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Iot-Based Farm Monitoring System

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Abstract: The Internet of Things (IoT) has revolutionized various industries, and agriculture is no exception. This paper presents an IoT-based farm monitoring system designed to improve agricultural productivity and sustainability. By integrating various sensors and wireless communication technologies, the systemenables real-time monitoring of key environmental parameters such as soil moisture, temperature, humidity, and light intensity. The data collected is analyzed and used to provide actionable insights to farmers, enabling them to make informed decisions about irrigation, fertilization, and pest control. This paper discusses the system's architecture, components,implementation, and benefits, along with case studies demonstrating its effectiveness

I. INTRODUCTION

Agriculture, a cornerstone of human civilization, is confronted with significant challenges in the 21st century, including climate change, resource scarcity, and the demand for increased food production to support a growing global population. Traditional farming practices, which often rely on manual observation and intuition, are increasingly insufficient to meet these demands efficiently and sustainably.

An IoT-based farm monitoring system integrates sensors, wireless communication, data processing, and cloud computing to provide a comprehensive solution for modern agriculture. This system not only helps in optimizing irrigation, fertilization, and pest management but also contributes to resource conservation and environmental sustainability. By transforming data into actionable insights, IoT-based farm monitoring empowers farmers to make informed decisions, enhance productivity, and ensure the long-term viability of their operations.

In this paper, we explore the architecture, components, implementation, and benefits of an IoT-based farm monitoring system. We also present case studies demonstrating the practical applications and advantages of this technology in various agricultural settings. The aim is to highlightthe potential of IoT to revolutionize farmingpractices and address the critical challenges facing agriculture today.

Fig 1: iot based farm monitoring system

II. PROBLEM STATEMENT:

Traditional agricultural practices face significant challenges in efficiently managing resources and maximizing crop yields. The reliance on manual observation and decision-making often leads to suboptimal use of water, fertilizers, and pesticides, contributing to resource wastage and environmental degradation. Moreover, the lack of real-time data and predictive insights makes it difficult for farmers to respond promptly to changing environmental conditions, resulting in reduced productivity and increased vulnerability to crop failures.


Fig 2: agriculture farm

III. OBJECTIVE OF THE PROJECT :

The main objective of the proposed system is

To design a automatic irrigation process that reduce human intervention and ensure that crops receive the right amount of water at the right time.

IV.OVERVIEW OF THE PROJECT:

This smart agriculture using IoT system powered by NodeMCU consists of a DHT11 sensor, Moisture sensor, DS18B20 Sensor Probe, LDR, Water Pump, and 12V led strip. The Smart Agriculture System has wide scope to automate the complete irrigation system. Here we are building a IoT based Irrigation System using ESP8266 NodeMCU Module. It will not only automatically irrigate the water based on the moisture level in the soil but also send the Data to Adafruit IO Server to keep track of the land condition. The System will consist a motor connected to it which will be used to sprinkle water on the land depending upon the land environmental condition such as Moisture. Before starting, it is important to note that the different crops require different Soil Moisture condition. So, a crop which will require a soil moisture of below 35% . So, when the soil loses its moisture to greater than 35%then Motor will turn on automatically to sprinkle the water and it will continue to sprinkle the water until the moisture goes up to below 35% and after that the pump will be turned off. The sensor data will be sent to Thinkspeak Server in defined interval of time so that it can be monitored from anywhere in the world.

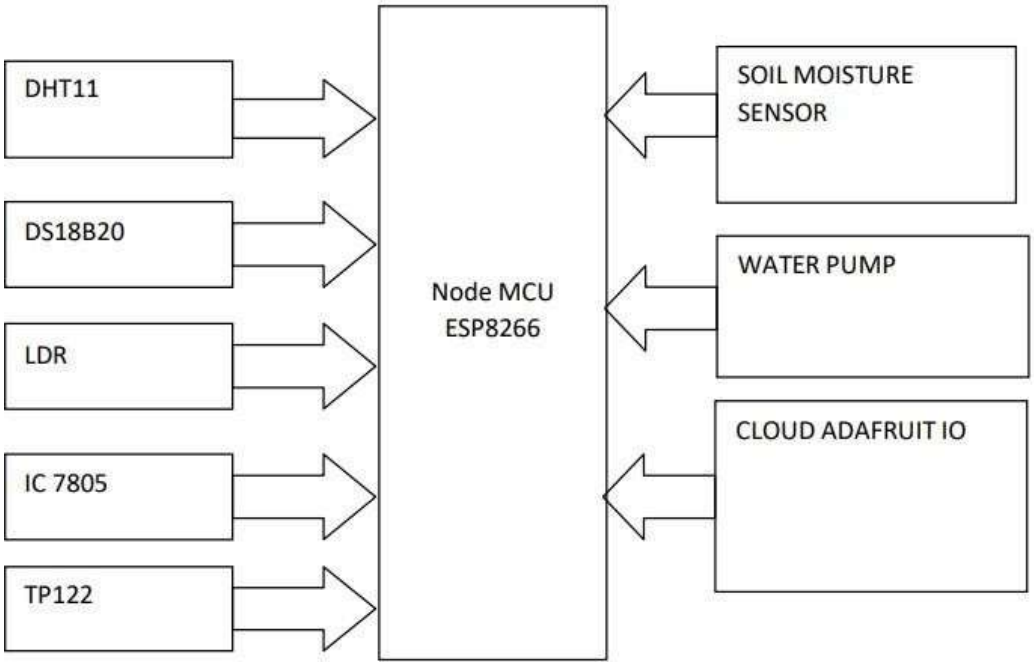

Fig 3: block diagram

V. DESIGN AND IMPLEMENTATION:

This circuit isn't that hard. Here we have used 4 sensors i.e. DHT11, DS18B20 sensor probe, LDR and Soil Moisture Sensor, one 12V LED Strip, 12V water pump, 7805 voltage regulator, and two TP122 transistors to controlled strip and water pump. 7805 is used to get the regulated 5V from the 12V adapter where it is connected to node mcu 30 pin as power supply for board , DHT11 sensor is used to get the temperature and humidity readings it is connected from pin number 1as vcc and pin no 2 as ground and D4 pin as data. The DS18B20 sensor probe is used to get the soil temperature it is connected D2 pin for data and vcc and gnd are same as dht11 sensor and a soil moisture is connected to A0pin as a signal and vcc to 26th pin and gnd to25th pin, soil moisture sensor is used to read the Soil moisture so that the water pump can be turned on/off automatically.

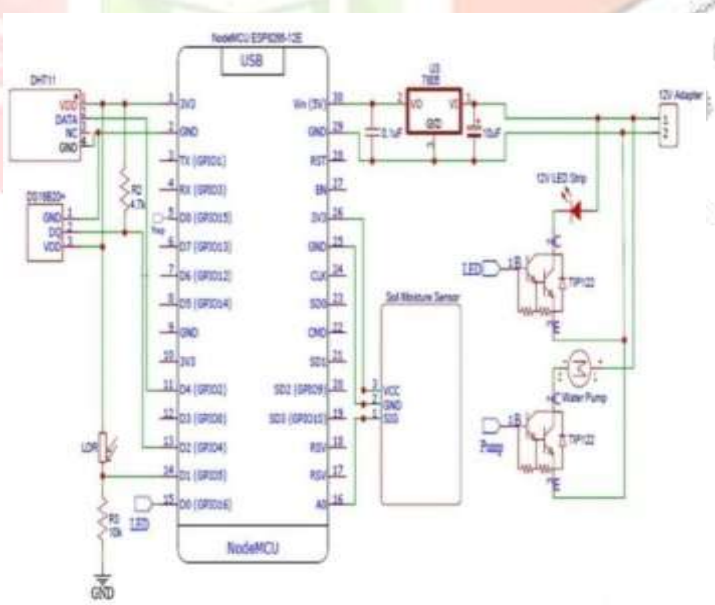

Fig 4: Pin diagram

VI. FUTURE SCOPE OF THE PROJECT:

By incorporating AI and machine learning, the system can predict crop yields, pest infestations, and weather conditions. This can help farmers make data-driven decisions. Future sensors could provide more accurate data on soil moisture, nutrient levels, and environmental conditions. With the advent of 5G, the system's connectivity will be faster and more reliable, enabling \real-time monitoring and control even in remote areas.

VII. CONCLUSION:

The farm monitoring system may be used to agricultural destiny variables. Farmers would be relieved since it lessens the workload associated with manual labour. The project provided an opportunity to examine the current buildings, together with their benefits and drawbacks, and led to the construction of a device to monitor soil moisture levels. The above mentioned device may be used to automate irrigation, one of farmings are most time consuming tasks, by turning on and off the water sprinkler in accordance with soil moisture levels. One of the hobbies that requires the greatest work is farming. To irrigate soil, the gadget uses information from soil moisture sensors.

VIII. ACKNOWLEDGMENT :

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