Smart Farming

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Abstract---- The main aspect in smart farming project is how we can implement a smart technique to enhance the growth of crop and water management. Moisture status is monitored through moisture sensors connected to NodeMCU. Temperature and Humidity sensor is used to measure the ambient weather parameter that suits the farm moisture condition. Whenever the soil moisture is under the reference moisture condition it displays moisture percentage on LCD display as well as sends a notification to MQTT platform. If there are any abnormalities in the measured parameters it works as programmed The project also projects the safety of farmer and has a facility to provide and intimate the farmer if there is any trespassing which will be monitored by distance sensor on the entry.

Keywords---Microcontroller, Temperature sensor& Humidity sensor, Soil Moisture sensor, LCD display, Ultrasonic distance sensor, Submersible irrigation pumps.

I. INTRODUCTION

Agriculture is the backbone of Indian economy. Well-timed and adequate supply of water is the most important requirement for agriculture. One of the major problems in irrigation is the downfall of ground water level [1] which is due to unawareness among framers about irrigation methods and techniques. Important aspect of the project is to bring updated farming facilities using IoT and introducing MQTT sector in faming making the control of advanced farming facilities from distance. There is a continuous need of observing the moisture level at agriculture lands. India is a land of agriculture. The continuous increasing demand of food requires the turbulent improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason of this is due to unplanned use of water due to which a significant amount of water goes to waste. Indian agriculture depends on the monsoon, which is depended on the nature and not a reliable source of water.

So there is a need for an automatic irrigation system in the country which can provide water to the farms according to their moisture, temperature and soil types & fertilizers. The idea includes usage of elegant controllers that read real-time site conditions and deliver required amount of water to keep plants healthy.

The modules in the project are: Condition of soil is continuously monitored and updated by moisture sensor (WET or DRY), humidity sensor DHT11 is used to monitor temperature and humidity, submersible motor is used as a sprinkler which has a long pipe attached to it and based on the sensor values motor pours water. LCD display where the values of humidity and temperature are displayed which are retrieved from the [2] IoT platform. The controlling device of the whole system is a Node MCU (ESP8266-12E). The data from the sensors is posted in weather station (MQTT platform) that we have created.

II. METHODOLOGY

The module is designed to develop an automatic irrigation system that will turn ON/OFF the Pump based on the moisture present in the soil. Data collected from LM393 comparator IC connected to moisture sensor is utilized for the purpose.

The moisture sensor reads the value of the moisture and for a dry condition or for a low moisture level the reference value is set and is between a certain scale, the moisture sensor is place in the farm land for mapping data which is recorded on the server, the server display all data's in a graphical form, the same goes for temp and moisture sensor data where the moisture data is recorded and in displayed on the MQTT platform.

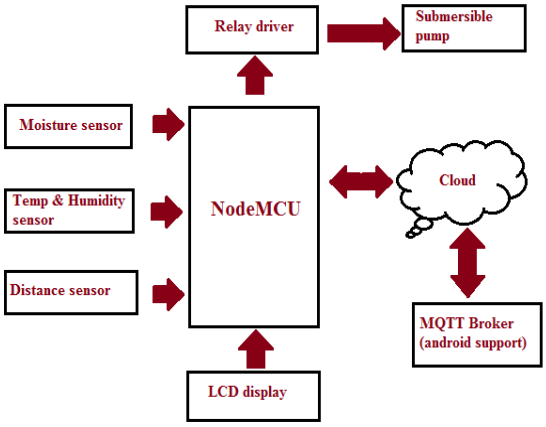

Fig.1: Flow of the system

The programming is done in such a way if the moisture level is below the [5] reference point the pump connected to the relay deriver is tripped and the water starts flowing in to the fields . Distance sensor is connected to the farm entrance whenever there is an intruder the buzzer connected to it is triggered and the notification is sent to the server and a notification is sent to the user. This data can be seen on the server anytime.

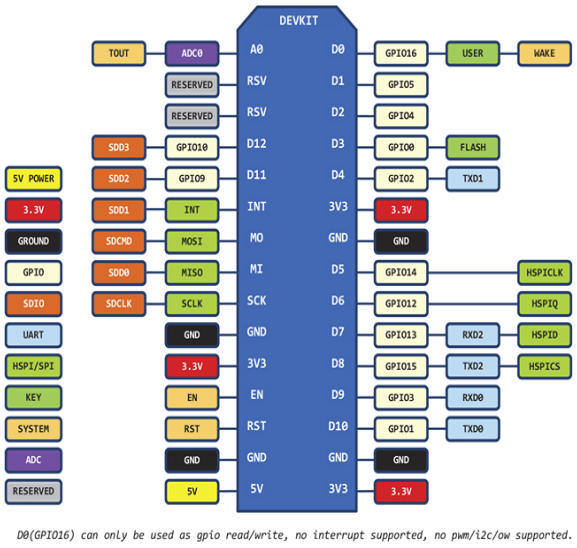

Fig 2: Pin configuration of NodeMCU

The ESP8266 is an appealing, low cost WiFi module suitable for adding WiFi functionality to an existing microcontroller project via a UART serial connection. NodeMCU [4] has 33 gpios and 1 analog pin. Its clock speed 80MHz/160MHz. It consists Flash of 4MB The power saving architecture operates mainly in 3 modes: active mode, sleep mode and deep sleep mode.

SL NO	COMPONENT	PIN TYPE	PIN NUMBER CONNECTED TO NODE MCU
1.	Moisture sensor	Analog pin	A0
2.	Temperature and Humidity sensor	Digital	D7
3.	Distance sensor	Digital	D5 and D6
4.	Relay driving unit	Digital	D2

Table-1:pin connection details

By using upgraded power management techniques and logic to power-down functions not required and to control switching between sleep and active modes, ESP8266EX use up about than 60uA in deep sleep mode (with RTC clock still running) and less than 1.0mA (DTIM=3) or less than 0.5mA(DTIM=10) to stay connected to the access point.

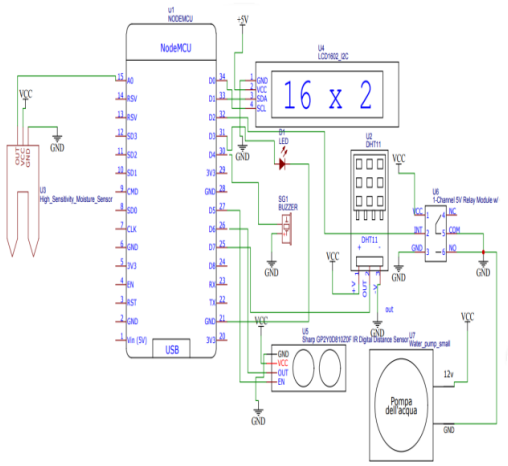

Fig.3: Circuit diagram of the system

III. ALGORITHM OF THE PROPOSED SYSTEM

Embedded C language will be used for developing the firmware which is finally programmed/burned into the flash memory of the Microcontroller ESP8266.

• For embedded project, C language programming is fairly efficient and supports access to I/O Controls.

• The Microcontroller reads the analog signal from the Moisture sensor through built in ADC channel and converts the data appropriately.

• Microcontroller monitors the water level (digital input) and analyze/compare the moisture data with the configured set value by the user and controls the DC motor operation accordingly.

• When sensors are activated motors turn ON and field gets auto irrigated. Once the humidity sensor reaches the particular level the system takes steps to stop the [7] water flow.

FLOWCHART:

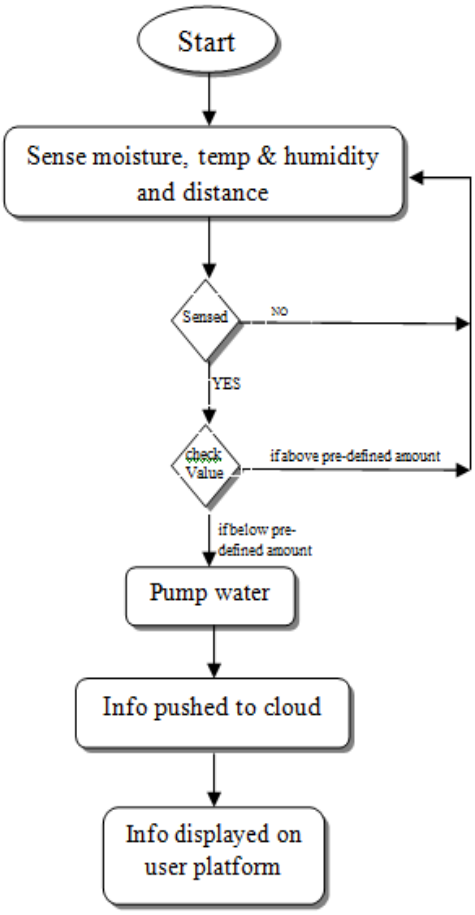

Fig.4: Flowchart of the proposed system

IV. SOFTWARE SPECIFICATION

In order to program the Node MCU we will need an IDE (Integrated Development Environment), where the programming takes place. A compiler, where our program gets converted into MCU readable form called HEX files. An IPE (Integrated Programming Environment), which is used to dump our hex file into our MCUs.

1. The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of list/menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Arduino is an open source electronics platform based on easy-to-use hardware and software. Arduino IDE is designed to provide users with a continous workflow, arduino create connects the dots between each part of a developer's from inspiration to implementation.

2. Embedded C: It is most popular programming language in software field for developing [3] electronic products. Each processor used in electronic system is associated with embedded software.
   Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C

V. RESULT

The final model of the project is as shown below. The circuit board is connected to the water supply which has submersible pump controlling

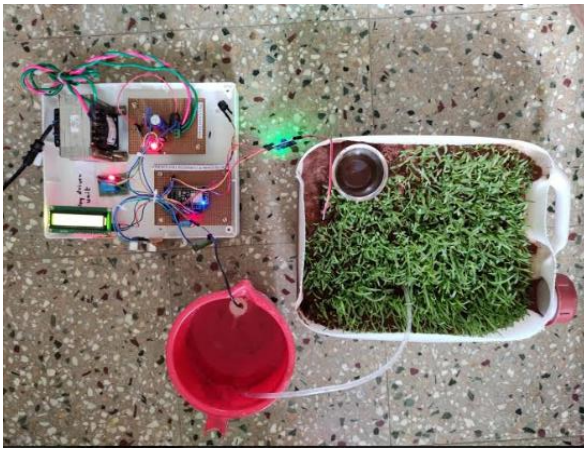

fig.5: Hardware model of the system

the water level in the crop field. The power supply is turned on providing energy to drive the circuit. Initially the motor remains to be in the off state. The value of moisture, distance, temperature and humidity are continuously evaluated and are displayed individually on the LCD screen giving the discrete values of the information required. The moisture content shown is measured as g/cm^3 which is also the unit of humidity.

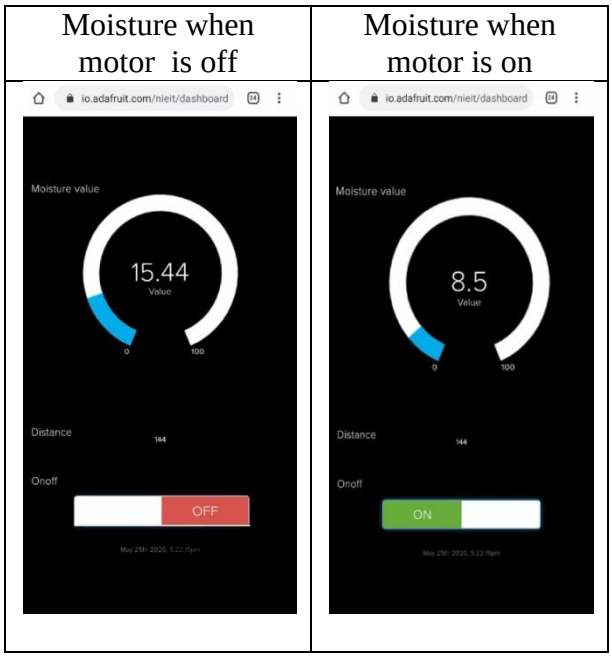

Fig.6: Adafruit dashboard displayed

But the sensor measures the value in percentage itself. Distance of the predator is given in Centimeters(cm).whereas the temperature is given Celsius(°C). This information [6] measured is also continuously updated to the server through the MQTT platform using Adrafruit.

VI. CONCLUSION

The Soil moisture content based irrigation system was developed and successfully implemented. This proposed system is very effective in the field for irrigation, Environmental parameters monitoring and predator detection. The prediction of the crop in the field is also very accurate due to the use of ph sensor. Due, to the prediction of the crop to be grown the productivity of the crop will be more. This is very useful for the farmers for monitoring the situation of the field without going to the field. This system is very much helpful for the rice crops as it requires much water than the other crops. This system also will be useful for any type of crop. The developed system is of low cost and consumes less power due to the usage of NodeMCU as micro controller.

VII. REFERENCES

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