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Smart Irrigation System

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ABSTRACT

The motivation for this paper came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farm land has a water-pump, manual intervention by farmers is required to turn the pump on/off whenever needed.
The aim of our paper is to minimize this manual intervention by the farmer, 1) as there is no un-planned usage of water, a lot of water is saved from being wasted. 2) The irrigation is the only when there is not enough moisture in the soil and the threshold value decides when the pump should be turned on/off, saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don't have to go and turn the pump on/off manually.
Keywords : Raspberry pi, connected farm, Android app, Wi-Fi module, Soil Moisture Sensor, Temperature Sensor.

I. INTRODUCTION

The smart farm, embedded with IOT systems, could be called a connected farm, which can support a wide range of devices from diverse agricultural device manufacturers. Also, connected farms could provide more intelligent agricultural services based on shared expert knowledge. For example, people having even little experience on farming could grow plants or crops for profits.

Green House Monitoring and Controlling is a complete system designed to monitor and control the soil moisture and temperature inside a green house. Our proposed system uses an Android mobile phone, connected using Wi-Fi/internet to a Raspberry pi which connects via serial communication to a processor, soil moisture sensor and temperature sensor. Green house farmers cannot precisely detect level of soil moisture and temperature inside the green house. Ultimately, experiences play a bigger part on their daily operations. If the condition is too dry, they will give water to the plants or soil, but if it is too humid, they will open the fans of the green house, especially in the daylight. When the soil moisture sensor-reach a certain threshold, the soil moisture sensor will send a signal to raspberry pi which will then process the signal and communicate it to the mobile.

II. METHODS AND MATERIAL

In this paper we are proposing following components for detecting temperature and soil moisture

1. Raspberry pi
2. Sensors
3. Android app

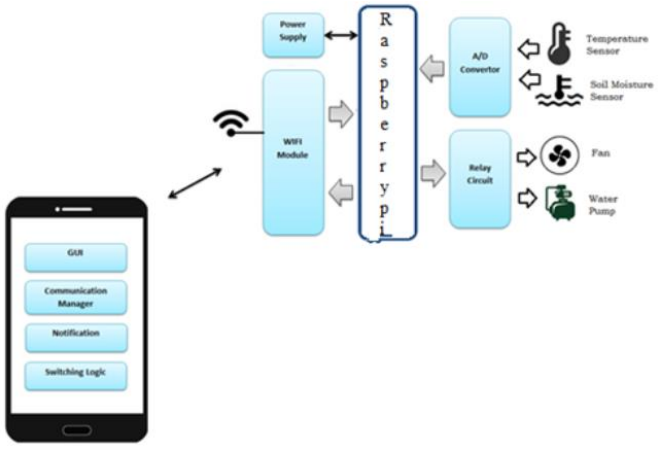

Figure 1 : System Architecture

1. Raspberry Pi:

Raspberry Pi acts as minicomputer. It is having own internal and external memory. In that we install any operating system like Linux/Unix. Temperature and soil moisture sensor connected to raspberry pi and they send signal to raspberry pi. Sensor values are compared with threshold value given or set by user.

2. Sensors:

(a) Soil moisture sensor:

The soil moisture sensor is used to measure the volumetric water content of soil. It is used to monitor soil moisture content to control irrigation in greenhouse. A moisture sensor is used to sense the level of moisture content present in irrigation field. It has a level detection module in which we can set a reference value.

(b) Temperature Sensor:

The temperature sensors are necessary to reduce the watering times when the weather gets cooler and less water is needed. Then as the weather begins to warm up, to add more watering time.

3. Android App:

Client will be android based application and this module will be responsible to take inputs from user. The GUI is developed in XML. Raspberry pi input will be taken through this GUI.

Application/Usefulness

- Low cost solution for implementation and adorable to farmers.
- Automatic time provisioning alerts on instant climate parameter variations.
- Analysis of various environmental/climate parameters like Soil Moisture Level, temperature and humidity.
- Use of renewable energy source i.e. Solar Energy to power the devices in day time.

Remote operations on Green House Devices.

III. RESULT AND DISCUSSION

A. Breakdown Structure (Modules)

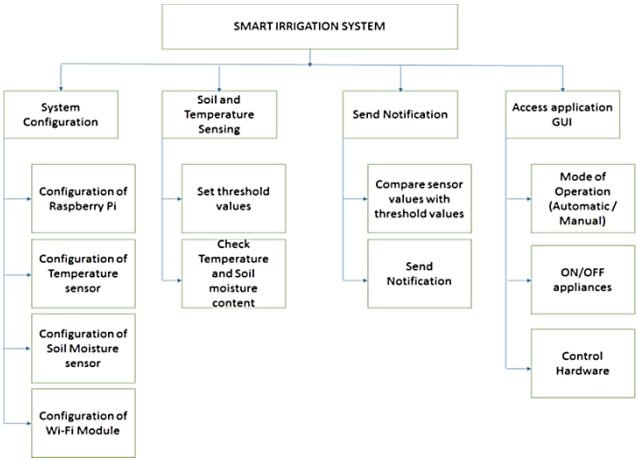

Figure 2: System Breakdown Structure

1. System Configuration:
   System configuration module is used to configure all the hardware devices. Soil moisture sensor, Temperature sensor, Wi-Fi module all are connected to major component called as Raspberry pi , initially we required to install Raspbian operating system on raspberry pi and related gpio connection with soil moisture sensor, Temperature sensor.
2. Soil moisture and Temperature sensing: Soil moisture sensor and Temperature sensing use analyze the moisture content in soil and weather temperature, according to the values of sensor further decision will be taken.
3. Send Notification: Once the values of sensors are become less/ greater than threshold then it send offline alert message to user mobile using Wi-Fi module.
4. Access Application GUI:
   Once the message come to the mobile phone user will launch the mobile App and see the following option to fetch information.
   - Mode (Automatic/Manual).
   - Automatic system turns ON/OFF will make system ON/OFF as per their convenience.
   - System turns ON/OFF.
   - Control hardware.

B. **Algorithm**

1. Start.
2. Temperature is detected using temperature sensor.
3. Moisture content in soil is detected using soil moisture sensor.
4. When sensor values condition is satisfied then send alert message to owner phone.
5. As per user mode that is automatic and manual next decision will be taken.
6. If mode is automatic then automatic system turns ON/OFF will make system ON/OFF
7. as per their convenience.
8. And if mode is manual then system turns ON/OFF will make using input from user application.
9. User launch APP and it will display following option-
    a. Mode.
    b. System turns ON/OFF.
    c. Control hardware.
10. User will take corrective action on particular situation.
11. Stop.

IV. CONCLUSION

The paper as the name indicates, “Smart Irrigation System” provides an attractive user interface. This paper gives the idea to maintain the soil moisture content and temperature in a farming area and the user can control Sprinkler using Android phone/tab. This paper is based on Android and raspberry pi platform both of which are Free Open Source Software. So the overall implementation cost is cheap and it is an orderable by a common person. Looking at the current scenario we have chosen Android platform so that most of the people can get benefits. The design consists of Android App by which user can interact with the android phone and send control signal to the raspberry pi which will control sensors also raspberry pi monitor the environment. Thus user can control their farm from remote location by using Android mobile.

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