Irrigation-Scheduling and Management

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Abstract

This paper focus on providing an overview of wireless irrigation technique as applied for intelligent farming. In this project we are aiming to provide farmers an automated irrigation scheduling as well as control over its management wirelessly. A survey on existing techniques of wireless irrigation was carried out. Agriculture is the backbone of any country's economy and based on the analysis and survey, the need for intelligent farming especially in developing countries like India, has grown to a greater extent. We need an effective technology which can improve continuously the productivity, profitability, sustainability of our major farming systems and their management. Management includes Greenhouse management and Irrigation management using wireless sensor network.

Keywords: Sensors, ZigBee, Arduino, Android

I. INTRODUCTION

Agriculture is the worldwide prime occupation of human being. There is a challenge in front of every country to sustain the fresh food requirement and reducing the farm water consumption. India's population is growing faster than its ability to produce grains. Also recent studies claim India can easily feed its growing population, plus produce wheat and rice for global exports, if it can reduce food staple spoilage and raise its farm productivity to those achieved by other developing countries.

Irrigation is the process of watering the soil. The requirement of water to the soil depends on the soil property like soil moisture and soil temperature. It[1] also depends on the crop which grow in the soil. From the last decade few existing system working for reducing the agriculture water consumption but these systems have some limitations. In these watering is done without analyzing the soil properties. Due to which system apply non uniform water to the soil results in less yields. Also systems required more human intervention and time consuming. So we require modern technology to resolve this problem and support better irrigation management. To improve the crop yield, the information on weather condition, soil environment monitoring, soil humidity and moisture content, soil Ph level can greatly help in improving the crop yield while maintaining the soil fertility.

There are many existing systems which are working on this soil parameters with wireless sensor[3] networks. Wireless technology today is growing rapidly to a greater extent in such a way that even the agriculturist today use cell phones. So it would be convincing to provide with all the environment conditions of the soil and the plant to the farmer through mobile phones. It can be done in various ways, one of them is zigbee.

II. TECHNOLOGIES REQUIRED

ZigBee[4] is used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.

The technology defined by the ZigBee[4] specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs) such as Bluetooth or Wi-Fi. Some applications are wireless light switches, electrical meters with in-home-displays, traffic management system, and other industrial and consumer equipment that may require short-range as well as low-rate wireless data transfer.

Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. ZigBee[4] devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee[4] is typically used in low data rate applications that require long battery life and secure networking.

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

There are various types of sensors in the market, one of them is moisture sensor. Soil moisture [3] sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, and electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture.

With the help of zigbee we can establish a communication between farmer and tap of water, automating the flow of water as required for irrigation thereby reducing efforts of farmer of running into the fields to operate the irrigation valves.

III. METHODOLOGY

A. Embedding Sensors in the Soil and the Crops

Soil moisture sensing [3] network is used to monitor the moisture contained in soil. Measuring soil moisture is important to get the information regarding the exact quantity of the water needed to irrigate the crops. Humidity sensor gives two parameters: humidity and air temperature. The sensor has a crucial role in plants growth; low temperature causes a decrease in the absorption and movement of water in the plants and low humidity causes fast transpiration. Fast transpiration means the plants using lots of water (nutrients). The soil moisture [3], humidity and crops temperature data from the sensors are transferred to the Android via ZigBee receiver.

B. Connection of Android with ZigBee

By enabling ZigBee and Android [5] technologies in one platform, we can create an efficient control system rather than using an individual technology. Thus we make use of XBee for interfacing. The XBee is the brand name a wireless transceiver device introduced by the Digi international which works on the ZigBee protocol and can form PAN networks. They have an approximate range of 10 to 100 meters and are used in industries, scientific fields, medical fields etc. The XBee module even though uses complex packet data based Zigbee protocol for communicating with each other, they can communicate with other devices using simplest serial communication protocol and hence they are widely used in microcontroller baseboards. Finally an arduino is used and the corresponding coding is done to control the valves remotely with the smartphone as well as automated controlling and management of irrigation in the farms.

C. Communication of ZigBee's with each other

We connect Zigbee with each other in mesh[4] network. Mesh networking is a powerful way to route data. Range is extended by allowing data to hop node to node and reliability is increased by self-healing, the ability to create alternate paths when one node fails or a connection is lost.

D. Arduino coding to control solenoid valves

An arduino is used and the corresponding coding is done to control the valves remotely[1] with the smartphone as well as automated controlling and management of irrigation in the farms. A solenoid[2] valve is an electronically and mechanically operated valve which is controlled by an electric current through a solenoid. In the case of a two-port valve, the flow is switched on or off and in the case of a three-port valve, the outflow is switched between the two outlet ports. The solenoid that is most preferable for controlling flow in a drip[2] irrigation system is Plastic Water Solenoid Valve.

IV. CONCLUSION

The Irrigation Scheduling And Management System provides the feedback control system which monitors and controls the activities of irrigation system efficiently. This will help in improving the agriculture field and irrigation control by using ZigBee, one of the reliable technology used for communication between farmer's android mobile device and the components present in the field.

V. REFERENCES

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