Sensor based Automated Irrigation System with IOT: A Technical Review

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Abstract:- India's population is reached beyond 1.2 billion and the population rate is increasing day by day then after 25-30 years there will be serious problem of food, so the development of agriculture is necessary. Today, the farmers are suffering from the lack of rains and scarcity of water. The main objective of this paper is to provide an automatic irrigation system thereby saving time, money & power of the farmer. The traditional farm-land irrigation techniques require manual intervention. With the automated technology of irrigation the human intervention can be minimized. Whenever there is a change in temperature and humidity of the surroundings these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller.

Keywords:- IOT, Sensor based irrigation, GSM,GPRS based mobile system, MAX232, GPS

I. INTRODUCTION

India's major source of income is from agriculture sector and 70% of farmers and general people depend on the agriculture. In India most of the irrigation systems are operated manually. These outmoded techniques are replaced with semi-automated and automated techniques. The available traditional techniques are like ditch irrigation, terraced irrigation, drip irrigation, sprinkler system. The global irrigation scenario is categorized by increased demand for higher agricultural productivity, poor performance and decreased availability of water for agriculture. These problems can be appropriately rectified if we use automated system for irrigation.

A. Need of Automatic Irrigation

- ➢ Simple and easy to install and configure.
- ➢ Saving energy and resources, so that it can be utilized in proper way and amount.
- ➢ Farmers would be able to smear the right amount of water at the right time by automating farm or nursery irrigation.
- ➢ Avoiding irrigation at the wrong time of day, reduce runoff from overwatering saturated soils which will improve crop performance.
- ➢ Automated irrigation system uses valves to turn motor ON and OFF. Motors can be automated easily by using controllers and no need of labor to turn motor ON and OFF.
- ➢ It is precise method for irrigation and a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production.
- ➢ It is time saving, the human error elimination in adjusting available soil moisture levels.

II. LITERATURE REVIEW

In GSM Based Automated Irrigation Control using Rain gun Irrigation System.R.suresh , S.Gopinath , K.Govindaraju , T.Devika , N.SuthanthiraVanitha [1] mentioned about using automatic microcontroller based rain gun irrigation system in which the irrigation will take place only when there will be intense requirement of water that save a large quantity of water. These system brings a change to management of field resources where they developed a software stack called Android is used for mobile devices that include an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Mobile phones have almost become an integral part of us serving multiple needs of humans. This application makes use of the GPRS feature of mobile phone as a solution for irrigation control system. These system covered lower range of agriculture land and not economically affordable.

The System Supports excess Amount of water in the land and uses GSM to send message and an android app is been used they have used a methodology to overcome under irrigation, over irrigation that causes leaching and loss of nutrient content of soil they have also promised that Microcontroller used can increase System Life and lower the power Consumption. There system is just limited to the automation of irrigation system and lacks in extra ordinary features.

In GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile Pavithra D. S, M. S .Srinath.[2] States features of their system.

- The system supports water management decision, used for monitoring the whole system with GSM(RS-232) module
- The system continuously monitors the water level (Water level Sensor) in the tank and provide accurate amount of water required to the plant or tree (crop).
- The system checks the temperature, and humidity of soil to retain the nutrient composition of the soil managed for proper growth of plant.
- Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using a GSM using android mobile.

In Irrigation Control System Using Android and GSM for Efficient Use of Water and Power - LaxmiShabadi, NandiniPatil, Nikita. M, Shruti. J, Smitha. P & Swati. C [3]
Automated irrigation system uses valves to turn motor ON and OFF. These valves may be easily automated by using controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Those valves may be easily automated by using controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. They lack in a featured mobile application developed for users with appropriate user interface. It only allows the user to monitor and maintain the moisture level remotely irrespective of time.

From the point of view of working at remote place the developed microcontroller based irrigation system can work constantly for indefinite time period, even in certain abnormal circumstances. If the plants get water at the proper time then it helps to increase the production from 25 to 30 % [5]

Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network Yunseop (James) Kim, *Member, IEEE*, Robert G. Evans, and William M. Iversen [6]

The setup of technical system describe in this paper is broad based and is relatively one of the efficient system that has developed windows application to monitor the field. Field is equipped with wireless communication sensors that avails better facilitated sensor communication and covers wider field area.

Detailed description on site field sensors and Internet technology is described briefly. The statistical data provided is measured to be efficient and used for research work.

Microcontroller Based Automatic Plant Irrigation System* Venkata Naga Rohit Gunturi[7]

The main aim of this paper is to provide automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using 8051 micro controller which is programmed as giving the interrupt signal to the sprinkler.

A wireless application of drip irrigation automation supported by soil moisture sensors [8]

Irrigation by help of freshwater resources in agricultural areas has a crucial importance. Traditional instrumentation based on discrete and wired solutions, presents many difficulties on measuring and control systems especially over the large geographical areas.

If different kinds of sensors (that is, temperature, humidity, and etc.) are involved in such irrigation in future works, it can be said that an internet based remote control of irrigation automation will be possible. The developed system can also transfer fertilizer and the other agricultural chemicals (calcium, sodium, ammonium, zinc) to the field with adding new sensors and valves.

Solar Powered Smart Irrigation System, Advance in Electronic and Electric Engineering. [9]

- Cost effective solar power can be the answer for all our energy needs.
- Conserves electricity by reducing the usage of grid power and conserves water by reducing water losses.

Advantages: Discourage weeds, saves water and time, statistical data can be used to control diseases and fungal growth, simplest model.

Disadvantages: This system is just limited to the automation of irrigation system and lacks in extra ordinary features

III. METHODS

A pipe with rain gun irrigation mechanism attached, is connected to the water pump, the other end of the pipe is near to the root of the plant. The flow of water is managed by solenoid valve. The opening and closing of valve is done when a signal is send through microcontroller. The water to the root of plant is done drop by drop using rain gun and when the moisture level again become normal then sensor senses it and send a signal to microcontroller and the value is then closed.

The two mobile are connected using GSM. The GSM and microcontroller are connected using MAX232. when moisture of the soil become low moisture sensor sense it and send signal to microcontroller, then the microcontroller gives the signal to mobile and it activate the buzzer. This buzzer indicates that valve needs to be opened by pressing the button in the called function signals are sent back to microcontroller.
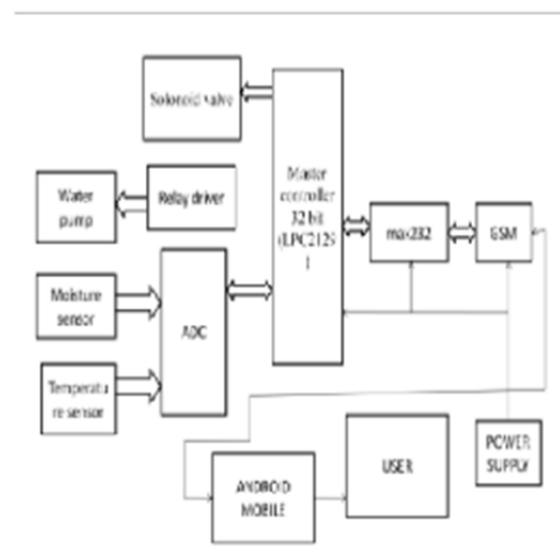

Figure 1: Block diagram of [1]

Algorithm
It states the steps that the proposed system undergoes.
Step 1: Start the process.
Step 2: Initialize power is supplied to GSM
Step 3: Check the moisture level (less than or more than).
Step 4: If the level will be more than a fixed criteria, no need to irrigation

Step 5: If Moisture level is less than a fixed criteria, start irrigation

Step 6: Initialization of pump and raingun

Step 7: After the process completed,It moves to original state.

Step 8: Stop the process.

Another methodology is broad based and is relatively one of the efficient system that has developed windows application to monitor the field. Field is equipped with wireless communication sensors that avails better facilitated sensor communication and covers wider field area.

A conceptual system layout of distributed in-field WSN is illustrated in below Figure. The system consists of five in-field sensing stations distributed across the field, an irrigation control station, and a base station. The in-field sensing stations monitor the field conditions of soil moisture, soil temperature, and air temperature, whereas a nearby weather station monitors micrometeorological information on the field, i.e., air temperature, relative humidity, precipitation, wind speed, wind direction, and solar radiation. All in-field sensory data are wirelessly transmitted to the base station. The base station processes the in-field sensory data through a user-friendly decision making program and sends control commands to the irrigation control station. The irrigation control station updates and sends geo-referenced locations of the machine from a differential GPS mounted at the cart to the base station for real-time monitoring and control of the irrigation system. Based on sprinkler head GPS locations, the base station feeds control signals back to the irrigation control station to site-specifically operate individual sprinkler to apply a specified depth of water.
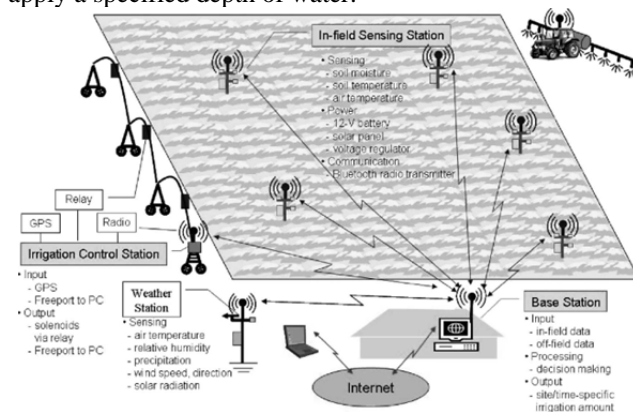

Figure 2: Diagram of [6]

IV. CONCLUSION

This review is proposed to supports aggressive water management for the agricultural land. Microcontroller in the system promises about increase in systems life by reducing the power consumption resulting in lower power consumption. It is considered to be used at Cricket stadiums or Golf stadiums and also in public garden area for proper irrigation. Automated irrigation system has a huge demand and future scope too. It is time saving, led to removal of human error in adjusting available soil moisture levels and to maximize their net profits in accordance to factors like sales, quality and growth of their product.

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