valuable commodity, an automated irrigation system is critical for water conservation and, consequently, farm viability. Around 85% of the total accessible water resources are used only for irrigation purposes. Because of the growing population, this demand is expected to rise in the coming years. To meet this need, we must implement new approaches that reduce the amount of water used in this irrigation process. Water availability to the crop is monitored using sensors in the automated system, and watering is done as needed using controlled irrigation. Cloud computing is an appealing answer to the vast amount of data generated because of its nearly endless storage and processing capabilities, as well as its quick elasticity.

## 4.5 Communication

The Microcontroller ATMega8 is used to construct the Smart Irrigation system, and it is a key component in this automated system. The microcontroller is coupled to sensors like soil moisture, a water level and a temperature sensor. As a result, the result of these sensors is supplied into the ATMega8 microprocessor.

The Microcontroller receives the data from all sensors and sends the appropriate result, Then,which switches on the relay and controls the water pump based on the soil and the weather condition. The soil condition is determined by this soil moisture sensor, which is expressed in voltage. After then, the output voltage is compared to a reference voltage. The pump is triggered and the agricultural area is automatically irrigated by the signal from the relay if the r voltage is larger than the voltage represented in the soil. In the converse circumstance, the relay does not operate, and the pump remains turned off. The soil moisture sensor sends an analog signal to the microcontroller, which translates to a digital signal. The signal has already been transferred to the relay circuit by the microcontroller, which has completed the program. The signal provided to the relay circuit controls whether the motor is switched on or off. When the temperature dips below freezing, the soil becomes moist, and the voltage rises beyond the reference voltage, a low signal ["logic 0") is transmitted to the microcontroller, causing the motor to turn off and the water to stop pimping.The voltage is measured by a comparator built into the sensor. Water is an excellent conductor of electricity, hence good conduction necessitates moisture content. The signal is then passed, and the motor is turned off by the required signals. The motor is connected to the circuit and the water is pumped to the plants when the control signal turns on the motor and the motor is sent. As a result of the control signal, the motor is turned off, and the relay switch is opened. So, because there is no conduction, there is no water present, and the microcontroller creates. The motor is turned off when the relay switch is closed and supplied with power.

## 4.6 Estimated Cost

| No. of Equipments | Name of Equipments | Amount (Tk) |
|---|---|---|
| 1 | Project Board | 220 |
| 2 | Vero Board | 70 |
| 3 | Solenoid Valve | 2000 |
| 4 | Water Pump | 530 |
| 5 | Electrical Components | 4050 |
| 6 | Micro Controllers | 150 |
| 7 | Solar | 720 |
| 8 | Others | 2270 |
| Total | | 9290 |

Table 4.6.1: Estimated Cost

## CHAPTER 5

## Result and Application

### 5.1 Result

A smart Irrigation system is implemented in agricultural lands.

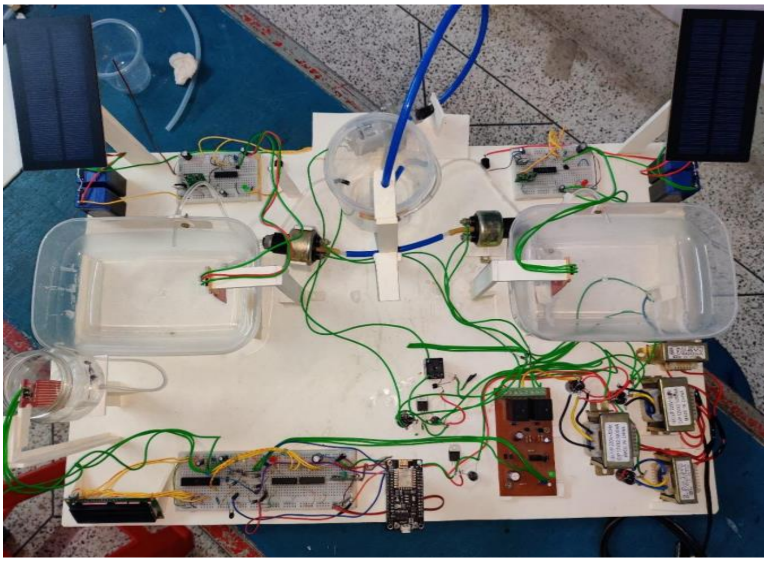

Figure 5.1 Project Picture

The moisture sensor is placed in the soil and provides the Arduino with an analog signal. The Arduino receives the analog signal from the water level sensor as well as the temperature.

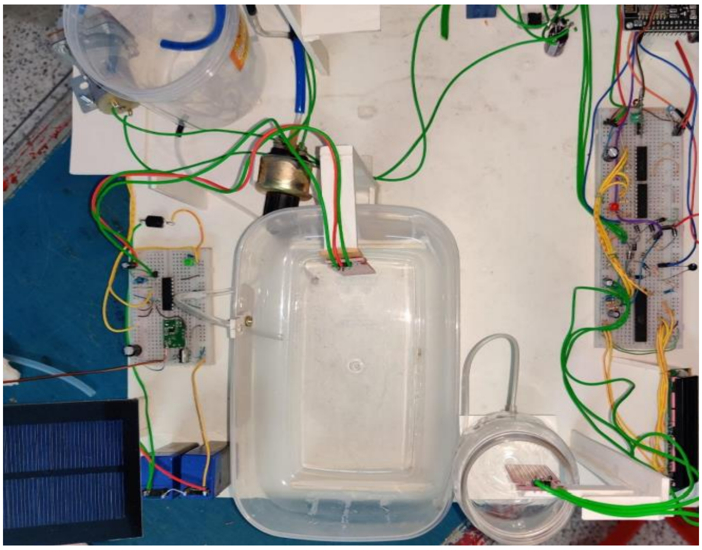

Figure 5.2 Project Picture in Operation Time


Figure 5.3 Control System in User’s Device

## 5.2 Application

For automatic water supply to fields, a smart irrigation approach is used. To achieve good yields in any crop, automatic irrigation is required. Future agricultural approaches, irrigation, and crop monitoring are smart irrigation techniques. It can also be utilized for health assessments, sprinkling water, fertilizer, and pesticide applications.

## 5.3Advantages

1)Less hardware involved:

The new system uses less hardware and is more energy-efficient. This is because the new system is integrated with the irrigation device rather than using a structured system of wired sensor stations in the field.

2) Cost Efficient: The suggested system is less expensive to implement than the existing system. This claim is based on the fact that the proposed system does not require heavy and expensive hardware.

3) Power consumption:
For a long-term operational system, power efficiency is crucial. The majority of wireless sensor nodes are powered by batteries, which necessitates efficient power management for data reading from sensors. Sensor systems have a very high power consumption for the implemented system, which can be lowered by using the proposed system.

## 5.4 Disadvantages:

Because most of the system's components are composed of plastic, it has a limited life after installation due to the deterioration of the plastic component when exposed to ultraviolet light in a hot, arid region. It’s also some mechanical parts, so it has some limitations of mechanical decay like day by day it will lose some efficiency.

# CHAPTER 6

# Future Work and Conclusion

## 6.1 Future Work

Object detection could be used to display the present state of the crops, the proportion of water utilized to water the plant and the amount of time the water pump is running. We can show a graphical representation of the moisture content levels in the soil. To boost the system's efficiency and effectiveness. The following proposals should be considered. It's possible that the farmer will be given the choice of running the water pump. Due to adverse weather conditions, the farmer has decided to halt crop production or risk harm to the crops. In such cases, the farmer may need to turn off the system remotely. The concept of using IOT for irrigation can be expanded to include management functions like fire detection and climate control.

## 6.2 Conclusion

The smart irrigation system can be used in a variety of ways to save water and provide healthy plants and farms. In our idea, the motor may be turned on and off automatically by using a relay to control the operation. The water tank storage attached to the motor provides the required amount of water to the plants. This initiative ensures that the water level in the plants is properly monitored. It gives plants the proper amount of water when they need it. The plant's health and growth can be preserved. Farmers' labor costs are lowered because they are no longer necessary to monitor the irrigation operation regularly. This project has a favorable economic impact since water wastage has been reduced, which has several economic benefits.

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