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Forest Management and Automated Irrigation System By Using Wireless Sensor Network

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Abstract - *Now a day the world faces the problem of global warming and sudden change in environment make critical problems in country like India. India faces problems especially in agriculture and forestry so this is the need of time to resolve the problems by using advanced technologies such as wireless sensor technology,GPRS. Computerized water saving Irrigation management and wireless sensor network will one of the key solutions to resolve the problems of agriculture and forestry. This project will design and develop an automated irrigation system based on microcontrollers, wireless sensor network and design forestry management by using wireless sensor network and GPRS.According to the type of the soil, availability of the water, crop in the farm and temperature of the soil, irrigation system will be managed in farm. Also in case of forest fire, we will get updated rapidly and will manage fire as fast as possible. Whole software design will be the user friendly so that farmers can handle the system effectively. Because of system uses solar energy and systems cost effectiveness, the system will be useful in isolated rural areas, where there is shortage of water*

KeyWords: GPRS, WIRELESS SENSOR, FOREST MANAGEMENT

1.INTRODUCTION

The rapid development of agriculture in India, the water consumption was increasing from past time. Due to more demand and environmental changes there is a shortage of water and low utilization of water in Indian agriculture, water resources were being existence, the implementations of water-saving irrigation were more and more crucial. Agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption due to difference in water required and method of water supply. As one of the key factor, soil moisture content is essential for the crop growth, while excessive soil moisture would cause the root of crops. With the development of computer and electronics technology, monitoring and control of soil moisture content had made great progress. There are many systems to increase water utilization in various crops, from basic ones to more technologically advanced ones.System must be monitored and irrigation scheduled based on canopy temperature distribution of the plant, which was acquired with thermal imaging. But, there is need to develop new advance system to overcome old complicated wired technology as well as to understand crop water quantity which is physical and not possible in old mathematical modules.

Now a days whole world suffer by the problem of global warming, sudden changes in environment question arises on the existence of human on earth. To save the world, we must save the forest and wildlife. In summer days forest fire is main problem of forest life. To a large extent, Forest fires are among the most dangerous natural accidents that occur in practically all countries. Forest fire is a dominant disturbance factor in almost all the forest vegetation zones throughout the World, and it is considered to be a potential hazard causing physical, biological, and environmental consequences. Furthermore, forest fires can have adverse societal impacts regardless of whether they are caused by natural forces or human activities. So this is the need to give alarm of fire to the forest department so that department can stop the fire before it get spread on long area. This research objective is to build a network through distributed wireless sensors randomly spread in the forest and to create a self-organized and robust network between the sensors to cover large areas in the forests that may be prone to/or in threat of fire damage at any time. At initial stage of forest fire its easy to stop the fire.So in forest management we can control forest fire by using temprature sensor and wireless network for huge area of forest.

2. PROPOSED SYSTEM

1] Automated irrigation been developed for large areas of land allowed for the optimizing of irrigation. With decision support software and its integration with an infield wireless sensor network (WSN), it will drive an irrigation machine converted to make sprinkler nozzles controllable. Each of the moisture and temperature sensor contained into WSU(Wireless sensor Unit)that contain data soil water reflect,a soil temperature sensor, and radio radio transceivers communication. Applications in agriculture have been used to provide data for appropriate management, such as monitoring of environmental conditions like weather, soil moisture content, soil temperature, soil fertility, mineral content, and weed disease detection, monitoring leaf temperature, moisture content, and monitoring growth of

the crop, automated irrigation facility and storage of agricultural products. Using the network information and the irrigation machine positions through a differential GPS, the software controlled the sprinkler with application of appropriate amount of water. A data acquisition system was deployed for monitoring crop conditions by means of soil moisture, soil, air, and canopy temperature measurement in cropped fields. Data were downloaded using a handheld computer connected via a serial port for analysis and storage. Another system used to achieve the effectiveness of water management was developed based on a WSN. Water flux leached below the root zone under an irrigated cropping system. Hybrid architectures, wireless modules are located inside the greenhouse where great flexibility is required, and wired modules are used in the outside area as actuator controllers. The development of WSNs based on microcontrollers and communication technologies will improve the current methods of monitoring to support the response appropriately in real time. Now, lets have a look on, how it works:

A] Moisture and temperature are taken as Input, so inputsensors sense the moisture and temperature through installed probes.

B] Recorded Data is transferred from WSU to WIU by using the wireless technology. Output-Data arrive at WNU from WSUs.Data is transferred from WNU to monitor by using GPRS and at the server end there is a storage of data on database. There will be the comparison of knowledge sets of temperature and moisture values (which are set by experts) and according to the results of logic values, water will be managed to crops.

2] The use of sensors to detect and monitor fire behavior has enhanced the application of .new technologies in the fire field. Sensors are able to consider certain dynamic and static variables such as humidity, the type of fuel, slope of the land, the direction and the speed of the wind, smoke, etc. They allow us to determine the direction and possible evolution of the flame front. The sensor-based systems can be very useful to detect a fire and to take decisions to eradicate it. In this research, all nodes have known location, and nodes only use temperature sensors and they are programmed on a certain threshold temperature, above it the node will send an alarm message to the control room. This concept relies solely on the node behavior to alert of crises possibility using simple node components to provide detection and information on whether this is a peaceful fire, or the beginning of wild fire. The key in this method is to make decisions by tracking the fire propagation and check the logic behind it rather than imaging technologies. The most convenient method is to monitor forests by using a GUI to represent the events and alerting messages on the monitoring screen. Nodes been inserted into the forest areas according to the density of forest trees. By using wireless network of the detection of temperature sensor will be send to the monitor to give the fire alarm to the department.

3. COMPONENTS OF SYSTEM

Following figure shows the design of system which is useful for the automated irrigation system and forestry management.

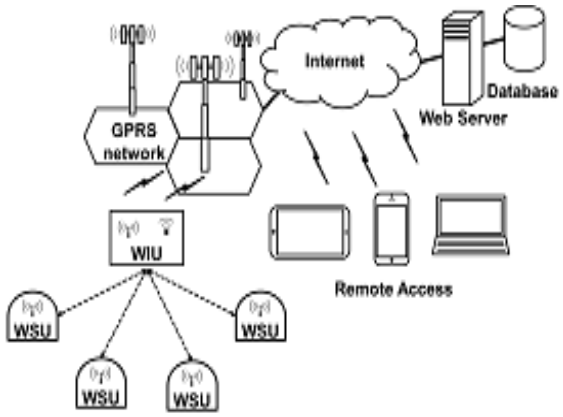

Fig.1 Architecture of System

1] WSU- Wireless Sensor Unit

WSU is comprised of a RF transceiver, sensors, a microcontroller, and power sources. Some WSUs can be inserted in-field to make a distributed sensor network for the computerized irrigation system. Each unit is based on the microcontroller that controls the radio modem and processes information which is we got from the inserted moisture sensor and temperature sensor. The small microcontroller, radio modem, rechargeable batteries and electronic components will be encapsulated in a waterproof PVC container and are get powered by rechargeable batteries. The charge is maintained by a photovoltaic panel to achieve independent and free energy.

2] WIU- Wireless Information Unit

The soil moisture and temperature data from each WSU are received, identified in the WIU. The WIU consists of a master microcontroller, an radio modem, a GPRS module,an interface of RS-232, two relays, two pumps for driving the water of the tanks. All the WIU were encapsulated in a waterproof container.

3] Master Microcontroller

The functionality of the WIU is depend upon the master microcontroller, which is programmed to execute tasks.First task of the program is downloading the date and time from web server through the GPRS module. The WIU is ready to transmit the date and time data for each WSU once it get powered. Then, the microcontroller receives the information in the package format which is transmitted by each WSU to WIU. These data then analyzed by the algorithm that first identifies the least significant byte of a unique 64-bit address encapsulated in the package received. Second, detected soil moisture and temperature data are compared with programmed values of desired soil moisture and soil temperature to start the irrigation pumps of crops. Third, the algorithm also records a log file with the data in a solid state memory which is having capacity of 128 kB. And web application will show all the values of which are detected and results of analysis that how much water the plants required according to detected vales in case of automated irrigation and in forestry fire alarm to the forest department will be generated to alert about fire.

4] Web Application

Graphical user interface software was developed for real time monitoring and programming of irrigation based on soil moisture and temperature data. The software application permits the user to visualize graphically the data from each WSU online using any device with Internet. Besides the soil-moisture and temperature graphs, the web application displays the total water consumption and the kind of the IA. The web application also enabled the user direct programming of scheduled irrigation schemes and adjusting the trigger values in the WIU according to the crop species and season management. All the information is stored in a database.

4. CONCLUSIONS

By focusing on irrigation system, sensing moisture and temperature of soil and it will get transfer on remote monitor through wireless sensor network will be result in the water-saving irrigation system. This system will work according to the soil moisture and temperature. Water evaporation in open environment, in traditional method makes it ineffective, so new technology been introduced to make more utilization of water. Uncertainty of monsoon, non-planning of water resources, are problem in agriculture of India. So, with the help of this new technology, we will make efficient water utilization. This system will be more effective with combination of other new technologies. Also by using this technology, also there is possibility of to avoid the damage of forest.

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