IoT BASED SMART IRRIGATION SYSTEM

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Abstract - *Irrigation is the prime source of edible items all over the world. It is also a major source of income of million citizens. Although three-forth portion of the earth consists of water, it is still scare in many regions. Farming without using water is quite impossible and hence it is our responsibility to use it wisely. In such a scenario, it is very essential to develop smart systems to lessen the use of water. This paper proposes such an advanced system so as to minimize its usage. Various sensors are connected with an IOT and GSM board in order to fetch the data and send it to the owner. So, the owner can control the water device with it.*

Key Words: Irrigation, Moisture, Temperature, IOT, GSM

1. INTRODUCTION

Irrigation is the process of distributing water to the field to fulfill their water needs. The varied sources of water for this process are dams, ponds, lakes, canals, tube-wells, and even wells. For growth, development, germination, and other related functions, irrigation provides necessary moisture to the soil. Water moistens the soil so as to help in penetration of roots even in the dry field. The frequency, rate, amount and time of irrigation are different for various crops and also vary consistent with the kinds of soil and seasons. For example, summer crops require a better rate of water as compared to winter crops. India may be a very huge country, where population is in many people that need good amount of food items. The rainfalls are uneven and scare which definitely causes many problems like famines and droughts. Also, there are very less number of amenities available for farming and are very dense in desert areas. This certainly demands external facilities like building canals and dams. India is equatorial and equitropical country with a mean temperature of 25' Celsius. This increases the speed of evaporation.

A.Neelima presented in [1] measured the moisture level of soil and controlled water pump on its basis and sent the data through wifi and Arduino board. Himani Mahajan in [2], on the other hand, did the same above mentioned process by the help of solar panel. While, an online application for data retrieving and managing actions was presented by Srishti Rawal in [3]. A current scenario of studies of smart systems used in irrigation system was analyzed by Dr. J. Jegathesh Amalraj in [10].

The aim of this research paper is to make agricultural process easy and convenient. Automatic systems are used instead of traditional methods. Irrigation is vital for sustenance of mankind but simultaneously it is very tedious and time consuming. By introducing advanced systems, this process can become better. There is already a shortage of water sources and hence it becomes essential for mankind to save it. This proposed system consumes the least amount of water required for crops, thus saving it. This paper proposes a system which does not require physical presence of people in the field by controlling the farming process with the help of a smart phone.

2. METHODOLOGY

Here, we are using an arduino board as our basic microprocessor with moisture sensor and temperature sensor. The moisture sensor measures the moisture content in the soil and transfers this data to the board while the temperature sensor measures the present temperature in the atmosphere and transfers the data to

the arduino board. In the coding, the temperature and the moisture, relevant to the field, are prefixed. When the data is received to arduino, it compares with the preset data and takes control action accordingly. Simultaneously, this data is also sent to the owner's smart phone through GSM board. The controlling message is sent to the GSM board by the owner which is interpreted by the arduino board and control action can also be taken by this way. The controlling method contains two aspects. The prime one is to switch on and off the water pump so as to fetch the water in the field while the other one is to control the spraying of pesticides in the farm.

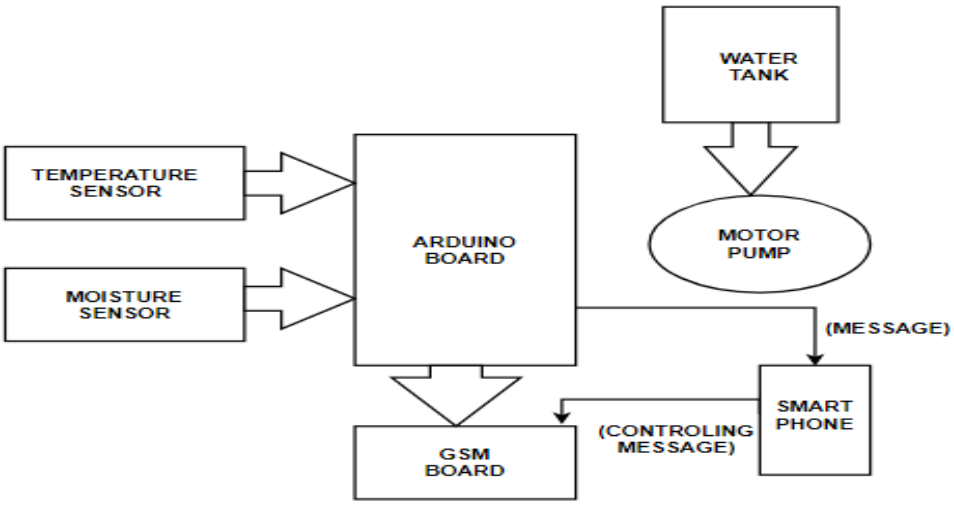

Fig - 1 Block Diagram of the System

3. COMPONENTS OF THE SYSTEM

3.1 IOT

The internet of things, or IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals and mankind that are provided unique identifiers (UIDs) and therefore has the ability to transfer data over a network without any of human-to-human or human-to-computer interaction. An IoT system is made up of web-enabled smart devices that use embedded systems like processors, sensors and communication hardware, in order to gather, send and act on data they fetch from their environments. IoT devices share the sensor data, which they collect by connecting to an IoT network or other edge device where this data is either sent to the cloud to be analyzed or managed manually. Sometimes, these devices communicate with other relevant devices and act on the information they get from each other. The devices do most of the work without human intervention, although people can interact with the devices -- for an example, to sequence them, give them instructions or access the information. The connectivity, networking and communication protocols needed with these devices largely depend on the precise IoT applications deployed. It also can make use of AI (AI) and machine learning to assist in making data collecting processes easier and more dynamic. Increasingly, organizations during a sort of industries are using IoT to work more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the worth of the business.

3.2 ARDUINO

Arduino is an open source hardware and software organization, project and user community that designs and manufactures board microcontrollers and microcontroller kits so as to build digital devices. The

boards are equipped with sets of digital and analog input/output (I/O) pins which will be interfaced to varied expansion boards or breadboards and other circuits. The boards contain serial communication interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are often programmed using C and C++ programming languages, other than using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) supported the Processing language project.

Fig - 2 Arduino Board

3.3 WATER PUMP

In this process, the values fetched from the moisture sensor and temperature sensor is compared to prefixed value in the arduino board. The water pump turns on and off on the basis of these values as well as from the controlling message received from owner's smart phone.

Fig - 3 Water Pump

3.4 MOISTURE SENSOR

The moisture of the soil plays an important role within the irrigation field also as in gardens for plants. As nutrients within the soil provide the food to the plants for their growth, supplying water to the plants is additionally essential to vary the temperature of the plants. The temperature of plant is often changed. Water is provided using the tactics like transpiration. The plant root systems are also developed better when rising within moist soil. Extreme soil moisture levels can guide to anaerobic situations which will encourage the plant's growth also as soil pathogens. The soil moisture sensor is employed to measure the volumetric content of water within the soil because the straight gravimetric dimension of soil moisture

needs eliminating, drying, also as sample weighting. These sensors measure the volume of the water content indirectly with the assistance of other measurements of soil like dielectric constant, electric resistance, otherwise interaction with neutrons, and replacement of the moisture content. The relation between the calculated property and moisture of soil should be adjusted and may be changed because of supported ecological factors like temperature, type of soil, or electrical conductivity. The microwave emission which is reflected is often influenced by the moisture of soil also as mainly utilized in agriculture and remote sensing within hydrology.

Fig - 4 Moisture Sensor

3.5 TEMPERATURE SENSOR

A temperature sensor is a device, generally a RTD (resistance temperature detector) or a thermocouple, that collects the data of temperature from a specific source and converts it into voltage form for a tool or an observer. Temperature sensors are required in many applications like HV and AC system, environmental controls, food processing units, medical devices, chemical handling and automotive under the hood monitoring and controlling systems, etc. The most common sort of temperature sensor may be a thermometer, which is employed to live temperature of solids, liquids and gases. It is also a standard type of temperature sensor, mostly used for non-scientific purposes because it is not much accurate.

Fig - 5 Temperature Sensor

3.6. GSM BOARD

GSM is a world standard for mobile telephones which is an acronym that stands for Global System for Mobile Communications. It is also mentioned as 2G, because it is a second-generation cellular network. GSM supports outgoing and incoming voice calls, Simple Message System (SMS or text messaging), and digital communication (via GPRS). The Arduino GSM shield may be a GSM modem. From the mobile operator perspective, the Arduino GSM shield looks a bit like a mobile. From the Arduino perspective, the Arduino GSM shield looks a bit like a modem.

Fig - 6 GSM Board

3.7 GPRS SYSTEM

GPRS is a packet switching technology that stands for General Packet Radio Service. It can provide idealized data rates ranging from 56-114 Kbit per second. With the GSM shield, it is also possible to leverage the information communication to access the internet. Almost like the Ethernet and Wi-Fi libraries, the GSM library allows the Arduino to act as a client or server, using http calls to send and receive sites.

4. RESULTS AND DISUCSSIONS

4.1 OUTCOMES

The measured data is compared with the preset data and the decision is taken accordingly. Apart from this, the message of data is sent to the owner through which also the control action can be executed. There are different types and sediments of soil and so the preset values have to be set on its basis. The temperature also differs in regions which should be taken care of.

MEASURED MOISTURE	MEASURED TEMPERATURE	PRESET MOISTURE	PRESET TEMPERATURE	CONTROL ACTION
80	32	60	25	PUMP OFF
75	29	60	25	PUMP OFF
55	28	60	25	PUMP ON
50	26	60	25	PUMP ON

Table - 1 Measured Results

4.2 FLOWCHART OF THE SYSTEM

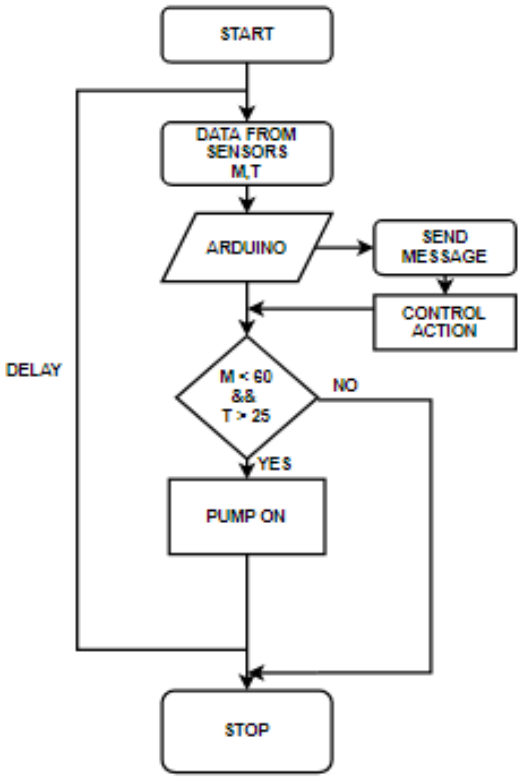

Fig - 7 Flowchart

5. CONCLUSION AND FUTURE SCOPE

Agriculture is very essential for our day to day life and so it can be improved with the help of the advanced technology. Hence this proposed system can be very helpful with full efficiency. Simultaneously, it also uses the water in redundant. Many other sensors such as PIR sensor, fire sensor as well as CCTV cameras can be installed at the field in the advanced version, according to the owners need. The fire sensor can immediately sprinkle water in case of an accident, while the PIR sensor and CCTV cameras can help the owner to suspect the trespassers.

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10. AUTHOR'S BIOGRAPHIES

Muskan Vahora is presently pursuing her Bachelors in Electical Engineering from Gujarat Technical University. Various type projects have been performed under her leadership along with the participation in Student Start – up and innovation policy **(SSIP).**

Neel Patel is currently in his final year of Bachelors in electrical engineering at Gujarat Technical University. He is an expert in technical aspects and has achieved fabulous outcomes.

Shalini Pandey is studying Bachelors of electrical engineering at Gujarat Technical University. She has participated in making many technical projects in throughout her course study.

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