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AUTOMATIC AGRICULTURE CROP MONITORING ANDPROTECTION FROM HEAVY RAINFALL

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Abstract:
Agriculture is a backbone of our country. About 70% of our country's revenue comes from agriculture. But during heavy rain falls, the farmers face lot of problems because there cultivated crops get washed off or destroyed. So, in order to avoid this problem this project is designed which helps if protecting the crops from heavy rainfall and saving that rain water to use it for other purposes. The saved water can be used for feeding animals, washing, cooking etc. and can also be reused to sprinkle it back to the field when needed. In this system an automatic roof is inculcated which works by taking the signals from the rain and soil moisture sensors and covers the whole field to protect it from heavy rains. Whenever there is rainfall the rain sensor gets activated. The water level in the soil is sensed by the soil moisture sensor. Whenever there is rain, the rain sensor is „ON" and when the water level in the soil is beyond the normal level then soil moisture sensor is „ON". If both the sensors are „ON" then this information is given to the controller. Then the controller indicates the DC motor to run which opens the roof automatically to close the field using a polythene sheet. If there is any problem in opening of the roof, then this is intimated to the farmers thought SMS to their mobile phone using Blynk app. Then the roof can be opened manually using mechanical roller. In this project, the roof is open automatically when both the sensor is „ON". The emerging applications of IOT is used in this system.

Index Terms: Rain sensor, soil moisture sensor, ESP32 microcontroller, IOT, Blynk app, DC motor, polythene sheet.

I. INTRODUCTION

In this project we are proposing the system which prevents the spoilage of crops due to heavy rains. This is achieved with embedded system design using IOT technology. The actual concept of this project is protecting the crops from heavy rainfall by covering the field automatically and also to save the collected rain water. In order to achieve this, in this system we use Blynk app, Rain sensor and soil moisture sensor.

This system mainly works on the sensors, the automatic roof works when both the sensors are ON. Here the auto roof is mainly depending on the rain sensor and soil moisture sensor. As the rain starts the rain sensor is ON also when the moisture of the soil is above normal level then soil moisture sensor is also ON. Then this information is sent to the controller.

The controller sends this information to the Blynk app and DC motor to run so that the automatic roof gets opened and the field gets covered by the polythene sheet. Then the rain water in the roof is collected to the Water tank. When water scarcity in agricultural field, the collected water is pumped out using sprinkler. In this way the wastage rain water is saved. The collected rain water can also be used for other purposes. Through Blynk app the farmer gets the intimation that the system has been operated. Therefore, this system helps not only in protecting the crops but also in making use of rain water. The automatic roof can be operated manually through mechanical roller. So, whenever there is any fault in the working of the system then the roof can be operated manually.

II. SYSTEM ARCHITECTURE

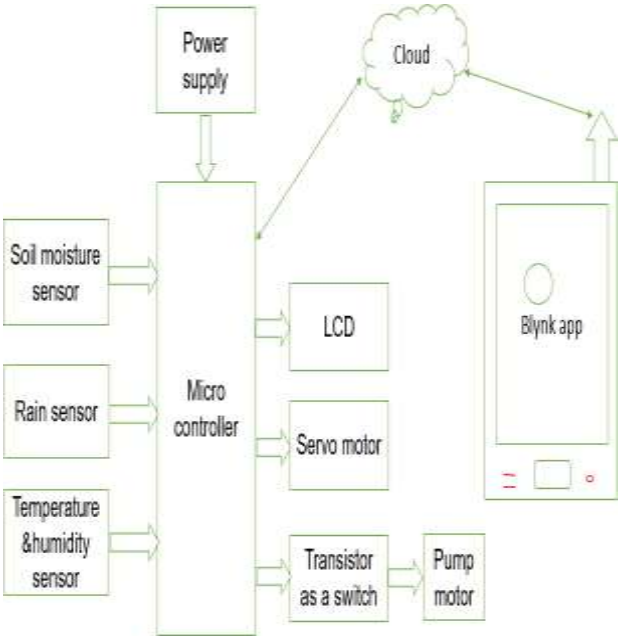

Figure.1. System block diagram

III. HARDWARE DESCRIPTION

1.Microcontroller Unit:

The working of the system is written using program and stored in the microcontroller in its ROM. According to the written program the system operates and do not change its working over the life time until and unless it"s program is changed. The architecture and instruction set of the micro controller are optimized to handled data in bit and byte size. The areas if applications of micro controllers include control process, manufacturing process, medicine, instrumentation etc.

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2. ESP32:

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Ten silica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth. The good thing about ESP32, like ESP8266 is its integrated RF components like Power Amplifier, Low-Noise Receive Amplifier, Antenna Switch, Filters and RF Balun. This makes designing hardware around ESP32 very easy as you require very few external components.

Microcontroller Core Features:

- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz
- 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.
- Support for both Classic Bluetooth v4.2 and BLE specifications.
- 34 Programmable GPIOs.
- Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC

3. Humidity and Temperature:

A DHT 11 is a basic, and a very low-cost sensor. It is used to measure the humidity and temperature of the surroundings. The unit has a capacitive humidity sensor for measuring humidity and a thermistor for measuring the temperature.

Humidity sensor indicates the exact amount water vapour present in the air and these values are displayed on LCD.

It converts directly relative humidity to voltage; the digital signal is then used to transfer the measured values onto the controller using a digital signal.

The sensor has a delay of 2 seconds. This means that the sensor reading can be up to 2 seconds old.

4. Rain Sensor:

A switching device which is activated when rain occurs is called rain sensor or a rain switch. Rain sensors for irrigation systems are available in both wireless and hard-wired versions, most employing hygroscopic disks that swell in the presence of rain and shrink back down again as they dry out — an electrical switch is in turn depressed or released by the hygroscopic disk stack, and the rate of drying is typically adjusted by controlling the ventilation reaching the stack. However, some electrical type sensors are also marketed that use tipping bucket or conductance type probes to measure rainfall. Wireless and wired versions both use similar mechanisms to temporarily suspend watering by the irrigation controller — specifically they are connected to the irrigation controller's sensor terminals, or are installed in series with the solenoid valve common circuit such that they prevent theopening of any valves when rain has been sensed

5. Soil Moisture Sensor:

Measuring soil moisture is important for agricultural applications to help farmers manage their irrigation systems more efficiently. Knowing the exact soil moisture conditions on their fields, not only are farmers able to generally use less water to grow a crop, they are also able to increase yields and the quality of the crop by improved management of soil moisture during critical plant growth stages Soil moisture sensors measure the volumetric water content in soil. soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

6. LCD:

16x2 LCD display is very basic mode land is very commonly used in various devices and circuits. It can display 16 characters per line and there are 2 such lines. LCD each character is displayed in 5x7 pixel matrix. This LCD has 2 registers namely Command and Data Every pixel includes a blue, red, green sub-pixel that can be switched ON/OFF. Once all these pixels are deactivated, then it will appear black and when all the sub-pixels are activated then it will appear white. By changing the levels of each light, different colour combinations are achievable.

7. Servo motor:

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism. If motor is powered by a DC power supply, then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor. For this tutorial, we will be discussing only about the DC servo motor working.

8. DC motor:

Micro DC 3-6V Micro Submersible Pump Mini water pump For Fountain Garden Mini water circulation System DIY project. This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. Dry run may damage the motor due to heating and it will also produce noise.

IV. SOFTWARE DESCRIPTION:

1. Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores

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2. Blynk app:

Allows to you create amazing interfaces for your projects using various widgets, we provide.

V. IMPLEMENTATION AND RESULT

In our project we have designed a model to help the farmers in rural zones. By implementing this project, we can avoid crop damage against rains and floods and as well a good yield can be achieved in farming lands. The problem of crop Protection by wild animals has become a major social problem in the current time

Fig: Actual view of the project

VI. ADVANTAGES

- Protection of harvested crop from rain.
- Low power consumption and easy to install
- The proposed system works for longer period.
- The roof has flexibility to use whenever it is required.
- Preserved rainwater can be used for the crops or household and irrigation purpose.
- High Humidity and temperature can be detected.

VII. APPLICATIONS

This can be used in the agricultural fields.

- Optimising crop growth
- Optimising the water usage.
- Temperature control of soil in fields.
- Motor to be ON/OFF.

VIII. FUTURE SCOPE

In the near future, more sensors can be embedded for Control of water usage by using temperature level, humidity level, soil moisture and light intensity as per variety of the crop and This project can be extended for animal monitoring.

One potential future direction for this technology is the use of drones for crop monitoring and protection. Drones can be equipped with sensors that can detect soil moisture, temperature, humidity, and other environmental factors. These sensors can provide real-time data that can be used to optimize irrigation, fertilization, and pest control.

Another potential direction is the use of AI and ML to analyze data collected from sensors and drones. This data can be used to predict weather patterns and other environmental factors that can impact crop growth. This can help farmers make better decisions regarding planting, harvesting, and pest control.

IX. CONCLUSION

It can be concluded that the use of electronic and mechanical System will be very advantageous for better agricultural output. In this project we have designed a model to help the farmers by sending alert messages and controlling agricultural activities in the land in the presence or absence of the farmer using wireless Sensor network technology by simply sending a message.

The microcontroller and sensors are interfaced successfully and wireless communication is achieved. Also, this proposed System of farming is user-friendly, cost effective and highly robust.

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