The Journal of Computational Science and Engineering (TJCSE)
ISSN 2583-9055 (Media Online)
Vol 4 No 2, Feb 2026
PP 49− 60

IOT-BASED CROP PROTECTION SHED WITH INTEGRATION OF ACCUWEATHER

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ABSTRACT

Weather changes are affecting farming. Climate changes can really hurt crops. Heavy rains can hurt crops after they are picked because they are wet while they are on the farm. Climate changes are a problem for farming. Checking on and protecting crops by hand is a way to do things. It does not work when it rains out of the blue and costs a lot of money. Because of changes in technology, it is now possible to automate the monitoring and protection of agriculture. Climate changes are a problem for farming.

This research paper presents a system that protects crops from rain. The system uses a computer with WiFi to get current weather data from a website and temperature and humidity readings from sensors in the environment. The system uses technology to protect crops from climate changes. When the predicted amount of rain exceeds a level a motorised system opens to keep crops from the rain. The system makes things easier for people. Helps protect the crop yield.

By combining technology, environmental monitoring and weather forecasting farmers can protect their crops. They can work efficiently. Climate changes can be managed with the help of technology.

1. INTRODUCTION

Agriculture is very important to the world economy. It is a way for many people to make a living. One of the problems in farming is that crops can die suddenly when the weather changes. During the harvest and drying process the crops are out in the open, which makes them more likely to be hurt by rainstorms.

These storms that come out of nowhere hurt the crops. It costs money. Traditional methods for managing crops include keeping an eye on changes in the weather all the time and covering the crops with covers when it rains. This method has been shown to be ineffective and impractical due to the possibility of weather changes. Also it is even harder to do at night when people cannot see when it rains. So there needs to be a system that can predict changes in the weather and then protect the crops without any help from people. Recent improvements in technology have made it possible to create systems that can gather data and carry out automated tasks. Using weather forecasting services and sensors you can make systems that act on predicted rain. The suggested solution is to use a system that automatically covers the crops when it looks like it will rain. It has a computer, sensors and a weather forecast service that work together to turn on the motorised mechanism when the chance of rain goes above a level.

2. SYSTEM ARCHITECTURE

The suggested system makes use of technology such as weather apps and sensors. There are hardware and software parts in the system that work together to find out what the weather is like and automatically respond when it looks like it might rain. The small computer is the control unit for the system because it can process the data it collects and connect to the weather forecast service online.

A number of sensors like the soil moisture sensor, rain sensor and temperature sensor are used to collect data.

The small computer connects to the internet. Get the weather forecast from a website. It can also read sensors. This tells the system ahead of time if it will rain.

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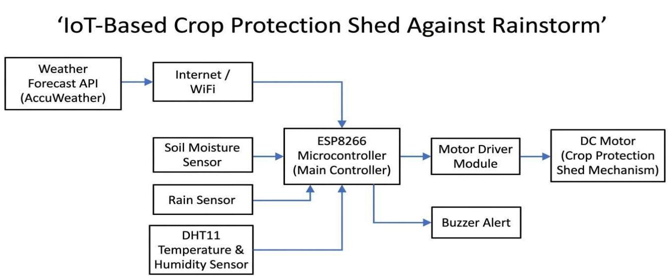
The small computer looks at the input. Decide what to do with it. When it rains or is expected to rain the system turns on a motor through the motor driver, which causes the protective cover to fold over the crops.
This kind of system makes it self-sufficient and able to protect crops without much help from people.

Fig 1 - block diagram of IOT- Based crop protection system



3. HARDWARE COMPONENTS

- We chose the hardware for our system so that the crop protection system can be watched and controlled automatically.
- The small computer is used to control the system.

1. ESP8266 Microcontroller

- We chose the hardware for our system so that the crop protection system can be watched and controlled automatically.
- The small computer is used to control the system.
- This lets it connect directly to cloud-based weather services.
- This is why it's great for farms.

2. DHT11 Temperature and Humidity Sensor

- The temperature sensor measures temperature and humidity.
- The temperature sensor checks the temperature and humidity in its area.
- By keeping track of these values our system learns about things that could affect the drying and storage of crops.

3. Soil Moisture Sensor

- The soil moisture sensor tells you how much water is in the ground.
- This helps our system decide if it needs to give the plants water.
- When the soil moisture level drops below a point the system uses a relay module to turn on the water pump by itself.

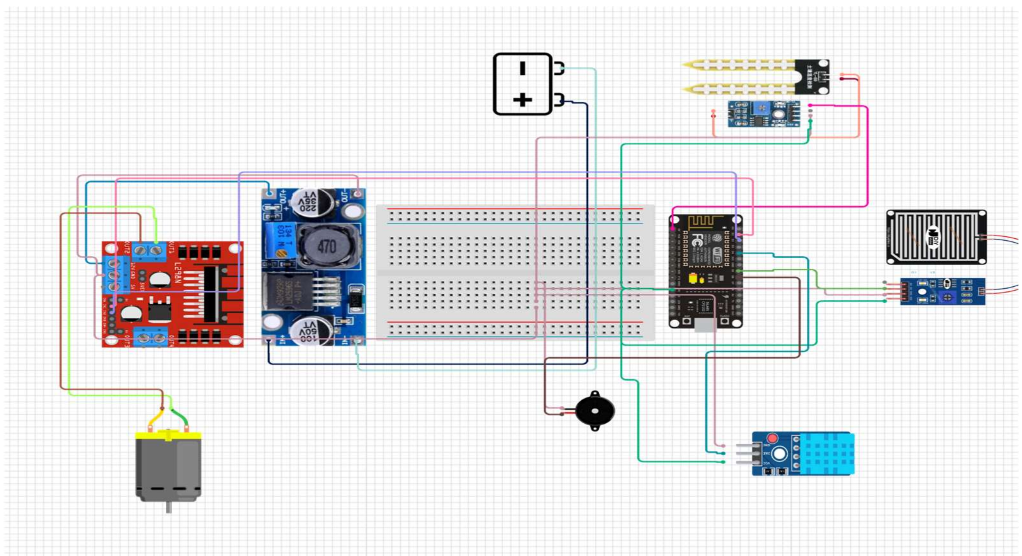
4. Rain Sensor

The rain sensor can tell when there are drops of water on it.When it starts to rain the sensor sends a signal to the computer.Our system can quickly take steps to protect the crops because we found out about this early.

5. Motor Driver and DC Motor

- The motor is controlled by the motor driver.
- This engine closes the system that keeps crops safe.
- It links the motor to the computer.
- So the controller can change the speed and direction of the motors.
- When it rains or is expected to rain the motor turns in one direction to close the system and keep the crops safe.
- When the weather gets better the motor turns the system door open.

Fig 2 - Circuit Diagram of the system



4. METHODOLOGY

- One of the important parts of our system is keeping an eye on the environment.
- It also depends on looking at weather forecasts and using machines to keep the crops safe from rain.
- This system combines data and online weather forecasts to help it make choices.

This is how our system works:

Step 1: System setup

- The small computer gets power at first.
- It starts up all of the hardware parts that are connected to it such as the motor driver, sensors, relay and buzzer.
- The system connects to a Wi-Fi network using network credentials that have been set up.
- Once the network connection is set up the system is ready to connect to the online weather forecast service.

Step 2: Collecting Data from Sensors.

- The system starts gathering sensor data after it has been set up.
- This information has parameters.
- Some of the sensors that our system uses are:

1. A moisture sensor to find out how wet the soil is
2. Sensor, for rain to see if it is falling
3. The sensors are always sending signals to the ESP8266 microcontroller. These signals are. Digital or analog signals. The ESP8266 microcontroller reads the sensor values and stores them. This is something that happens all the time. The ESP8266 microcontroller is always working.

Step 3: Getting the Weather Forecast

The ESP8266 microcontroller gets the weather forecast information from a website like AccuWeather. It does this by sending a message through the internet. The system checks things like if it is going to rain, how hot or cold it is outside and what the weather is like outside. The ESP8266 microcontroller uses this information to make decisions about what to do.

Step 4: What to Do with the Data

The ESP8266 microcontroller looks at the sensor data and the weather forecast information from the website. It uses this information to make decisions. The system does things based on these rules: if the rain sensor says it is raining or the weather forecast from the website says it will rain the system closes the shed. If the soil is too dry the system turns on the water. If it gets too hot the shed may open to let air in. The ESP8266 microcontroller is always checking the sensor data and the weather forecast information from the website.

Step 5: Making Things Happen

The ESP8266 microcontroller tells the devices what to do. These devices include a motor that opens or closes the shed, a water pump that turns on and off and a buzzer that makes noise to alert someone. The motor driver gets a signal from the ESP8266 microcontroller. Makes the motor move the shed. The ESP8266 microcontroller is always working.

Step 6: Always Checking

After the system does something it waits a bit. Then it checks everything again. This keeps happening. The system always checks what is happening outside. It does something if it needs to. The ESP8266 microcontroller is always checking the sensor data and the weather forecast information from the website.

This means the system can work by itself without someone watching it. The ESP8266 microcontroller is very important. The. The ESP8266 microcontrollers work together.

5. SOFTWARE IMPLEMENTATION MODULE

The software is what makes the system work. It controls the hardware. It gets the weather data from the website. The software was written using the Arduino program and a language called Embedded C.

1. Starting the Program

When the program starts it gets ready to talk to the internet and the sensors. The ESP8266 microcontroller connects to the internet using a password. The system also gets ready to talk to the sensors and the motors. The ESP8266 microcontroller is always working.

2. Connecting to the Internet

The ESP8266 microcontroller connects to the internet. When it does it can talk to websites. Get information. This helps the system get the weather forecast information from the website. The ESP8266 microcontroller is always working.

3. Looking at Sensor Data

The ESP8266 microcontroller always looks at the sensor data. It gets information from sensors that measure things like how wet the soil's if it is raining. The system uses this information to make decisions. The ESP8266 microcontroller is always checking the sensor data.

Section 4 - Weather Information Essentially

the system visits the weather website on a periodic basis to obtain information about the latest weather and then pulls the information back into its system. Once the ESP8266 has received that information, it evaluates all of the data available. Based on that data, the ESP8266 is also responsible for determining the next course of action based on the current weather conditions. The entire process continues, with the ESP8266 checking back every so often for any new weather information.

Section 5 - Decision Making

At this point, the ESP8266 now has two pieces of information: the most current sensor readings from the farm and the most current weather reporting. Combining these two pieces of information allows the ESP8266 to determine the most effective way to run the shed and manage the operation of the water pump. Should the shed remain open, or does it need to close? Is it the appropriate time to irrigate, or is there still enough moisture in the ground? The ESP8266 will continue to make these decisions as long as it has access to the latest data.

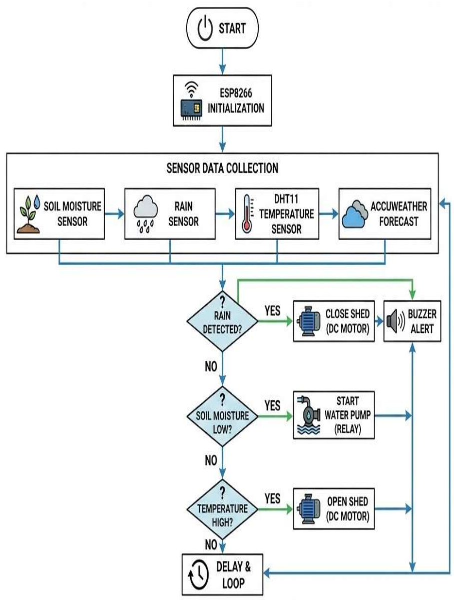
6. Things Happen

The ESP8266 microcontroller controls the actions of the devices. The motor driver drives the shed; The relay turns the water pump on and off; and the buzzer produces sound (alerts). The ESP8266 microcontroller is always "on".

.7. Always Running

The software runs its course all the time, checking sensors, forecasting weather, and making decisions. This allows for the system to react to the environment and helps to protect the crops. The ESP8266 microcontroller is still "on".

Fig 3 - flowchart of the system



VIRTUAL REPRESENTATION OF SYSTEM

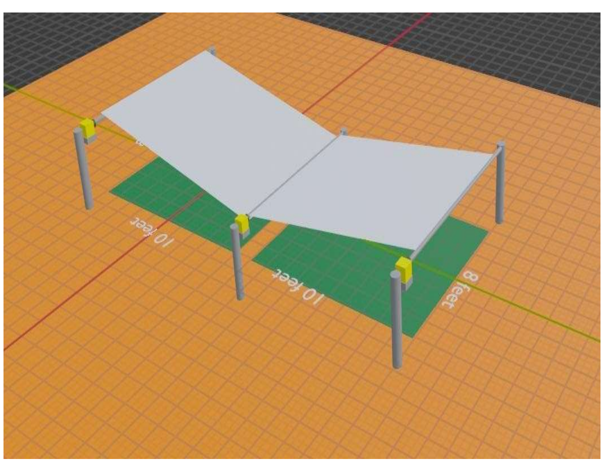


Fig 4.1

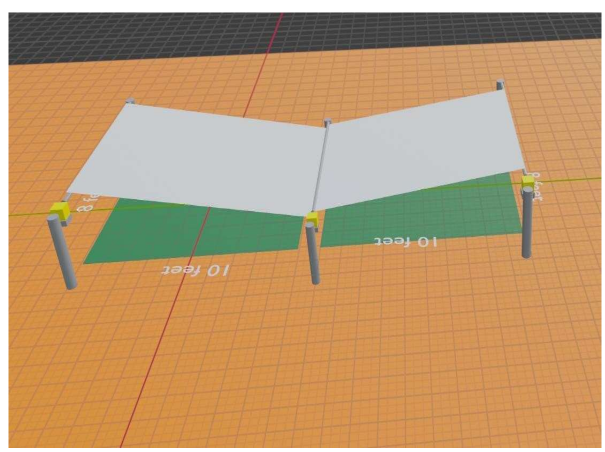


fig 4.2

6. RESULTS AND DISCUSSION

The system was tested for functionality in a farm-like environment and passed. It established an internet connection, downloading weather forecast information from the internet, then it communicated with the sensors to make decisions. You're going to have to believe the ESP8266 microcontroller plays an integral part in all of this.

Water was provided automatically to protect crops from rain if soil moisture was absent. The crops would always be given the correct amount of water needed to grow based on weather predictions. The amount of water used for the crops was based on the amount of time and energy used to provide the correct amount of water.
ESP8266 microcontroller and the automated system worked together to protect crops by helping the system determine when to provide moisture. The ESP8266 microcontroller was the main component of this system and it worked in tandem with the automated system. Both ESP8266 microcontroller and automated system worked well as one to promote healthy crop growth. ESP8266 microcontroller was always active.
The advantages of these types of systems are; rain prediction, automatic mishap protection, watering crops at necessary times, conserving water & energy. These are all benefits that have been found from the use of IoT Technology in Agriculture by various others.

7. CONCLUSION

A crop protection shed based on IoT (Internet of Things) is an inexpensive and efficient way for modern farming. Continuous monitoring of the environmental conditions surrounding crops allows farmers to Auto/automatically protect their crops through this monitoring process.

This project aims to protect crops from rain by utilizing sensors and Internet based weather forecasting to predict rainfall and close sheds. This allows the crops to remain safe from being damaged by rain before rainfall occurs.

The shed is controlled by the ESP8266 NodeMCU which will use the data collected from the sensors and the weather data found on the Internet to determine if the shed should open or close based on the real-time and/or forecast conditions.

By improving sensor capabilities and advanced prediction techniques for better accuracy, you will be able to enhance your system in the future. You could also make the system work in remote locations by using other power sources.

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