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MOISTURE AND PH DETECTION USING SENSORS AND AUTOMATIC IRRIGATION SYSTEM USING RASPBERRY PI BASED IMAGE PROCESSING

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Abstract:

India's population rate is increasing day by day. In near future, we could face serious problem of food and other daily necessities, hence the development of agriculture is necessary. Today, the farmers are suffering due to inconsistent rains and scarcity of water. The main objective of this paper is to provide an automatic irrigation system, thereby saving their time, money & power of the farmer. The traditional farm-land irrigation techniques require manual intervention. With the automated technology of irrigation, the human intervention can be minimized. There will be moisture sensors installed on the field. Whenever there is a change in water content of soil these sensors sense the change gives an interrupt signal to the micro-controller. As soil is recognized as one of the most valuable natural resource whose pH property used to describe the degree of acidity or basicity which affect nutrient availability and ultimately plant growth. For capturing the images, a camera is used and after processing the captured image the pH value of the soil is determined and accordingly crops or plants are suggested that can be grown in the field. Due to detection of soil pH value, we can reduce the chances of crops being destructed.

Keywords: Runoff; SDK; Solenoid.

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1. Introduction

The irrigation systems which are currently in use are manually operated. Those systems are replaced with an automated concept of irrigation to use the water efficiently and effectively. Sensor based Automatic Irrigation System is based on soil moisture sensor that will measure the level of moisture in the soil and send the signal to Raspberry pi system and accordingly it will irrigate the crops. The Raspberry pi plays the role of Microcontroller here. It will compare the values received from moisture sensor with the predefined moisture levels already stored in the system. Based on the values received from the sensors, the Raspberry pi will turn the irrigation system ON/OFF. It will also provide the functionality of calculating the pH value of soil. pH is a term that is used to describe the degree SOF acidity or basicity. The Raspberry pi uses pi camera

for capturing the images of the Soil and after calculating the pH values, particular crops that can grow in the field are suggested to the farmers.

1.1. Motivation

India's population has reached beyond 1.2 billion and it is increasing day by day then, so the development of agriculture is necessary. Today, the farmers are suffering from the lack of rains and scarcity of water. That's why, to fulfill this need we are motivated to develop this project. The main objective of this paper is to provide an automatic irrigation system which would be great improvement over current systems. The traditional farmland irrigation techniques require manual intervention. With the automated technology of irrigation, the human intervention can be minimized.

1.2. Literature Survey

As we went through some relevant papers, we found that GSM Based Automated Irrigation Control using Rain Gun Irrigation System [1] mentioned about using micro-controller based rain gun irrigation system in which irrigation will take place only when there will be intense requirement of water that can help save a large reserves of water. This system brings a change to management of field resources where they developed software on stack .Here, Android was used because it is compatible to mobile devices which include an operating system, middle-ware and key applications. Here, they used software called Android SDK which provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Mobile phones have almost become an integral part of us serving multiple needs to human. This application makes use of the GPRS feature of mobile phone as a solution for irrigation control system. These systems used to cover lower range of agricultural land and were not economically affordable. This system supports excess amount of water in the land and uses GSM to send message and also an android app is being used as a methodology to overcome under irrigation and over irrigation that causes leaching and loss of nutrient content of soil. They have also promised that micro-controller used can increase system life and lower the power consumption. There system is just limited to the automation of irrigation system and lacks in innovative features.

2. Project Statement

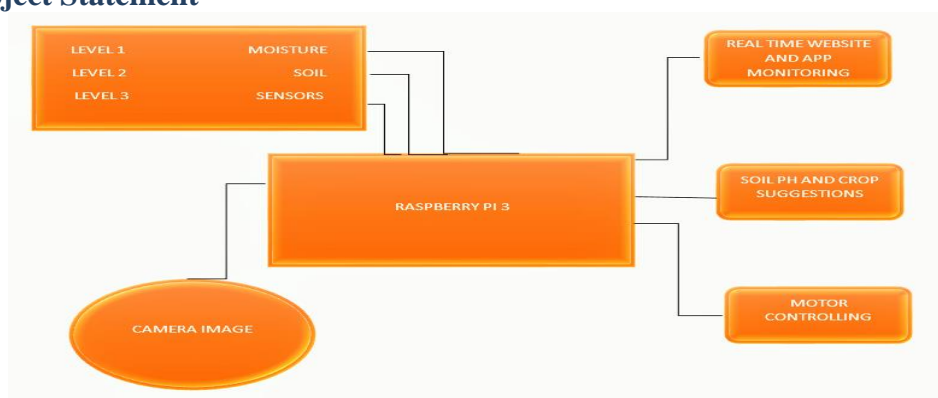


Figure 1: Block Diagram

The main objective of this project is to provide an automatic irrigation system there by saving time, money and power of the farmer. With the automated technology of irrigation, the human intervention can be minimized. Whenever there is a change in water content of soil the moisture sensors sense the change and gives an interrupt signal to the microcontroller. Here, three soil moisture sensors will be interconnected to one another in top to bottom fashion i.e. level 1 (Top sensor), level 2 (mid-level sensor), level 3(deep sensor). They will be kept immersed dipped in soil. Sensors will detect the moistures in three ways: If top sensor detects moisture the irrigation system will remain off. If top sensor didn't detect moisture but mid-level sensor detects the system will be off. But if both the top sensors didn't detect moisture then the irrigation will get started for a period even if the deep sensor detects some moisture. This moisture data i.e. the notifications will be sent on the cloud using IOT which can be accessed by website. The system will continuously send the data on the cloud. These data can also be accessed using Bluetooth on android app if there is no internet present. The farmer can control the irrigation system through the android app.

2.1. Innovation

Soil is regarded as one of the most valuable natural resource whose pH property is used to determine the degree of acidity or basicity which affect nutrient availability and plant growth. For capturing the images, Pi camera is used and after processing the captured image the pH value of the soil is determined and accordingly crops or plants are suggested that can be grown in that field. This second system will give information to farmers about the particular crops that can be grown in their field. The previous systems used to consume excess amount of water and resulted in water wastage. Installing this automatic irrigation system and determining the pH value would reduce time consumption and ensures judicious usage of water, which would result in farmers getting educated about suitable crops can be grown in his field. This system can work in area where there is no regular supply of electricity. The system reduces human intervention therefore it results in less human labor. In future, Artificial Intelligence can be used to automatically learn the pattern of watering the crops and improving the overall yield.

3. Results

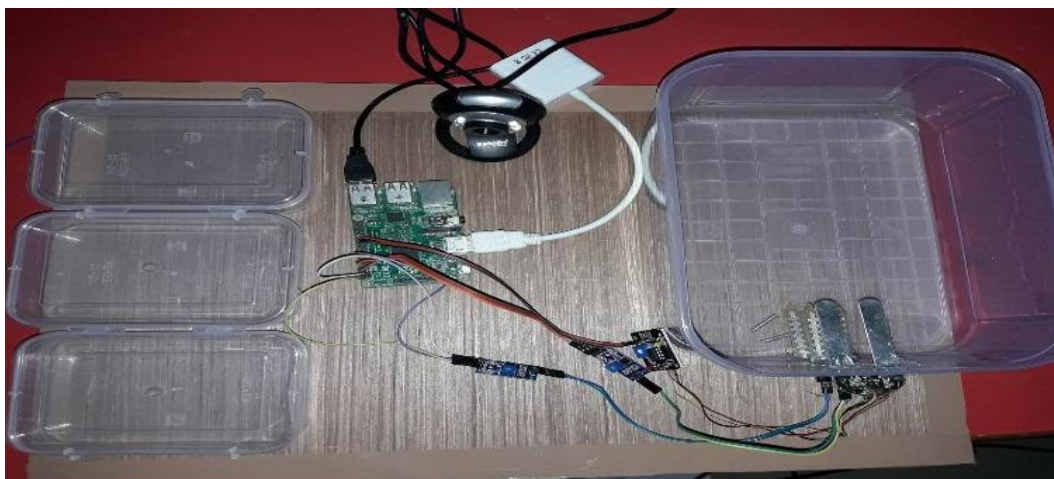


Figure 2: Working Model [2]



Figure 2: pH Detection using PI camera [2]

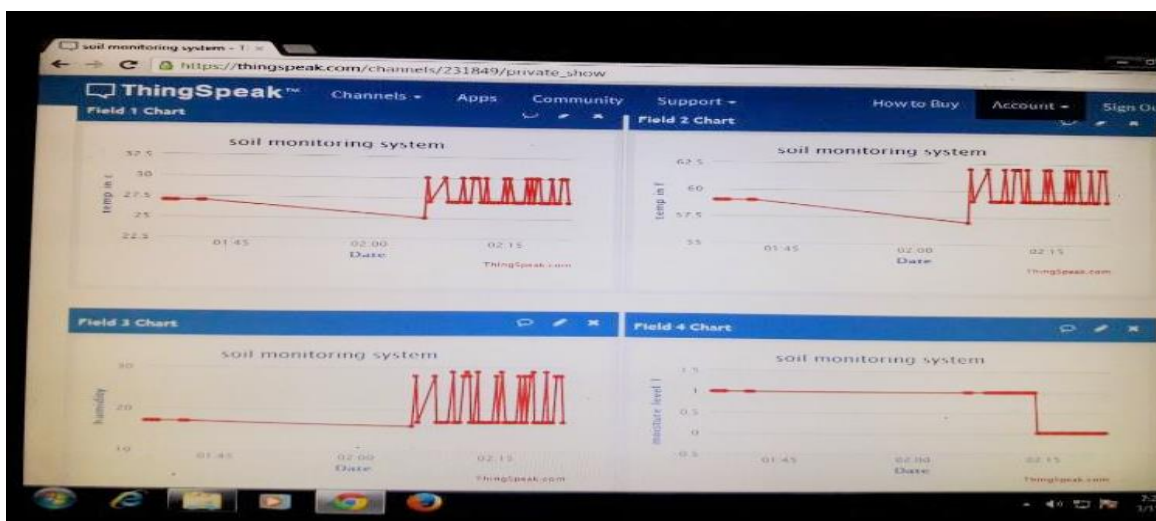


Figure 2: Analysis on ThingSpeak [2]

4. Conclusion

The previous systems used to consume excess amount of water and resulted in water wastage. Installing this automatic irrigation system and determining the pH value would reduce time consumption and ensures judicious usage of water, which would result in farmers getting educated about suitable crops can be grown in his field. This system can work in area where there is no regular supply of electricity. The system reduces human intervention therefore it results in less human labor. In future, Artificial Intelligence can be used to automatically learn the pattern of watering the crops and improving the overall yield.

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