An Efficient Automated IOT based Agricultural Monitoring System

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Abstract - The main objective of this concept is to design an efficient and enhanced agricultural monitoring and controlling system using EMBEDDED IOT technology. Agriculture is the primary occupation in our country for ages. But now due to migration of people from rural to urban there is hindrance in agriculture. So to overcome this problem we go for smart agriculture techniques using IOT. This project includes various features like crop filed parameters. Monitoring and partial controlling is done automatically using embedded system. Internet based data transfer takes place in this model. IOT is used to communicate with the former. Temperature, Moisture, Ph, and Nitrate sensors are connected to ardunio for calibrations and controlling.

Keywords – EMBEDDED IOT, Arduino, Node MCU, WiFi, Nitrate sensor, Soil moisture sensor.

I. INTRODUCTION

As the world is trending towards new technologies and implementations it is a necessary goal to trend up in agriculture too. Many researches are done in the field of agriculture and most of them signify the use of wireless sensor network that collect data from different sensors deployed at various nodes and send it through the wireless protocol.

Monitoring the environmental factors is not the complete solution to increase the yield of crops. Real-Time Automation of Agricultural Environment for Social Modernization of Indian Agricultural System attracts great attention these days. Efficient water management is a major concern in many cropping systems in semi-arid and arid areas.

Internet of things (IOT) is allowing controls the systems from remote area over an internet.IOT is the emerging area that penetrates other area and made them so efficient.

II. LITERATURE SURVEY

The new scenario of decreasing water, drying up of rivers and tanks, unpredictable environment, present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture, sensors are placed at suitable locations for monitoring the crops. 2After research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays an important role in increasing the production as well as in reducing the man power. 3Some of the research attempts are done for betterment of farmers that provide systems which use technologies helpful for increasing the agricultural yield. 4It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system.5It aims at making agriculture smart using automation and IOT technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance. The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates. 6This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology. It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not. It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural crops. In addition, a gateway unit handles sensor information. The atmospheric conditions are monitored and controlled online by using Ethernet IEEE 802.3.The partial root zone drying process can be implemented to a maximum extent.

III. PROPOSED SYSTEM

The proposed hardware of this system includes Arduino Uno ,temperature nitrate ,pH, Moisture Sensors, a power supply unit,LCD Display, Node MCU.

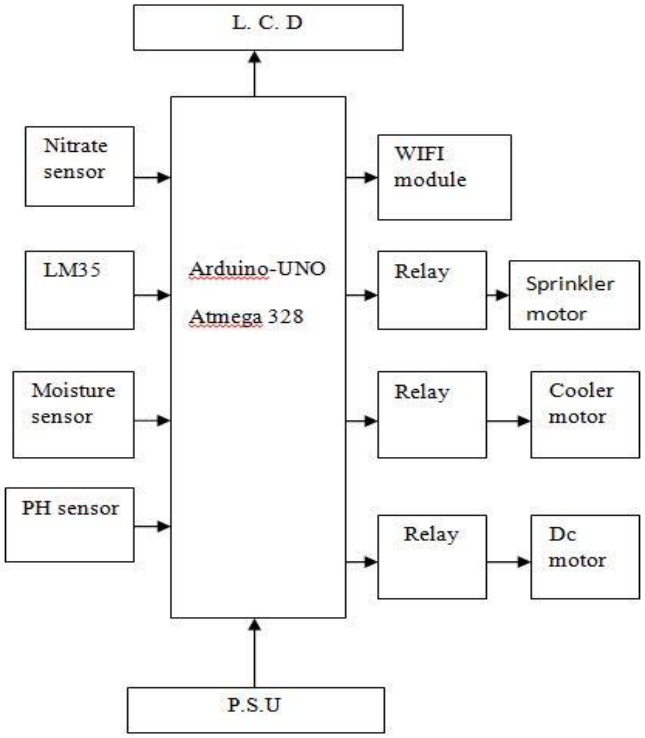


Figure 1: Proposed System

Hardware Components –

A. Arduino - The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

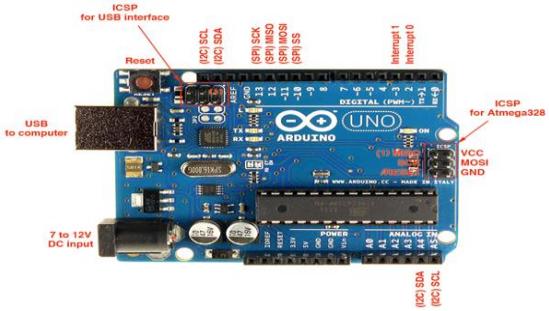


Figure 2: Arduino

B. LCD - The LCD display consists of two lines, 20 characters per line that is interfaced with the PIC16F73.The protocol (handshaking) for the display is as shown in Fig. The display contains two internal byte-wide registers, one for commands (RS=0) and the second for characters to be displayed (RS=1). It also contains a user-programmed RAM area (the character RAM) that can be programmed to generate any desired character that can be formed using a dot matrix. To distinguish between these two data areas, the hex command byte 80 will be used to signify that the display RAM address 00h will be chosen Port1 is used to furnish the command or data type, and ports 3.2 to 3.4 furnish register select and read/write levels.

Figure 3: LCD Display

C. Temperature sensor - LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured moreaccurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 °C temperature rise in still air.

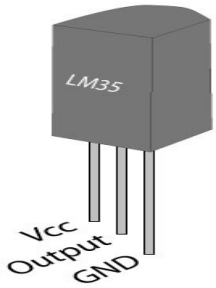


Figure 4: Temperature sensor

D. pH Sensor - A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH. The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode, and so the pH meter is sometimes referred to as a "potentiometric pH meter". The difference in electrical potential relates to the acidity or pH of the solution. They comprise a simple electronic amplifier and a pair of electrodes, or alternatively a combination electrode, and some form of display calibrated in pH units.

E. Moisture sensor - The soil Moisture sensor FC-28 has four pins The Module also contains a potentiometer which will set the threshold value and then this threshold value will be compared by the LM393 comparator. The output LED will light up and down according to this threshold value.

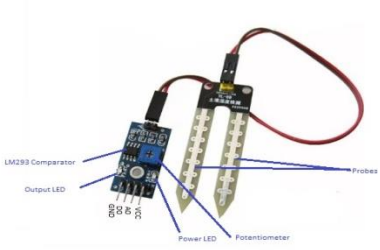


Figure 5: Moisture sensor

F. Nitrate Sensor - Nitrates are an important source of nitrogen necessary for plants and animals to synthesize amino acids and proteins.

Figure 6: Nitrate sensor

Nitrates are measured in units of concentration, which are the number of nitrate molecules in a given volume of water. Typical concentrations are usually between 10 and 500 parts per million (ppm).

G. ESP8266 - The ESP8266 series, or family, of Wi-Fi chips is produced by Espress if Systems, a fables semiconductor company operating out of Shanghai, China. The ESP8266 series presently includes the ESP8266EX and ESP8285 chips.
The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

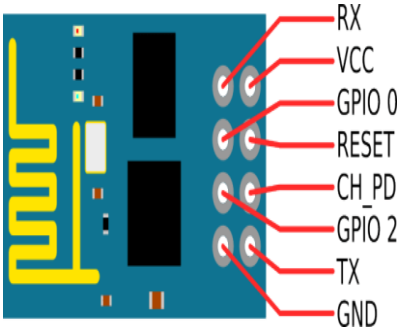


Figure 7: ESP8266

IV. CIRCUIT DIAGRAM

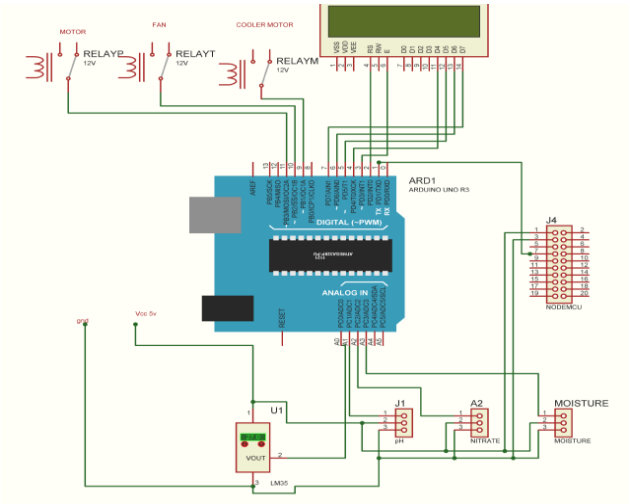
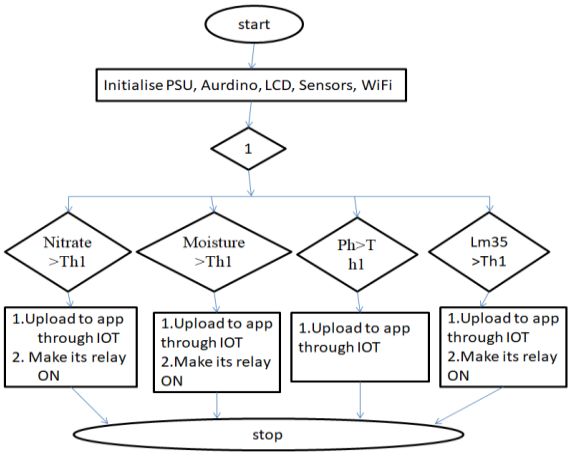


Figure 8: Circuit Diagram

V. FLOW CHART



The flow chart looks into the step by step procedure.

VI. RESULT

Figure 9: Electronic Setup for Agriculture monitoring system

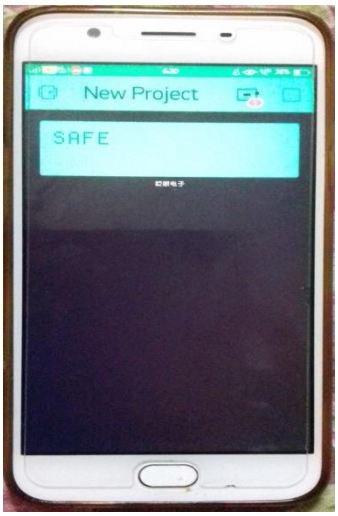


Figure 2: Indicating farmer through blynk app

VII. CONCLUSION

Here, we are developing a user friendly smart farming system which will liberate agricultural productive force greatly, change mode of production, and realize a qualitative leap in agricultural activity. The threshold voltages are chosen for calibration of the sensors by considering past months of temperature and soil moisture values. Threshold

values may be varying depends on the crop and plantation. All observations and experimental tests prove that this project is a complete solution to the field activities irrigation problems. Implementation of such a system in the field can definitely help to improve the yield of the crops and aids to manage the water resources effectively reducing the wastage.

VIII. FUTURE SCOPE

In future by introduce the machine learning algorithm to be used to process the data and reduce the complexity of the hardware. Hardware resources in agricultural information network are integrated into resource pool by using vitalization technology, achieving dynamic distribution of resource and balance of load, significantly improve efficiency. Our project can be improvised by using a sensor to note the soil ph value such that usage of unnecessary Fertilizers can be reduced. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. Further, it also reduces the investment of farmers.

IX. REFERENCES

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