Automated Irrigation System-IoT Based Approach

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Abstract: **Agriculture is a major source of earning of Indians and agriculture has made a big impact on India's economy. The development of crops for a better yield and quality deliver is exceptionally required. So suitable conditions and suitable moisture in beds of crop can play a major role for production.. Mostly irrigation is done by tradition methods of stream flows from one end to other. Such supply may leave varied moisture levels in filed. The administration of the water system can be enhanced utilizing programmed watering framework This paper proposes a programmed water system with framework for the terrains which will reduce manual labour and optimizing water usage increasing productivity of crops. For formulating the setup, Arduino kit is used with moisture sensor with Wi-Fi module. Our experimental setup is connected with cloud framework and data is acquisition is done. Then data is analysed by cloud services and appropriate recommendations are given.**

I. INTRODUCTION

India is a horticultural nation, where population is over 1.2 billion, out of which around 70% of the population relies upon horticulture. Agriculture is a major source of earning of Indians and agriculture also has made a big impact on India's economy. Agriculturists have an extensive variety of assorted variety to choose reasonable products of the soil crops. Be that as it may, the development of these crops for ideal yield and quality deliver is exceptionally specialized. It can be enhanced by the guide of innovative bolster. The administration of the water system can be enhanced utilizing programmed watering framework This paper proposes a programmed water system with framework for the terrains which will reduce manual labour and optimizing water usage increasing productivity of crops. Presently the computerization is one of the critical parts in the human life which gives comfort as well as lessen burden and helps us to save time We plan to develop a framework that helps the farmer to automatically provide water to the plant according to its need and current water moisture present in the soil. A keen water system is developed with the help of moisture sensors and Arduino chips. In the system, we bury moisture sensor into the soil which would notify the system about amount of water present in the soil. With the help of a program, coded in C language, system will check the amount of water required by a plant, with predefined values in the program. If the moisture level is less than the amount of water needed by the plant, the program automates the flow of water from a submersible pump unless a threshold value is reached. This ensures that crop has been provided optimum amount of water without any manual labour or wastage. It improves efficiency of water usage, reduced cost of irrigation water, intelligent irrigation.

II. EMBEDDED SYSTEMS

Embedded systems are PC systems that is a piece of bigger systems and them play out a portion of the prerequisites of these systems. A few cases of such systems are auto portable control systems; mechanical forms control systems, cell phones, or, on the other hand, little sensor controllers. Embedded systems cover an extensive scope of PC systems from ultra-little PC based gadgets to extensive systems checking and controlling complex procedures. The overpowering number of PC systems has a place with embedded systems: 99% of all registering units have a place with embedded systems today.

A. ARDUINO

Arduino is an electronic platform built on easy to use hardware. It is a open source software. [1] Arduino UNO is one of the most easily available low-cost Arduino board. The Arduino is an embedded system. Various pins on the Arduino are used to read or write values on to the system. Many types of micro controllers are available in the market. Some of them are Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard that provide the same functionalities but Arduino holds the following advantage over them:

- Inexpensive
- Cross Platform (Linux, Mac OS, Windows)
- Simple clear programming environment

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- Open Source and Extensible software and hardware.

III. LITERATURE REVIEW

There has been quite a few research work going on the agenda of automation of irrigation systems. Various other technologies (different microprocessors, different algorithms) have been used to reach variety of conclusions. Various scientists have worked with programmed water sprinkling or water system framework. They picked distinctive measurements for deciding the soil condition and amount of water. They likewise examined about various wellsprings of energy for the sensors. Plus, the innovation for making system among the sensors and outline of control framework were additionally intensely talked about by the researchers. An article on the mechanized water supply framework for urban local locations appeared that such a framework can be utilized to adequately oversee water asset. [2]

The aim of this system is to modernize farming innovation by using programming segments and construct the necessary parts for the framework. The framework is ceaseless based and focuses the right condition of paddy field. There is one central centre used which to control another centre. The key limit of RF module is to pass the message to the centre point and work the system. [3]

IV. DESIGN OF SYSTEM

A. Soil moisture sensor:

The Soil Moisture Sensor (SMS) is a sensor associated with a water system framework controller that measures soil dampness content in the dynamic root zone before each planned water system occasion and sidesteps the cycle if dampness is over a client characterised set point.

B. Arduino:

Arduino is an open source electronics platform built on easy to use hardware. It comes with its own IDE (Arduino IDE) and its own open source extensible hardware.

C. Use of sensors:

The Soil Moisture Sensor (SMS) is a sensor connected to the irrigation system controller that measures the soil moisture content. The soil moisture sensor reads the value of moisture content in the soil and prints it on the console to view the values. A threshold value is set at the beginning depending upon the plant being watered and region in which it is being watered. The soil moisture sensors reads the value once within a stipulated delay time. Once the moisture is above the user defined threshold value the sensor stops reading the value and the control passes on to the Arduino which switches on the pump to start the watering of the system.

D. Data Acquisitions:

Data Acquisition is the handling of various electrical or electronic contributions from gadgets, for example, sensors, clocks, transfers, and strong state circuits with the end goal of checking, breaking down or potentially controlling frameworks and procedures. Information securing instrument sorts incorporate PC sheets, instruments or frameworks, data loggers or recorders, outline recorders, input modules, yield modules, and I/O modules.
In this research work data is acquired by usage of the Soil Moisture Sensors.

- **Soil Moisture Sensors** works on the principle of Dielectric permittivity. The dielectric permittivity is the amount of electricity that can be passed through the soil. The dielectric permittivity is a function of water content present in the soil. Hence by measuring the dielectric permittivity we could measure the soil moisture content. A fixed (user defined) threshold value is set and data is acquired till it reaches the threshold value. Once it has reached the stipulated value the soil moisture sensor bypasses the reading of the value for one cycle.

E. *Decision regarding threshold value:*

The soil moisture sensor is buried in the soil and water is applied to the soil. At least one inch of standing water is put on the soil.

- The soil along with soil moisture sensor is left outside on the sun for twenty four hours and If it rains within this period the process needs to start over.
- After twenty four hours the value of the soil moisture is read and is set as a threshold value. A 20% reduction can be done on the moisture level to allow a little more time for the water to seep in.

V. WORK FLOW CHART:

IoT based system of irrigation works in cooperation with sensors on Arduino kit. All its functioning is shown in Fig 1. Firstly depending on need of crop a threshold value is set on moisture sensor. Then continuously humidity read by sensor is checked against the threshold values. If humidity value is less then threshold then still

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irrigation is continued. When threshold value is reached then pump is switched off automatically by sending signals through Arduino kit.

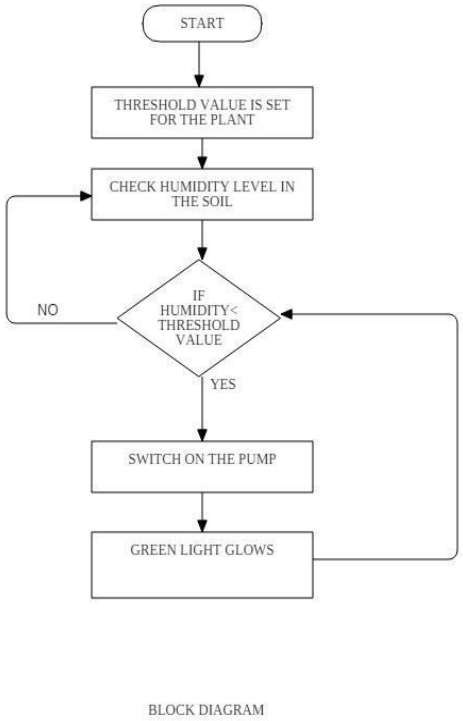

Fig1: Flowchart of process used.

VI. System Implementation:

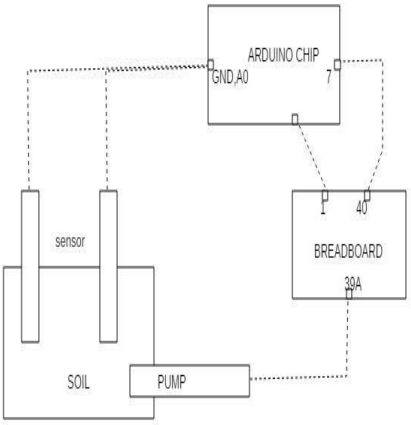

Fig 2: System Implementation

Arduino microprocessor board is connected with a bread board to extend the connections, for connecting the water pump with microprocessor. Soil moisture sensors are connected with Arduino kit to get readings of moisture of soil of farm. Then these gathered values are compared with threshold values of moisture levels and accordingly pump is being operated switched on or off as shown in Figure 2.

VII. DATA ANALYSIS

Data Analysis is a strategy in which information is gathered and composed with the goal that one can get accommodating data from it.

A. Gathering Of Data :

Soil Moisture Sensors works on the principle of Dielectric permittivity. The dielectric permittivity is the amount of electricity that can be passed through the soil. The dielectric permittivity is directly proportional to the amount of water present in the soil. Hence, by measuring the dielectric permittivity we could measure the soil moisture content. Soil Moisture Sensors are buried and are connected to the Arduino chipset at the other end. The soil moisture sensor reads the value of the dielectric permittivity of the soil after a stipulated interval of time. These values are sent to the Arduino chipset and are correspondingly displayed on the system.

B. Analysis Of Data :

A threshold value is set at the beginning of the procedure .The steps before setting up the threshold value are as follows :

- The soil moisture sensor is buried in the soil and the flow of water is opened. At least one inch of water is allowed to stand on the soil.
- The soil is left under the sun for twenty four hours. If it rains in this interval the procedure has to be started from the beginning.
- The moisture value is noted at the end of twenty four hours and with twenty percent deviation from the moisture value, the threshold value is set.

After acquiring the threshold value, the soil moisture sensors are allowed to read the moisture content in every fixed interval of time. The data is gathered and compared o the threshold value. After the comparison, the system has two course of actions:

Case 1: If the moisture content is more than the threshold value.

When the moisture content read from the soil using the soil moisture sensor and it is found out to be more than the threshold value, then after a delay of a fixed time the value is read again and compared. This procedure is continued until Case 2 is encountered.

Case 2: If the moisture content is less than the threshold value.

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When the moisture content read from the soil using the soil moisture sensor and it is found out to be less than the threshold value, then the system bypasses one circle of reading the values. Signal is sent to the pump to notify about a state change. (From LOW to HIGH)

Valve for the particular strip in which the moisture content is less than the threshold value is opened and water from the pump is allowed to flow.

CONCLUSION

India is a country with most of agriculture on its land. Irrigation is need of agricultural outputs. Better and optimally farms are irrigated suitable is the crop yield. So this work has designed a smart irrigation system based on IoT with sensor of humidity. It may check the moisture content levels of soil in farm and can generate moisture level data through sensors. Accordingly irrigation based decisions are taken by system automatically to start water pump and to divert the flow of pump motor for irrigation. Designed system can irrigate field with lesser amount of water. Crop can be maintained with its suitable threshold moisture levels for better yields.

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