ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.4

Automatic Smart Irrigation using Wireless Sensor Network and Raspberry Pi

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Abstract:
This paper illustrates the automatic smart irrigation system which can be used in increasing productivity and quality of crops. Due to global warming the natural cycle has changed totally which causes the failure of monsoon which is the main reason of the decreased ground water level. Moisture level of soil and humidity level of surrounding are the two very important aspects of irrigation process. In this automatic smart irrigation system, we have provided a raspberry pi-based system which detects the soil moisture level which will initially conserve water. It also calculates the humidity level of surrounding area and display it using LCD display. Even after production of good quality crops, the animals can ruin the production leaving farmers with great amount of loss. Therefore, to overcome this scenario PIR sensor is used which will detect any kind of motion and indicate the farmer. The python language is used for programming the raspberry pi.

Keywords: Raspberry pi, automation, Irrigation, sensors.

I. INTRODUCTION

Indian agriculture mostly depends on monsoon to cultivate the land. However traditional irrigation includes canals from river, ground water, well-based system, tanks and rainwater harvesting for agricultural activities. While depending on this traditional water resources the main problem arises is that some time there is shortage of rain in many parts of India. In many states like Maharashtra drought is the very common problem. Also more than 33% of crops are ruin by wild animals in India every hour. The intent of this project is to eliminate such problems by calculating the humidity level of the environment and by proper measure of moisture in soil and also to detect any movement by wild animals to increase the fertility of soil which will further increase the production of crops. The paper is intended to manifest the technology used in irrigation system which are used in most of the developed countries. Soil moisture sensor used to measure the moisture content of the soil, where temperature sensor used to detect the temperature of the soil. The main objective of this proposed system is an automated system which reduce the human efforts and increase the production of crops. The main objective of this proposed system is an automated system which reduce the human efforts and increase the production of crops. Further the work can be enhanced by making this system more advanced by alarming when the movement of the animals is detected by PIR sensor and also more developed sensors can be used to detect the quality of soil and parameters of the environment like humidity, temperature air flow rate etc. which is essential in proper irrigation.

II. LITERATURE SURVEY

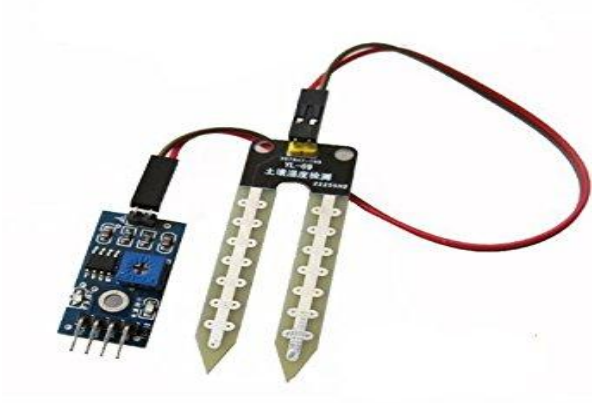
This project is basically based on IOT that is internet of things which transfer data over network without any involvement of human to human or human to computer interaction. After the IOT field found it dominance in our daily lives. This is a modern plan for designing a smart irrigation system in agriculture field. The main controller that is the Raspberry Pi 3 Model B which is the heart of the system. The Raspberry Pi 3 Model B is the latest version of the Raspberry Pi, a tiny credit card size computer. The GPU in the Raspberry Pi 3 runs at higher clock frequencies of 300 MHz or 400 MHz, compared to previous versions which ran at 250 MHz. Raspberry Pi board consist of 40 GPIO pins and external power provides reset switch USB plug etc. It is to be handled by the person who is beginner in the electronics field. [1] A Low Cost Smart Irrigation Control System Chandan Kumar Sahu proposed a system which includes a number of wireless sensors which are placed in different directions of the farm field. Each sensor is integrated with a wireless networking device and the data received by the "ATMEGA318" microcontroller which is on the "ARDUINO-UNO" development board.

III. COMPONENT DESCRIPTION

RASPBERRY PI

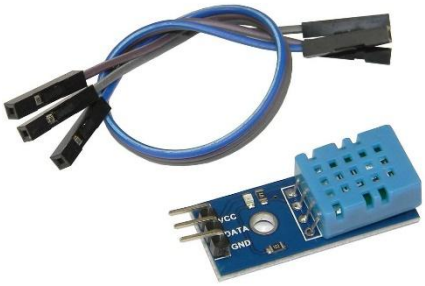
Raspberry Pi controller is used here. As the Raspberry Pi 3 supports HD video, you can even create a media center with it. It is fully HAT compatible and has 1GB RAM so you can run bigger and more powerful applications. Micro SD slot for storing information and loading operating systems. Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor powered Single Board Computer running at 1.2GHz. It has 40 pins extended GPIO to enhance projects.

SOIL MOISTURE SENSOR



Soil moisture sensors typically refer to sensors that estimate volumetric water content. It used copper electrodes to sense the moisture content of the soil. Its range is 0 to 45% volumetric water content in soil. It operates between –40°C to +60°C.

IV. TEMPERATURE AND HUMIDITY SENSOR DHT11



The DHT11 is a low-cost temperature and humidity sensor. It therefore measures both moisture and air temperature. It isn't the fastest sensor around but its cheap price makes it useful for experimenting or projects where you don't require new readings multiple times a second. The device only requires three connections to the Pi.

PIR SENSOR

A Passive Infrared sensor is an electronic sensor that measures Infrared radiation being emitted from objects in its field of view. A PIR based motion detector is used to detect the motion of people, animals, or other objects. They are commonly also called as Passive Infrared Detector

POWER SUPPLY

In this RaspberryPi has upgraded the power supply. The power supply takes the micro USB port voltage and creates the 5V USB and micro USB power input upgraded switched power source that can handle up to 2.5 Amps.

WORKING

Automatic smart irrigation is Raspberry Pi based device. It is used in agriculture field for irrigation purpose, which is used in most progressing countries. In these project, sensors are interfaced to raspberry pi. The Raspberry Pi Model 3 incorporates a number of enhancements and new features. This system is developed to improve power consumption, water consumption and increase connectivity. In this project raspberry pi cannot drive the relay directly. It has only 0 or 3.3 volts. Therefore, it needed electrochemical relay to drive which consist of 12V. In that case it uses a driver circuit which provides 12V amplitude to drive the relay. In this project sensors are interfaced with Raspberry pi 3, which is heart of the system. If the soil moisture value is above the moisture level then the motor will be off, that will indicate that no more water is required. We are using LCD display, two relay, pump, Bulb, sprinkle, and power supply. Soil moisture is used to conserve wastage of water where temperature and humidity sensor is to detect moisture of the soil. Sometimes farmer handwork destroys by pest so using PIR sensor we detect the motion of predator, which prevent crop from pest and insects. The thought of automation can be justified by their various benefits: literary of automation operations become more exact and timely the frequentness of the irrigation can be improved especially in wastage of water, as more and automation can be inserted in irrigation without the need for more operational staff, where the element of human error is taken out completely.

V. CONCLUSION

The automation irrigation system would control all the tasks and growth of the crops and performed irrigation system accurately. Using PIR sensor we can detect the motion of object and alert farmers. Researching and developing a working prototype enhance a self-confidence and assure that it is possible to design a system and apply it for solving a particular problem by acquiring the necessary information. Moreover, developing a prototype system can serve as a basis of a far more sophisticated and advance form of control system such as automatic smart irrigation system. In this project we have described how automatic smart irrigation can be automated with the help of paper presented above and its main advantages is increase in productivity, reduce water consumption and reduce soil erosion.

VI. REFERENCES

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