Design of a Smart Irrigation Management System Based on IoT

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Abstract- **Scarcity of water resources in the world due to poor utilization of the water resources, the risk of draught in some areas largely affecting the production from agriculture sources. In order to conserve existing water resources and efficiently manage it for agriculture, recent advances in technology can be used. Internet of Things is one of such new technology which can help our country to reduce the overall impact of faulty water management in agriculture sector. Interconnection of number of devices through internet describes the Internet of things (IoT). Every object is connected with each other through unique identifier so that data can be transferred without human to human interaction. Main objective of this work is for Farming where various new technologies yield higher growth of the crops and their water supply. Automated control features with latest electronic technology using microcontroller which turns the pumping motor ON and OFF on detecting the dampness content of the earth and GSM phone line is proposed after measuring the temperature, humidity, and soil moisture.**

Index Terms- **Internet of things, temperature, humidity, irrigation system, Arduino Mega.**

I. INTRODUCTION

Agriculture is the strength of Indian Economy. However, for agriculture water consumption is more than rainfall every year. Improving farm yield is essential to meet the rapidly growing demand of food for population growth across the world. By considering and predicting ecological circumstances, farm productivity can be increased. Crop quality is based on data collected from field such as soil moisture, ambient temperature and humidity etc. Advanced tools and technology can be used to increase farm yield. Developing IoT technologies can help to collect large amount of ecological and crop recital data. "IoT encompasses many new intelligent concepts for using in the near future such as smart home, smart city, smart transportation, and smart farming" [1]. The technique can be used for application of accurate amount of fertilizer, water, pesticide etc. to enhance productivity and excellence. Sensors are hopeful device for smart agriculture. The real-time environmental parameters like soil moisture level, ambient temperature and tank water level have continuous influence on the crop lifecycle. By forming sensor network, good monitoring of water regulation in the agriculture field can be achieved. Irrigation management is a important factor in agriculture allows the farmer to improve the cultivation in a way the plants need. According to the requirement of the crops the threshold will be set, if the any environmental condition like temperature, soil conditions and humidity goes below or above the threshold value, then IOT sense the changing in parameters are monitored simultaneously and all the data will be transmitted to farmers, according to that farmer will take the controlling decision and send to the system. The system will run the actuator and control the parameter. Types of sensor used and controlling action that are taken according to them[2].

Temperature control - Growth of plantation depends on photosynthesis methods that is depends upon the radiation from the sun.

Humidity control –Water vapour is main problem that's affecting the growth of crops. Because of high humidity, chances of disease are increasing.

Soil control- Soil water also affects the crop growth. Therefore, the monitor & control of soil condition have a specific interest, because the good condition of a soil provides the proper yield.

II.SYSTEM ARCHITECTURE

This archetype monitors the amount of soil humidity and temperature. A predetermine range of soil moisture and temperature is set, and can be varied with soil type or crop type. In case the moisture or temperature of the soil diverges from the specified range, the watering system is turned on/off. In case of dry soil and high soil temperature, it will activate the irrigation system, pumping water for watering the plants[4].

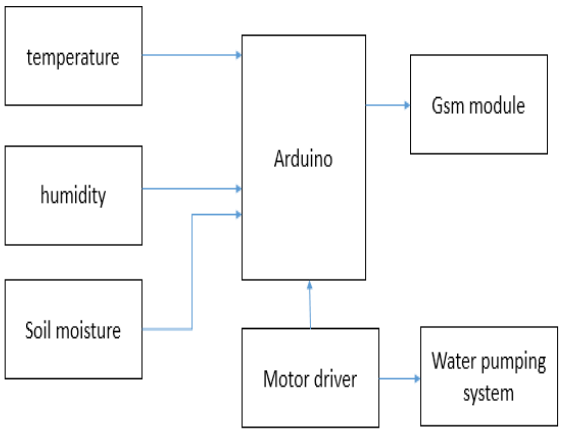

Figure 1: System Architecture

The block diagram of smart irrigation system is characterized in Fig1[3][10]. It consists of a microcontroller (ATmega328) which is the brain of the system. Both the moisture and temperature sensors are combined to the input pins of the controller. The water pump and the servo motor are coupled with the output pins. If the sensors depart from the per-ordinated range, the controller turns on pump. The servo motor is used to control the angular point of the pipe, which ensures equal diffusion of water to the soil. To reduce the amount of field work for the farmer this operation also offers wireless switching on-off of pumps for watering, irrigating. Wireless sensor network of soil moisture sensor, soil pH sensor and soil temperature sensor is connected to an Arduino Mega 2560 micro controller board.[6] The android application controls the pumps over GSM network via SMS (which enables pump control over long distances) and Blue-tooth (when in close proximity for real time diagnosis of the sensor readings). [11][12]This system can be implemented on a large scale for farming purposes, which can further prove to be more beneficial. Owing to prevailing conditions and water shortages, the optimum irrigation schedules should be determined especially in farms to conserve water.

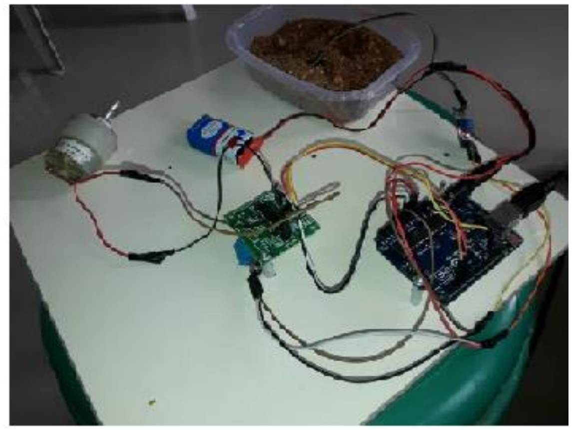

Figure 2 System Model

III SYSTEM MODEL

The work is implemented using Arduino ATmega328.Sensors are connected to Arduino using jumping cables. The entire system is observed and controlled by power full credit card sized microcontroller Arduino[7]. Basic DC motor are used for automatic water supply. Power supply is provided by using 5volt battery. Sensor values are displayed in monitor by using Arduino operating system. For Connection establishment is provided by using java coding. Here Motor automatically ON and OFF based on Soil values. Here the Sensor values are evaluated and displayed in system monitor using Arduino OS[8][9]. The motor automatically will be ON based on readings.

IV. CONCLUSION

Installing Smart irrigation system saves time and ensures judicious usage of water. Moreover, this architecture uses micro-controller which promises an increase in system life by reducing power consumption. The entire system is monitored and controlled by the power full credit card sized micro-controller Arduino. It provides with several benefits and can achieve with less manpower. The system provides water only when the humidity in the soil goes below the reference. Due to the direct transfer of water to the roots water management takes place and also helps to maintain the moisture to soil ratio at the root zone consistent to some extent. Thus, the system is efficient and compatible to changing environment.

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