Iot Based Smart Agriculture

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Abstract -- Internet of Things (IoT) is propagating and blooming technology, in the present years. IoT is the collection of the sensor data through embedded system and this embedded system uploads the data on internet. Fuelled by machine-to-machine (M2M) communications, the Internet of Things (IoT) is all about connecting a wide range of internet-enabled devices – from cars, lighting, smart meters and more – that generate actionable data. In the print industry, proactive maintenance and support is nothing new. Crop farming in India is labour intensive and obsolete. Farming is still development on techniques which were evolved hundreds of years ago and doesn't take care of conservation of resources. My project is to give cheap, reliable, cost efficient and easy to use technology which would help in conservation of resources such as water and also in automating farms. We proposed use of temperature, moisture, humidity and pH sensor at suitable locations for monitoring of crops. The sensing system is based on a feedback control mechanism with a centralized control unit which regulates the flow of water on to the field in the real time based on the instantaneous temperature, moisture, humidity and pH values. Thus by providing right amount of water we would increase the efficiency of the farm. As per the need of crop controller take the decision to make irrigation ON or OFF using arduino NodeMCU .

Index Terms- Internet of Things (IoT), NodeMCU, Sensors, Thingspeak

I. INTRODUCTION

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other objects to connect and items embedded with electronics, software, sensors, a ctuators, and connectivity which enables these exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

AGRICULTURE uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial, and institutional improvement. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the papers signifies the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The paper aims at making agriculture smart using automation and IoT technologies.

The highlighting features of this paper includes smart transmission of data using cloud (Thingspeak). . Secondly, it includes smart irrigation with smart control based on real time field data. Thirdly, smart warehouse management which includes; temperature maintenance, humidity maintenance, soil moisture maintenance and pH maintenance.

II. PROPOSED PROJECT

The aim of the project is to enable the smart agriculture which means to reduce the man power & problems in cropping or any agriculture farms. And the data is right away to the required place of need using the internet of things (IoT). The project uses a Node MCU along with the wi-fi module with the capability of connecting to the network.

Fig.1 Smart Agriculture Farm

The NodeMCU is initialized and synchronized with different sensors and make a possible way to act like a mini system to control the Farm from any possibly anywhere in the world with the help of any smart device or tool by using the one of the cloud network named as Thingspeak.

The system enables ease of access to information that is to be immediately reached as well because we live in an era where internet is reaching the destination faster than a clock ticking for a second. So this enables sharing data easier and cheaper.

III. IMPLEMENTATION

3.1 *NodeMCU* : NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 wi-fi soc from Espressif Systems and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits.

NodeMCU was created shortly after the ESP8266 came out. In the beginning the firmware uses the Lua scripting language. After the summer 2015 the creators abandoned the firmware project and a group of independent but dedicated contributors took over. By summer 2016 the NodeMCU included more than 40 different modules. Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.

Fig.2 NodeMCU

The NodeMCU uses a advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware. There have been various versions of the NodeMCU hardware advancing itself for every succeeding version.

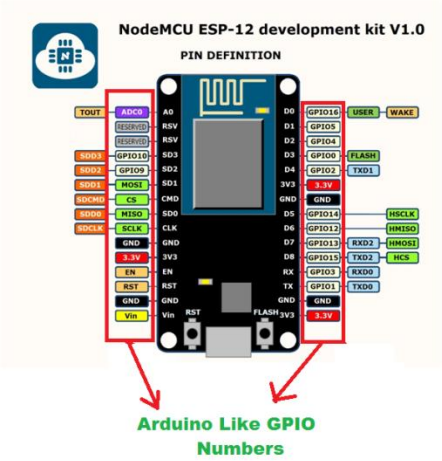

Fig.3 Pin Out Of NodeMCU

We use less than $2 wi-fi MCU ESP8266 integrated and easy to prototyping development kit. The development kit based on ESP8266, integrates GPIO, PWM, IIC, 1-wire and ADC all in one board. Power your development in the fastest way combinating with NodeMCU firmware.

3.2 DHT11: The DHT11 is a temperature and humidity sensor. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, NodeMCU, etc. DHT11 is a low cost humidity & temperature sensor which provides high reliability and long term stability.

Fig.4 DHT11 Sensor

DHT11 sensor can measure a humidity value in the range of 20-90% of relative humidity (RH) and Temperature in the range of 0-50^{0}c.

It gives out digital value and hence there is no need to use conversion algorithm at ADC of the microcontroller and hence we can give its output directly to data pin instead of ADC. It has a capacitive sensor for measuring humidity. The only real shortcoming of this sensor is that one can only get new data from it only after every 2 seconds.

3.3 Moisture Sensor *:*

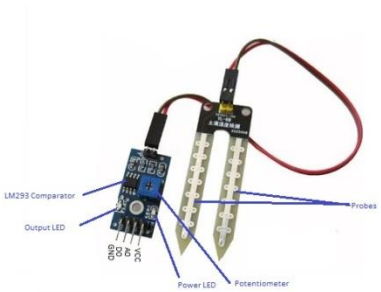

Fig.5 Moisture Sensor

Soil moisture sensor measures the water content in soil. It uses the property of the electrical resistance of the soil. The relationship among the measured property and soil moisture is calibrated and it may vary depending on environmental factors such as temperature, soil type, or electric conductivity. Here, It is used to sense the moisture in field and transfer it to microcontroller in order to take controlling action of switching water pump ON/OFF.

3.4 pH sensor : The pH sensor module consist of pH sensor called as pH probe and a signal conditioning board which gives an output which is proportional to the pH value and can be interfaced directly to any microcontroller.

Fig.6 pH Sensor Module

The pH sensor components are usually combined into one device called combination pH electrode. The measuring electrode is usually glass and quite fragile. Recent developments have replaced the glass with more durable solid-state sensors. The preamplifier is a signal conditioning device. It takes the high impedance pH electrode signal and changes it into a low impedance signal which the analyzer or transmitter can accept. The preamplifier also strengthens and stabilizes the signal, making it less susceptible to electrical noise.

The pH and ORP probes are both used for measuring the acidic intensity of liquid solutions. A pH probe measures acidity on a scale from 0 to 14, with 0 being the most acidic and 14 being the most basic. Similarly, an Oxidation-Reduction Potential (ORP) probe returns a voltage proportional to the tendency of the solution to gain or lose electrons from other substances (which is linked directly to the pH a substance).

IV. CLOUD

4.0 Thingspeak : Open source data platform and API for the Internet of Things. The internet of Things provides access to a broad range of embedded devices and web services. ThingSpeak is an open data platform and API for the Internet of Things that enables you to collect, store, analyze, visualize and act on data from sensors or actuators such as Arduino, Raspberry- Pi, Beagle Bone Black and other hardware. For example, with ThingSpeak you can create sensor-logging applications, location-tracking applications and a social network of things with status updates, so that you could have your home thermostat control itself based on your current location.

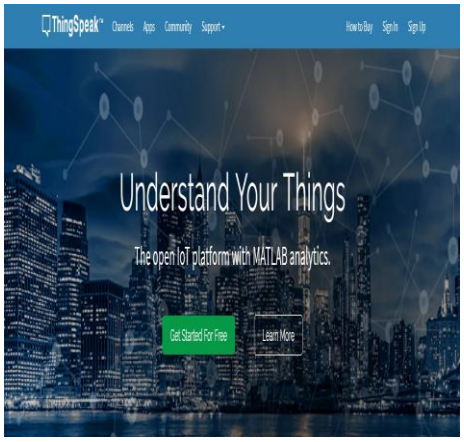

Fig.6 ThingSpeak Home Page

ThingSpeak channels store data sent to them from apps or devices. We have created our channel as weather monitoring system with four fields – Temperature, Humidity and LDR which represents the values that are taken from sensors in graphical format.

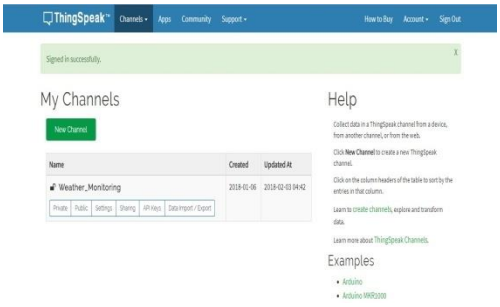

Fig.7 Channel Creation

API Key enables you to write data to a channel or read data from a private channel. API keys are auto-generated when you create a new channel

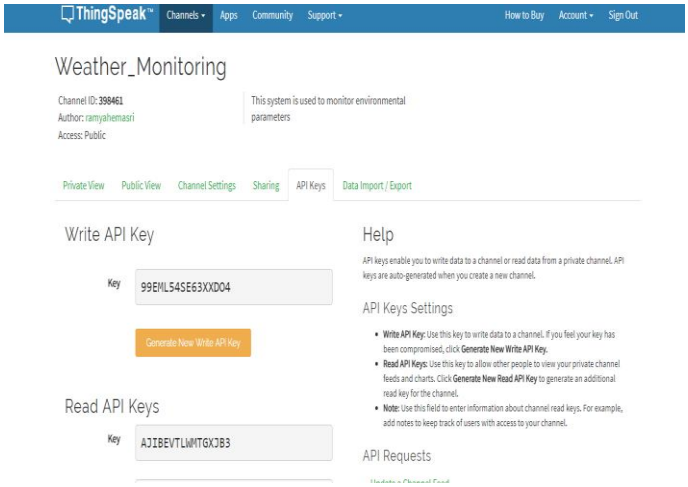

Fig.8 API Keys

V. RESULT

The below figure depicts the output of the moisture sensor when there is moisture in the soil/field and Temperature, Humidity,pH values.

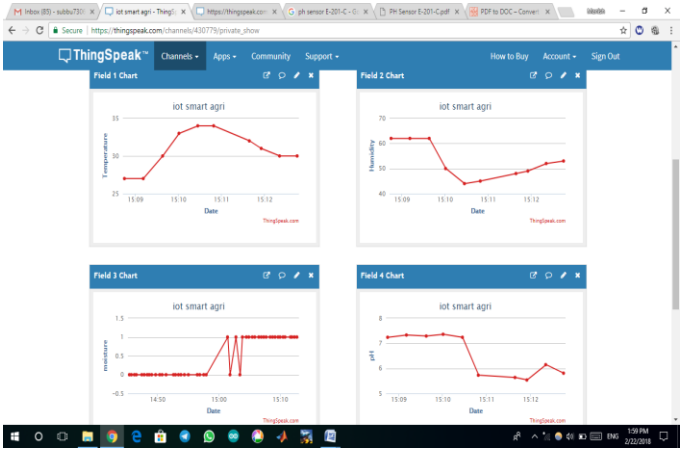

Fig.9 Result of sensors

VI. CONCLUSION

The sensors and microcontrollers of all Nodes are successfully interfaced with NodeMCU and thingspeak is achieved between various Nodes.

All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and smart irrigation system and a smart warehouse management system respectively. Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

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