IOT Based Automatic Irrigation System

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***Abstract*—Scarcity of water has become a predominant problem all over the world. Water plays an important role in agriculture. With majority of the Indian population dependent on farming for their daily needs, it's important to find a solution for scarcity of water. This project mainly focuses on rain water harvesting. The secondary objective of this project is to provide farmers with an option of automating the irrigation process by equipping him with a smart IOT network which notifies him about the status of his crop using soil sensor connected to a Wi-Fi device is in corporate to measure soil moisture levels. When the moisture level is low, an automatic water pump is activated in the land, ensuring optimal conditions for crop growth with the help of the pre-feed information about the crops to the processor. Real-time data on temperature and humidity, measured using DHT11 sensors, is transferred to an IOT webpage. Furthermore, an LDR sensor detects darkness and displays relevant information on an LCD, enhancing the system's functionality and efficiency. Sometimes when there is a thunderstorm the farmer will have to come out in the storm to stop excess rain water. We intend to solve this problem using a convertible roof which is controlled by a processor. This will prevent excess rain water from damaging the crops and it will also protect the crops from hail storms. During these situations the status quo of the crops is sent to the farmer through the internet.**

***Index Terms*—Arduino Nano Controller, EMBEDDED C++, LDR Sensor, Node MCU Device.**

I. INTRODUCTION

In our nation, Agriculture is a real well spring of nourishment creation to the developing interest of human populace. In farming, the water system is a fundamental procedure that impacts trim creation. Usually, farmers visit their agricultural fields occasionally to check soil moisture level and in view of the prerequisite water is pumped by a motor to fields. The farmer needs to sit tight for certain period before exchanging off the engine so water is permitted to stream in an adequate amount in individual fields. This water system strategy takes part of time furthermore, exertion especially when a farmer needs to in undated numerous farming fields disseminated in various land zones. Customarily farmers will show in their fields to do water system process. Be that as it may, these day's agriculturists need to deal with their farming action alongside different occupations. Mechanization in water system framework influences agriculturist to work significantly less demanding. Sensor-based robotized water system framework gives promising arrangement to farmers where nearness of agriculturist infield isn't mandatory. A little processor customized for control an electromagnetic valve and furthermore contrast with electromagnetic valve work engine to begin watering. Extremely INDIAN agriculturists require howdy and straight forward UI for controlling sensor based computerized water system framework. Presently a day's web is generally utilized.

II. EXISTING SYSTEM

Currently, addressing water scarcity in agriculture relies heavily on traditional methods, such as manual or labor irrigation and limited rainwater harvesting techniques. Farmers typically face challenges in efficiently managing water resources, leading to suboptimal crop growth and productivity.

Moreover, monitoring soil moisture levels and responding to weather conditions, such as thunder storms and hailstorms, often require manual intervention and can result in crop damage.

The existing system lacks real-time monitoring capabilities and automation, hindering farmers' ability to optimize water usage and protect crops effectively.

Thus, there is a need for technological advancements to modernize irrigation practices and mitigate the impacts of water scarcity on agriculture.

PROPOSED SYSTEM

The proposed system aims to revolutionize water management in agriculture through the integration of advanced technologies.

It focuses on rainwater harvesting as a primary solution to combat water scarcity, supplemented by an automated irrigation process facilitated by a smart IOT network. Soil sensors connected to Wi-Fi devices will enable real-time monitoring of soil moisture levels, triggering automatic activation of water pumps when moisture levels are low.

This ensures optimal conditions for crop growth while minimizing water wastage. Additionally, the system incorporates sensors to monitor temperature and humidity, providing farmers with vital information for crop management.

A convertible roof controlled by a processor will protect crops during thunderstorms and hailstorms, reducing the need for manual intervention and minimizing crop damage.

III. BLOCK DIAGRAM AND CIRCUIT DIAGRAM

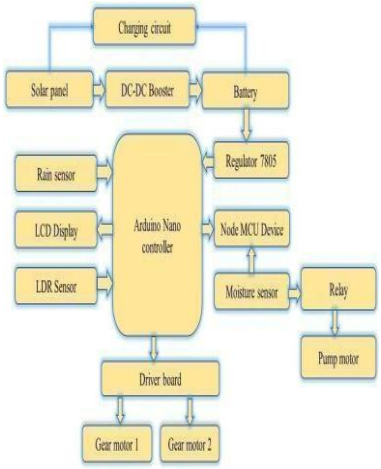

Fig (a): Block Diagram

The solar panel generates voltage, which is stored in the battery via the charging circuit. The battery voltage is stepped up to 12V using the DC-DC booster and then regulated to 5V using the voltage regulator. This regulated 5V supply powers the controller and other components. The Arduino Nano serves as the brain of the system, receiving inputs from various sensors (moisture sensor, LDR sensor, rain sensor) and processing them to make decisions. The LCD display provides real-time feedback to the user, while the Wi-Fi device enables remote monitoring and control of the system**.** The controller sends control signals to the electromechanical relay and driver board. The relay controls the operation of the water pump motor based on inputs from sensors, while the driver board regulates and amplifies the control signals to drive the gear motor effectively

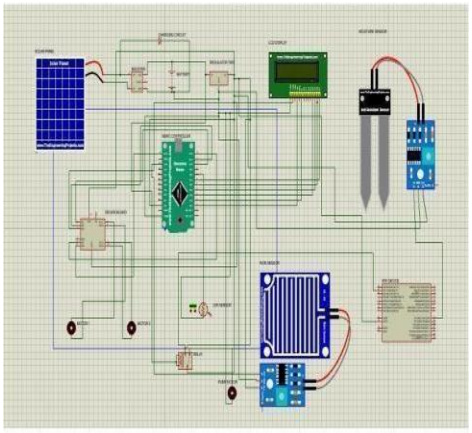

Fig (b): Circuit Diagram

In this circuit diagram consisted the components of core components like LCD display, LDR Sensor, Arduino Nano controller, solar panel, charging circuit, DC-DC Booster, battery, regulator 7805, rain sensor, Wi-Fi device, driver board , gear motor and moisture sensor, relay, pump motor .

IV. HARDWARE DESCRIPTION

ARDUINO NANO

Fig (c): Arduino Nano

Arduino Nano is a small, complete, flexible and breadboard-friendly Microcontroller board, based on ATmega328p, developed by Arduino.cc in Italy in 2008 and contains 30 male I/O headers, configured in a DIP30 style.

RAIN SENSOR

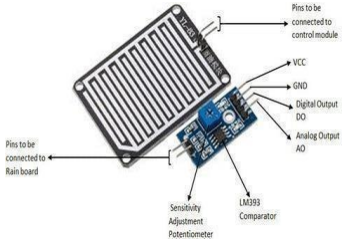

Fig (d): Rain Sensor

Rain Sensor is a tool used for sensing rain. It consists of two modules, a rain board that detects the rain and a control module, which compares the analog value, and converts it to a digital value

LDR SENSOR

Fig (e): LDR Sensor

Light dependent resistors, LDR photo resistors are often used in electronic circuit designs where it is necessary to detect the presence or the level of light. These electronic components can be described by a variety of names from light dependent resistor.

IV. SOFTWRE DESCRIPTION

Arduino IDE
Embedded C++
IOT webpage

Embedded C++ attempted to keep the most helpful aspects of C++ for embedded systems while eliminating those that caused un deterministic CPU cycles or boosted memory requirements. Embedded C++, for instance, retained how C++ uses classes as a blueprint to create objects for object-oriented programming.

IOT THINK SPEAK WEBPAGE

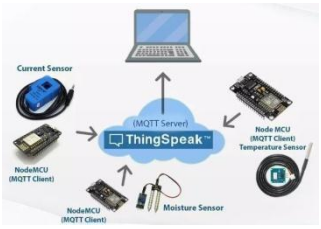

Fig (f): ESP32 Thing Speak

The Internet of Things is a network of interconnected computing devices such as digital machines, automobiles with built-in sensors, or humans with unique identifiers and the ability to communicate data over a network without intervention.

ARDUINO IDE

The Arduino IDE is incredibly minimalistic, yet it provides a near-complete environment for most Arduino-based projects. The top menu bar has the standard options, including “File”(new, load save,etc.),“ Edit”(font, copy, paste,etc.),“Sketch” (for compiling and programming), “Tools” (useful options for testing projects), and “Help”. The middle section of the IDE is a simple text editor that where you can enter the program code.

V. RESULTS

Fig (g): Prototype of IOT based automatic Irrigation system

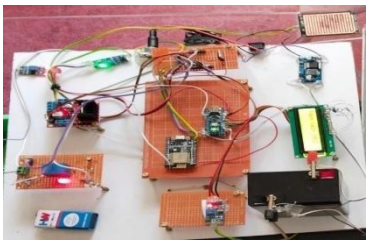

Fig (h): Sensors placed in wooden Board

Fig (i): door open status

Fig (j): door open status

VI. CONCLUSION

In the proposed system offers a comprehensive solution to address water scarcity and improve agricultural practices. By integrating rainwater harvesting, automated irrigation, and crop protection measures, it enables efficient water management and promotes sustainable farming methods. Real-time monitoring of environmental parameters empowers farmers with actionable insights, while automation reduces manual labor and enhances productivity. Ultimately, this project represents a significant step towards achieving water security, increasing crop yields, and fostering resilience in agricultural communities.

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