

Automated Irrigation System using IoT

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Abstract: Agriculture is the main building block of every country. Efficient use of water is necessary. In different season amount of water required for plants are different. Suitable amount of water to crops can play important role for quality of product. In traditional system of irrigation, a stream of water is used which flows from one end to other or sprinklers are used. In both the methods there is manual control over amount of water given to crops. This paper proposes the automated irrigation system which will automate the process of giving sufficient amount of water to crops. This will reduce the human work and optimize the water usage which will increase the quality and productivity of crops. In this paper we propose system which uses Tiva-tm4c123g Launchpad with soil moisture sensor and cc31000 Wi-Fi booster pack. Our system is connected with internet by using which system will notify the customer about the pump status.

Keywords: Enter key words or phrases in alphabetical order, separated by commas.

1. Introduction

Agriculture is the main building block of every country. Agriculture field uses around 80% of fresh water resources. Because of increasing population and food demand, this percentage will increase continuously. Due to this, efficient water management is the major concern in many cropping system. To optimize water use for agricultural crops, an automated irrigation system is proposed.

There are two situations which can occur in farming that are under irrigation and over irrigation. Over irrigation occurs because of excess distribution water. Under irrigation occurs because of poor distribution of water. To overcome these problems and to reduce the man power smart irrigation system has been used. In the design of model irrigation system is based on low power consumption TIVA-C Launch-pad. The soil moisture sensor will sense the amount of water present in the soil. According to the values given by soil moisture sensor, pump will turn ON or OFF. System will also notify the farmer about status of pump by sending the email by using Wi-Fi module. This will reduce man-power and save time.

2. Literature survey

[1] Vidadala Srija, P. Bala Murali Krishna "Implementation of agricultural automation system using WEB & GSM technology "Vidadala Srija et.al./ International Journal of

Engineering & Science Research (2015): Using WEB and GSM technology implementation of agriculture automation system is done. To design and develop a low cost system which is based on embedded platform for agricultural automation is the main purpose of this project. Optimum usage of available water resources is main objective of this system. This project uses soil moisture sensor and temperature sensor to detect the water quantity present in soil and water level sensor is used for detecting water level in resources. In this system by using WEB and GSM technologies we can monitor the status of sensor. In this temperature sensor, soil moisture sensor and water level sensor can be monitored on web page through microcontroller and information will be send by SMS. This web page can contains all the information about the status of the all these sensors. This information can be monitored at remote location by using GPRS technology.

[2] Ch. Apparao, G.Ravi Babu A. Sambhaiah, L.Edukond "Development of Low Cost Soil Moisture Sensor for Drip Irrigation System"; 1.This system is reduces the water use because it provides irrigation as per the requirement of the soil and crop present in that soil. 2. As this system is automated irrigation system so it reduces the human interference. 3. This irrigation system was found to be cost effective for optimizing water resources for agricultural production. Using this system we can monitor the status of soil-moisture, Temperature, Water level sensor and the ON or OFF status of the motor.

[3] Sanjukumar et. al. (2013): The Soil moisture content based irrigation system was developed and successfully implemented which also includes flow sensor. Salient features of the system are: Closed loop automatic irrigation system with flow sensor, temperature monitoring and water usage monitoring. User can easily get the level of moisture present in soil and is regularly updated about current value of all Parameters of sensor on LCD display. In future, many other important soil parameters namely soil electrical conductivity, soil pH, will also be incorporated in this system.

[4] S. Muhammad Umair, 2R. Usman "Automation of Irrigation System Using ANN based Controller" International Journal of Electrical & Computer Sciences, one more simple approach to Irrigation control problem is using Artificial Neural Network Controller. By comparing the ON/OFF controller based system with proposed system we comes to know that

ON/OFF controller based system fails because of its limitations. On the other hand the ANN based implemented automated irrigation system can result into the better and efficient system. These controllers do not require any prior knowledge of system and have an ability to adapt to the changing conditions unlike conventional methods. It is noteworthy that this system can save energy and water and can provide optimized results to agriculture areas of all type.

[5] R.Suresh et al. (2014) “ IOT based Smart Irrigation System” International Journal of Computer Applications, Volume 159 – No 8, February 2017: mentioned system is about using automatic microcontroller based rain gun irrigation system in which the irrigation will be done only when there will be intense requirement of water. By using this system we are able to save a large quantity of water. These systems developed a software stack called Android which is used for devices that include an operating system, middleware and key applications. The Android SDK provides the tools and APIs which are necessary for developing applications on the Android platform using the Java programming language. Now-a-days Mobile phones have almost become an integral part of us serving multiple needs of humans. This application makes use of the GPRS feature of mobile phone as a solution for irrigation control system. These systems covered lower range of agriculture land and not economically affordable.

[6] Mahir Dursun’ and Semih Ozden [3]. Irrigation are help of freshwater resources in agricultural areas are very important because of highly increasing demand of freshwater, optimal usage of water resources has been provided with greater extent by automation technology such as solar power, drip irrigation, sensors and remote control. This paper describes an application of a wireless sensor network for low-cost wireless control irrigation solution of water content of soil. The designed system has 3 units namely: base station unit, valve unit and sensor unit. The obtained irrigation system not only prevents the moisture stress of trees but also provides an efficient use of fresh water resource.

3. Proposed system

Our proposed system would be automatic irrigation system. This will automate the process of providing appropriate amount of water to crops. This system will use soil moisture sensor to detect the amount of moisture in soil. Then this sensor will give information to the Tiva-tm4c123g Launchpad. The cc31000 Wi-Fi booster pack will be connected to the other Tiva-tm4c123g Launchpad which will send the email to the farmer. That another Launchpad will also give command to the relay to turn on the solenoid valve which further allows the water flow.

A. Advantages

- Conserves less power.
- Fully automates. Hence no need of human interference or continuous monitoring.
- Gardening flexibility.

- Completely automatic.
- Requires less power.

B. Applications

- Used in farms for automate the irrigation system in field.
- Can be used for automating in house gardening.
- Can be used in greenhouse.

4. System design

The basic building block of this project is as shown below

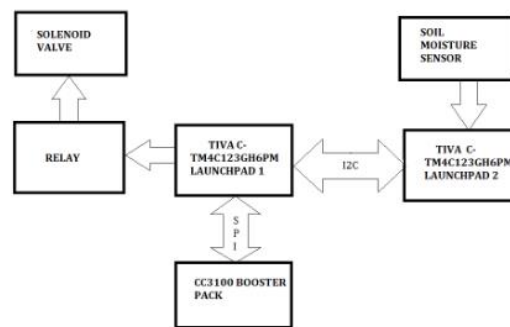


Fig. 1. Block diagram

1) Tiva- tm4c123g6pm

It is a high performance 32-bit ARM® Cortex®-M4F based MCU with 80-MHz processor. It has 64 pin LQFT with six physical GPIO blocks. This controller consumes very less power. In this project two Launchpad are used. Both are connected to each other. One Launchpad will act as a node to get information about soil moisture and other will act as a central point which will be connected to internet and water supply system.

2) CC31000 booster pack

This booster pack is directly mounted on one Tivac Launchpad. It helps the hardware system to connect to the internet. Farmer will get an email through this kit.

3) Soil moisture sensor

It detects the moisture in soil and give according values. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

4) Solenoid valve

Here we have used 24 V solenoid valve. It allows water to flow from its one end to other. Here we control the working of solenoid valve by using a relay. Controller will give command to relay which will turn ON or OFF the solenoid valve.

5. Flow chart

The logic of program used for this system is shown by using the flowchart given below:

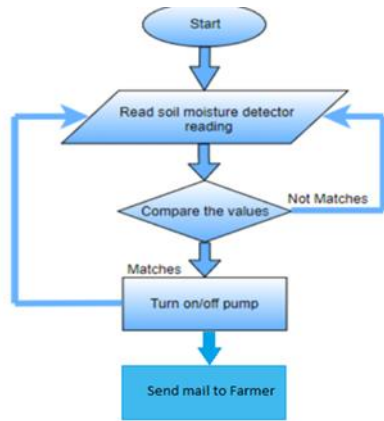


Fig. 2. Flowchart

6. Conclusion

Traditionally, farmer use irrigation system which is manually controlled, in which the farmers irrigate the land at regular intervals. This system consume more water hence results into water wastage. Here we proposed an automatic system which will monitor and control the water requirements in the field. Installation of this system is very easy. It ensures the proper use of water. This system uses microcontroller which reduce the power consumption and gives proper result.

7. Future scope

- Light sensor can be added to sense the light present in greenhouse and accordingly give crops light

- pH sensor can be added to sense alkalinity of soil and accordingly warn farmers to control the use of harmful chemical pesticides.
- A sensor can be added which will detect the attack of animals in the farm and accordingly turn on the buzzer.
- Water level sensor can be added to sense the water level in tank from which water will be provided to crops and give a notification to farmer or turn on pump automatically.
- Option of controlling the water pump can be given to the farmer.

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