iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4009

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

Smart Watering Framework for Better Yielding of Crops

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Abstract*— Agriculture has been the backbone of human existence since time immemorial. Agriculture is an important source of livelihood in most parts of the world. It is involves tough work but it contributes to food security and health of the nation. In spite of many commercial options coming up, many rely on agriculture for their income. Agriculture is a nature friendly and most peaceful method of livelihood. It is a very reliable source of livelihood for mankind and also one of the honest source of incomes. Farming become more profitable when combined with the alternative methods. So suitable conditions and suitable moisture in crop can play a major role for better yield.Agriculture is the major source of income for Indians and agriculture has made a big impact on Indian economy. The development of crops for a better yield and quality of crop is exceptionally required. So suitable conditions and suitable moisture in crop can play a major role for better yield. Mostly irrigation is done by traditional methods of stream flows from one end to other. Such method may leave different moisture levels in field and results in huge wastage of water. The management of the water system can be increased by utilizing programmed watering framework. This paper proposes a programmed water system with framework for the fields which results in reducing of manual labor and optimizing water usage by setting a threshold value to the specified crop to increase the productivity . For working out this setup, Arduino kit is used along with moisture sensor and a GSM module is attached to it for sending updates to the farmer.

***Keywords*— Agriculture, Irrigation, IoT, Arduino kit, Moisture Sensor.**

I. INTRODUCTION

India is mainly an agricultural country. Agriculture is the most important occupation for most of the Indian families. Agriculture included farm related activities for growing crops and includes the rearing of animals for agriculture purposes. In India, agricultural produce contributes about sixteen percent (16%) of total GDP and ten percent (10%) of total exports.As the world is changing day by day with the latest innovations in science and medical fields ,but the agriculture is still remains in the same position with the old practices and methods.For the development of the crops and for the better yield we have to follow the innovate methods. The administration of water to the fields is one of the back drop of better yield in old methods, if by applying the programmed watering framework the yield of the crop is high. This paper proposes a programmed water system with framework for the fields which will reduce manual labour that includes digging of canals,watering etc and optimizing of water usage increases productivity of crops. At present observing and monitoring of the fields through the electronic devices is one of the best and efficient method to 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. By dipping the moisture sensor into the soil to identify the amount of moisture level in the field. With the help of a program, coded in C language, system will check the amount of water required by a plant, by setting a predefined values in the program. The threshold values are obtained by observing the type of crop, environmental conditions and amount of water required for the particular crop. 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.

II. LITERATURE SURVEY

From the past research works on the field of smart irrigation systems various scientists have concluded different methods for the watered framework for better results. Starting from distribution of water to the households by monitoring with the water sensors and then the same method is used for the automatic irrigation of crops. This system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the every plant. This system results in high amount of cost to place a single sensor for single plant. Another research work is based on ARMs and RF module, this system is used to send and receiving the message to the controller about the information in the system in this System there is only one central module to control all other modules. In this system placing of temperature and moisture sensors at root of every plant become hard for maintaining all of them by checking one by one. Another research paper aim is to propose a programmed water system with framework for the fields to optimize water usage and to increase productivity of crops. For formulating the setup, Arduino

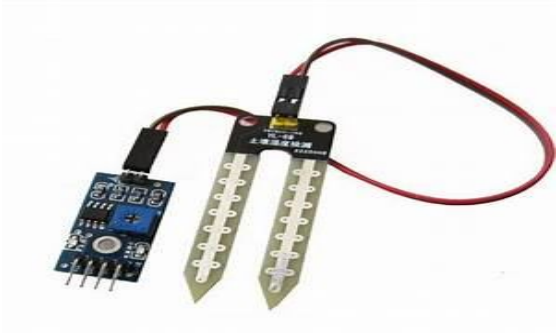
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sensor with Wi-Fi module. Our experimental setup is connected with cloud framework and data is acquisition is done. Then data is analyzed by cloud services. In this System Acquiring of data from the cloud framework is hard to understand by the farmer.

III. PROPOSED SYSTEM

A. Hardware Components

1) *Soil Moisture Sensor:* Soil Moisture Sensor consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value. When there is more water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher. Dry soil conducts electricity poorly, so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower. This sensor can be connected in two modes; Analog mode and digital mode.



2) *Gsm Module:* A GSM Module is basically a GSM Modem (like SIM 800C) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC (personal computer). The board will also have pins or provisions to attach mic and speaker, to take out +5V or other values of power and ground connections. These types of provisions vary with different modules.



3) *Submersible Pump:* Electric submersible pumps are multistage centrifugal pumps operating in a vertical position. Liquids, accelerated by the impeller, lose their kinetic energy in the diffuser where a conversion of kinetic to pressure energy takes place. This is the main operational mechanism of radial and mixed flow pumps.



4) *Relay* : It is used to switch on/off the pump according to the watering requirement of the soil

B. Software Design:

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Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

IV.METHODOLOGY

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.

There are different types of soils, Every soil has different features some has high fertility rate and some has low water storage capacity.The below steps are followed for setting of threshold value :

Selecting of the desired crop which we want to monitor.

The soil moisture sensor is placed in the soil and obtain the values with the help of soil moisture sensor.

Set the threshold value for the crop by testing the type of soil in all environmental conditions.

Compare the values with the scientific values already existed in the locality.

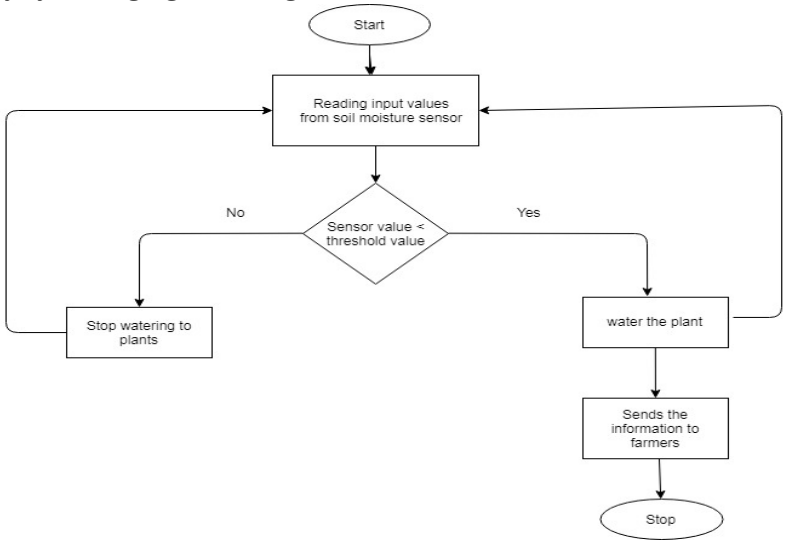
After getting the tested values we have to compare with the threshold values.In this mean time two cases are arised .

Case 1 : If the obtained tested value is less than the threshold value then the system sent the Signal to the pump to notify about the moisture level,then pump opens its valve for the field until it reaches the threshold value. A message is send to the farmer about the motor operations.

Case 2 : If the moisture value is more than the threshold value then it rechecks the moisture value until the moisture level in the field decreases with the threshold value. If it found less value then case1 will be performed.

V. WORK FLOW CHART

IoT based system of irrigation works in cooperation with sensors on Arduino kit. 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 the process of watering the field is continued. When threshold value is reached then pump is switched off automatically by sending signals through Arduino kit.



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VI. RESULTS

A. If the obtained tested moisture value is less than the threshold value then the system sent the Signal to the pump to notify about the moisture level,then pump opens its valve for the field until it reaches the threshold value. A message is send to the farmer about the motor operations.

B. If the moisture value is more than the threshold value then it rechecks the moisture value until the moisture level in the field decreases with the threshold value. If it found less value then case1 will be performed.

VII. FUTURE ENHANCEMENT

In present this system is developed only to send updates in the form of messages to the farmer. In future this system can be upgraded by adding another feature where updates are send to farmer by voice call.

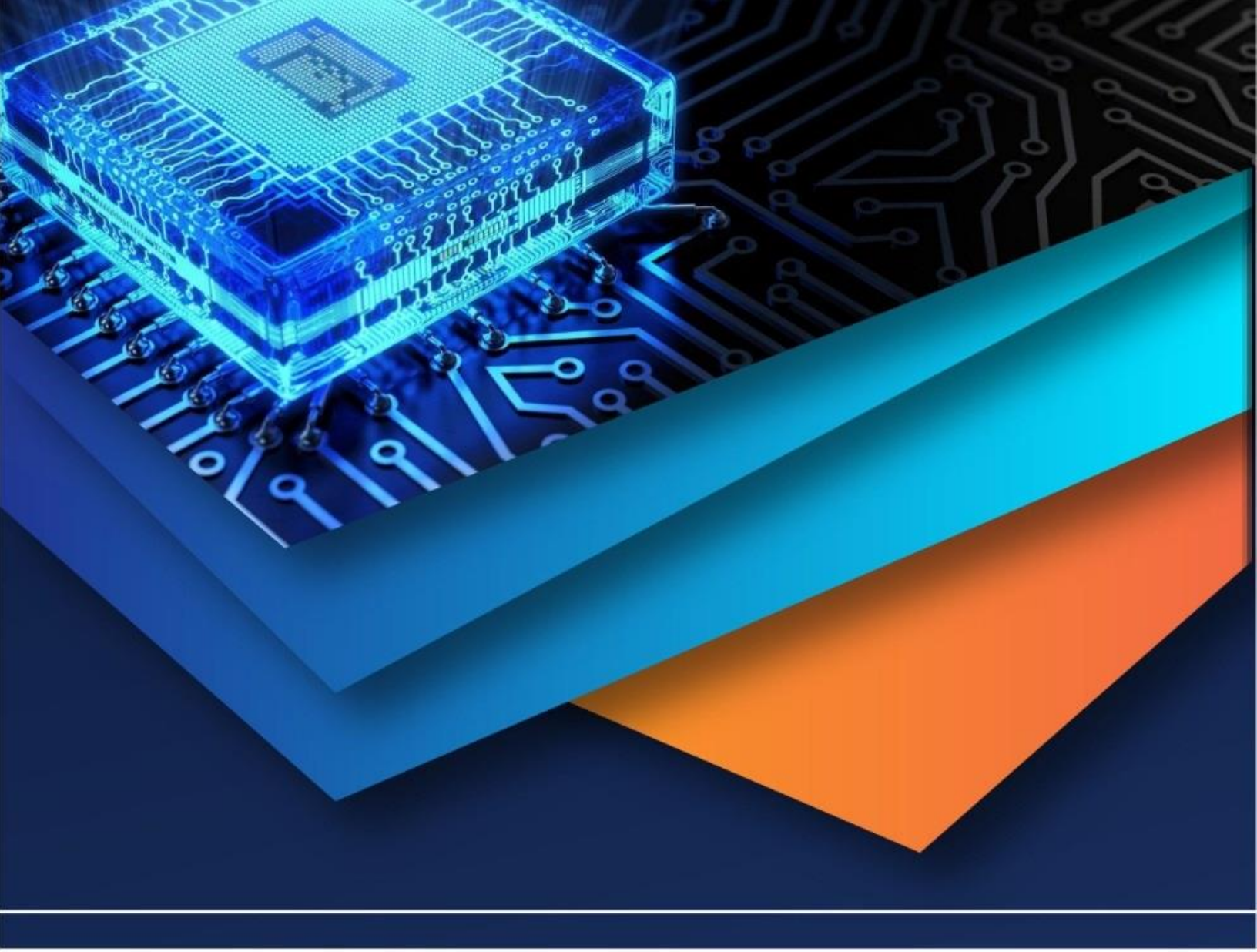
VIII. CONCLUSION

As the future is moving towards the Smart ideas with improving the technologies replacing with smart applications (Automation) with the invention of Internet of Things. Farming is the major source for the survival in this world, here the future Farming is also wearing foots towards these smarter technologies with newer improvements in order to increase the productivity with in short time. Depending on the moisture content present in the soil, irrigation system works. By checking the humidity with the help of sensors, water wastage can be reduced.This system provides several benefits and can be operated with less manpower. Over-watering and under-watering affects the crop so proper amount of water should be supplied.

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