IoT Based Agriculture Monitoring and Smart Irrigation System Using Raspberry Pi

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Abstract - *IOT is a shared Network of objects where these objects interact through Internet. One of the important applications of IOT is Smart Agriculture. Smart Agriculture reduces wastage of water, fertilizers and increases the crop yield. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring these parameters the irrigation system can be automated if soil moisture is low.*

Key Words: *Soil moisture sensor, IOT, Cloud networking, Wi-Fi networking, Raspberry Pi*

1. 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. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity . Hence, automation must be implemented in agriculture to overcome these problems. In order to provide solution to such problems, it is necessary to develop an integrated system which wills improve productivity in every stage. But, complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level, it is not given to the farmers as a product to get benefitted from the resources. Hence, this paper deals about developing smart agriculture using IoT and given to the farmers.

1.1 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. After 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 . Some of the research attempts are done for betterment of farmers that provide systems which use

technologies helpful for increasing the agricultural yield. The cloud computing devices create a whole computing system from sensors to tools that observe data from agricultura l field and accurately feed the data into the repositories .This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigaton system through wireless communication technology. It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture ,Humidity , temperature from various locations of field and as per the need of crop water motor is enabled .It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural purposes.

1.2. System Overview

The project consists of four major components; RaspberryPi, DHT11Sensor, Soil Moisture Sensor, Relay . The block diagram is shown below:

Block Diagram
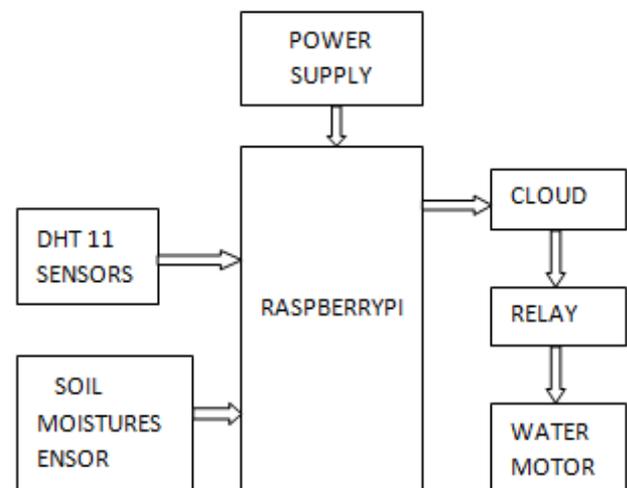
Hardware Used:

a) Raspberry Pi:

The Raspberry Pi is small pocket size computer used to do small computing and networking operations. It is the main element in the field of internet of things. It provides access to the internet and hence the connection of automation system

with remote location controlling device becomes possible. Raspberry Pi is available in various versions. Here, model Pi 2 model B is used and it has quad-core ARM Cortex-A53 CPU of 900 MHz, and RAM of 1GB. it also has: 40 GPIO pins, Full HDMI port, 4 USB ports, Ethernet port, 3.5mm audio jack, video Camera interface (CSI), the Display interface (DSI), and Micro SD card slot.


b) DHT 11 Sensor:

The DHT11 is a basic, low-cost digital temperature and humidity sensor. It gives out digital value 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.

c) Soil Moisture sensor(YL-69):

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 varies 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 raspberry pi in order to take controlling action of switching water pump ON/OFF.
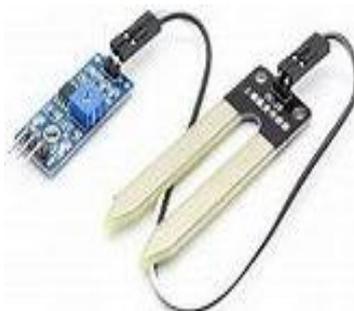
d)Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

SOFTWARE USED:

a)Python:

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, and a syntax that allows programmers to express concepts in fewer lines of code,[25][26] notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

b) ThingSpeak:

ThingSpeak is an open source Internet of Things application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates.

ThingSpeak was launched as a service in support of IoT applications.

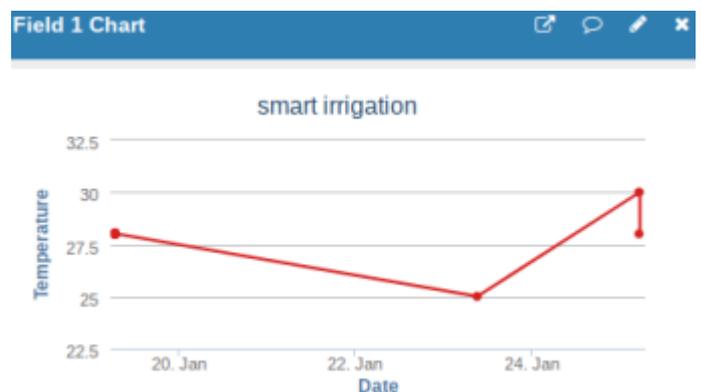**2. Graph Plots**: The outputs of sensors are shown below:

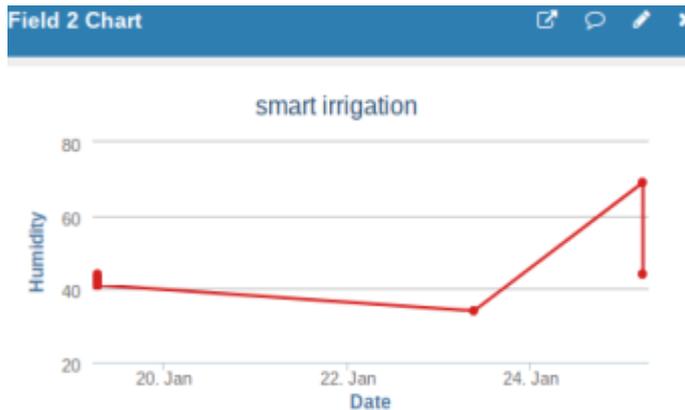**Chart -1**:Temperature Measurement

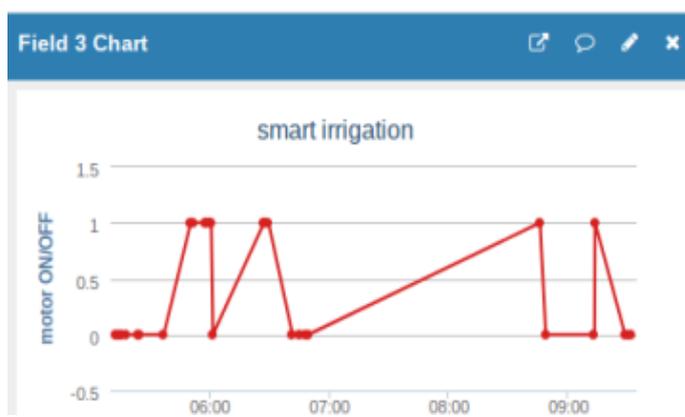**Chart-2:**Humidity Measurement

Chart-3: Moisture Measurement

The sensors are connected to raspberry pi and power supply is given. The raspberry pi reads the values from Sensors and posts the information to the cloud server. If the values are less than the already set threshold values, then the relay gets ON, and the relay switches ON the motor. The motor stays in ON condition till the factor that is less than the threshold value reaches the threshold value. When the threshold value is reached, the relay automatically switches off the motor. The connections of the experiment are shown below.

CONCLUSION:

The sensors are successfully interfaced with raspberry pi and wireless communication is achieved.

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.

FUTURE SCOPE:

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.

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