Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

Efficient Usage of Available Fresh Water Resources Through Optimized Irrigation System using Wireless Sensor Network

R. Brinda
Information Technology
Anna University Regional Campus
Coimbatore, India

Dr. P. Marikkannu
Information Technology
Anna University Regional Campus
Coimbatore, India

***Abstract*- Optimized irrigation system was developed to optimize water use of agriculture field. It consist of temperature sensor and moisture sensor. Each sensors fit in the every plant roots. There are two unit will be used in this irrigation system, There are wireless sensor unit (WSU) and wireless information unit(WIU) that can be very helpful for information processing. All the sensor send the information to WSU, then it send to WIU. Communication between sensors and WSU using zigbee communication. WSU and WIU using GPRS technology. All the plant temperature and soil moisture are stored in the database and compare with collected values and also scheduling process will handled through the web pages. If the value will be less, send the request to the motor. Less man power is needed for automatic irrigation system. Water saving up to 90% compared with traditional irrigation system. Irrigation system uses the solar power so it is significantly important for organic crop and the investment of electric power supply would be too expensive. Providing water to the plant how much they need to grow in the basis of temperature and soil moisture measurement not providing water in exit**

Keywords- Optimization, Distributed Networks, Scheduling, Wireless Sensor Unit(WSU) , Irrigation, Triggering, Relay Controller.

I INTRODUCTION

Agricultre field uses 80% of available freshwater resources in the all over world, and this percentage will continue, increasing water consumption day by day because of population growth and increased food demand. There is an immediate need to create system based on science and technology for significant use of water. There are many systems to achieve water control in various crops, from basic ones to more science and technologically advanced ones. The optimized irrigation system an embedded system for automatic control of irrigation. This system has wireless sensor network for real-time sensing and control of an irrigation system. The optimized system provides unique and required level of water for the agricultural farm and it will avoids water wastage. The system have provide real time sensing and control of a effective irrigation system. Then the condition of water in the agricultural farm is not normal then the automatic system automatically switches ON the motor. Then the water level obtain to normal level the motor automatically switch OFF.

India became a developing country and the most part of our GDP growth rate belongs only to agriculture . So we also say that field of agriculture is the key factor of India and irrigation system is consider the lifeline of agriculture field. The agriculture field in India has been the very important part in the economic development of country since the independence. Major part of our income is spent on agriculture alone but we not getting required output.

Many technologies are introduced but they are too expensive for the farmer. The irrigation system offers a less cost and very simpler solution to this problem developing traditional microclimate irrigation controllers with wireless sensor capability with cheaper cost In agricultural field use the water irrigation is sensor nodes. the temperature sensor, which senses the level temperature, moisture sensor will senses moisture of the soil. The land is divided into micro climatic regions and fit into equipped smart specified sensors and integrated through wireless sensor and optimized irrigation controller with wireless networking.

II LITERATURE REVIEW

As mentioned by the authors Y. Kim, R G Evans and W M Iverson in the year 2008, proposed the system using remote sensing and monitoring of an irrigation system using a distributed wireless sensor network. The agriculture land is available for cultivation its need a long period and high investigation. The remote sensing and electronic device use to monitoring the tasks. In this system as the remote monitoring PC is placed at a long area, the help of satellite is transferring. The transferring operation is done with transducer parameters. The cost is using satellite has to be high it will depending upon the involvement of number of channels using in the system.

O. Mirabella and M. Brischetto in the year 2011 proposed a irrigation system using Hybrid networks. A green house cooperation is monitoring of many greenhouses. The wireless unit is located in the environment where high flexibility is needed. using an integrated wired or wireless unit is to large use of both operation. by improving performances. (CAN) type network has been used for wired networks. The SCADA system is to control data in very

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

effective manner. The sensor networks are designed for specifically for industrial applications, designing efficient and it is very complex routing protocols for sensor networks is very important and significant.

In the year 2010 P. Mariño, F. P. Fontan, M. A. Dominguez, and S. Otero proposed a work based upon AD-HOC WSN. The biological research providing in agriculture field. It requires a large amount of electronic sensors to obtain various goals, there are climate monitoring, soil and fruit assessment, controlling the insects and related diseases, chemical pollutants, identification and control of weeds, crop tracking, and other related goals.

III PROPOSED METHOD

The irrigation system consist of wireless sensor units (WSUs) and next is wireless information unit (WIU), connected by radio transceivers it will allowed the transfer of soil moisture and temperature information, it will implementing ZigBee technology is used. The WIU has a GPRS technology. It will transmit the information to a web server through the public mobile network. The gained information can be remotely controlled online through a graphical web application via Internet access devices, the development of an optimized irrigation system consist of microcontrollers, wireless communication are represented in the system design. The aim of the implementation is to demonstrate that the effective optimized irrigation can be used to reduce water usage.

The existing system limitations are properly avoided in the automated irrigation system. The operation of all parameters such as motor ON/OFF strategy, water level, temperature and moisture etc. using zigbee communication we can collecting from long distance. We can monitored and controlled motor by using microcontroller. There are lot of technologies available for wireless communication useful in application related to different areas in irrigation field that is limited largely by the governmental communication organizations. The various types of wireless communication used in irrigation fields are radio frequency (RF) communication, ultra wide band (UWB) , narrow band, local area networks (LAN)personal area networks (PAN), cellular networks, and satellite networks . Irrigation with zigbee and gprs technology.

A. Architecture design

The sensors are collected the Temperature value and moisture value. these values are passes through the wireless sensor unit

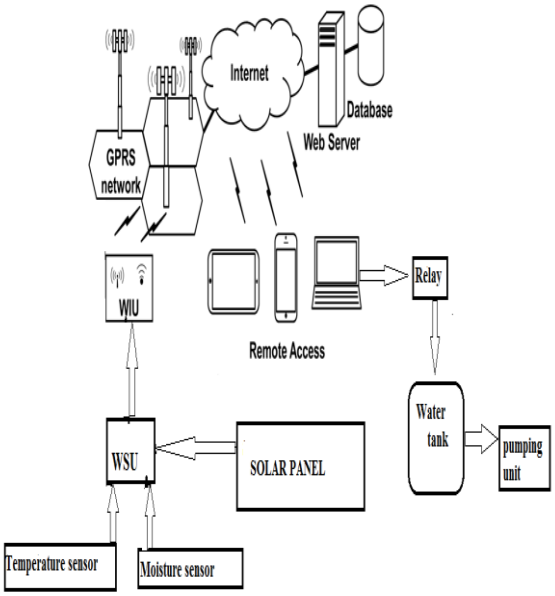

Fig 1 irrigation system

and passes through the WIU using zigbee communication. collected values are stored in the plant database. and it connect to webapplications. Scheduling process will be obtained the sensed values are compared with stored values. decision is obtained. scheduling process uses the sampling algorithm. Then the message will send to the motor. then the motor is ON.

B. Scheduling process

The process of data gathering is gaining the information from wireless sensor unit and wireless information unit. the data is temperature and moisture value. The threshold values is given from the agricultural departments. The input data will be obtained The temperature and moisture value will be analysed and comparing the threshold value

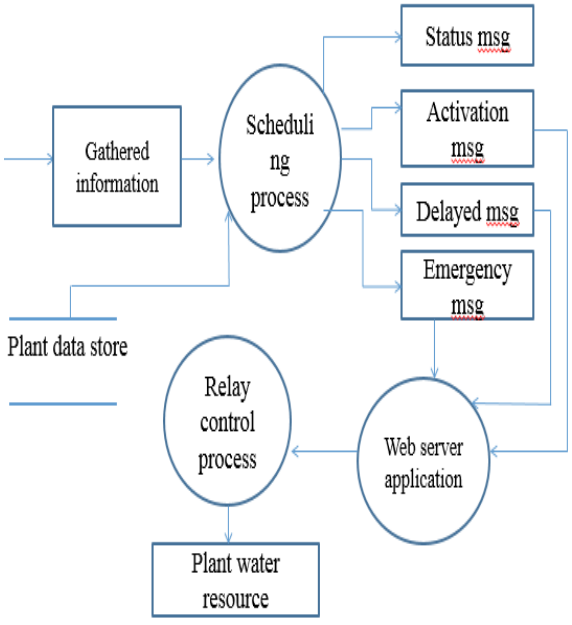

Fig 2 scheduling process

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 02, February-2016

There are four type of message occurred, if the immediate message will providing condition, (moisturevalue <cumulativevalue)&&(temperaturevalue>cumulative.value).if(m.v>c.v)&&(t.v>c.v) then the activation message is passed.(m.v<c.v)&&(t.v<c.v) and(m.v>c.v)&&(t.v<c.v) obtain delayed message and status message respectively.

While developing this system the controlling PC was set with predefined values with respect to the crop type as min and maximum threshold values .Fig3 shows the implementation of the master circuit diagram and sensory units and microcontrollers used by both WSU and WIU and the PC represents the Web applications or the database in which the thresh hold entries are stored. The collected GID, temperature and moisture are easily

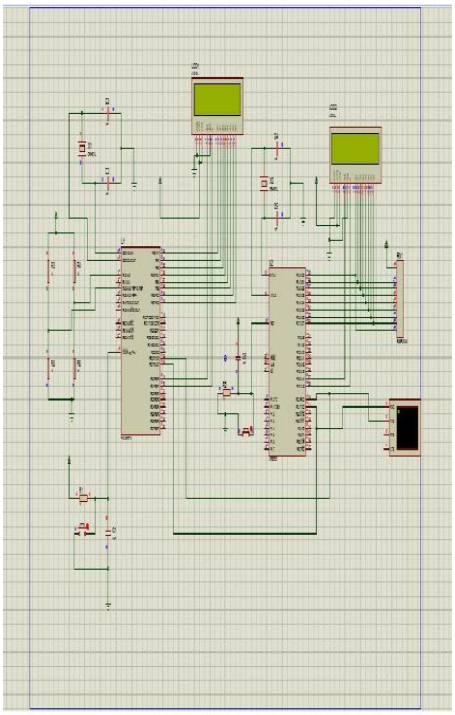

Fig 3 circuit diagram

Displayed on the LED displays which are sending to WIU When the WIU transfers the data to the PC. It will check greenhouse ID from the received values and verify what type of crop is cultivated in that particular crop by checking it from the database value After checking the type of crop it will verify for the threshold value. If it exceeds the threshold value it will send the activation signal to the WIU. If forwards the value to the WSU microcontroller.Single-Chip PIC24FJ64GB004- 16bit microcontroller with 44-pins and that operates in a range 2.0 to 3.6 V at 8 MHz. It has up to 25 digital input/output ports, 10-bit analogy-to- digital converters (ADC), it consist of two serial peripheral interface modules. Soil Sensor Array-The sensor array consists of two type soil sensors, including moisture and temperature sensors that are fit in the root plants root zone. The VH400 probe was selected to estimate the soil moisture because of very low power consumption (<7 mA) and low cost. Photovoltaic Cell-To maintain the charge and recharge of the WSU batteries, a solar panel was employed. Master Microcontroller-The functionality of the WIU is based on the microcontroller, The first operation of the program is to download from a web server the date and time passes through the GPRS module. The WIU get ready to transmitted via XBee the date and time for each WSU one time powered. The moisture and temperature informations are compare and scheduled with programmed values of minimum soil moisture and maximum temperature to activate the irrigation pumps for a desired period.

IV CONCLUSION

The optimized irrigation system developed was found to be feasible and cost effective for available freshwater resources for agricultural production. These type of irrigation system allows cultivation in different places with water scarcity there by improving sustainability. The optimized irrigation system developed proves that the use of water can be limited. The usage of solar power plant in this irrigation system is very significantly important for organic crops and other agricultural products that are determined and geographically isolated, where the overall investment in electric power supply would be more expensive. The optimized irrigation system can be adjusted to a large amount variety of specific crop needs. also providing requires minimum maintenance and maximum efficiency. the specified modular configuration of the optimized irrigation system allows it to be increasing larger greenhouses and open fields. other applications are temperature monitoring in compost production can be very easily implemented. The optimized irrigation system can be further implemented with the development of insect repelled unit to improve the efficiency quality of in this system. The developed system is implemented by using hardware components.

REFERECES

[1] I.F.Akyildiz,W.Su,Y.Sankarasubramaniam, and E. Cayirci, A survey of sensor networks, *IEEE Communication. Mag.*, vol. 40, no. 8, pp. 104–112, Aug. 2002.

[2] R. G. Allen, L. S. Pereira, D. Raes, and M. Smith, *Crop Evaporation and transpiration-Guidelines for Computing Crop Water Requirements FAO Irrigation and Drainage Paper 56*. Rome, Italy: FAO, 1998.

[3] A. Araujo, J. Garcia-Palacios, J. Blesa, F. Tirado, E. Romero, A. Samartin, and O. Nieto-Taladriz, Wireless measurement system for structural health monitoring with large time-synchronization accuracy,‖ *IEEE Trans. Instrum. Meas.*, vol. 61, no. 3, pp. 801–810,Mar. 2012.

[4] M. Bertocco, G. Gamba, A. Sona, and S. Vitturi, Experimental generalization of wireless sensor networks for industrial applications,‖ *IEEE Trans. Instrum. Meas.*, vol. 57, no. 8, pp. 1537–1546, Aug. 2008.

[5] J. M. Blonquist, Jr., S. B. Jones, and D. A. Robinson, Precise irrigation scheduling forgrass using a subsurface electromagnetic soil moisture sensor,‖ *Agricult. Water Manag.*, vol. 84, nos. 1–2, pp. 153–165, Jul. 2006

[6] M. P. Durisic, Z. Tafa, G. Dimic, and V. Milutinovic, A survey of military applications of wireless sensor networks,‖ in *Proc. MECO*, Jun. 2012, pp. 196–199.

[7] Y. Erdem, L. Arin, T. Erdem, S. Polat, M. Deveci, H. Okursoy, and H. T. Gültas, Crop water stress index for assessing irrigation scheduling of drip irrigated broccoli (Brassica oleracea L. var. italica), *Agricult. Water Manag.*, vol. 98, no. 1, pp. 148–156, Dec. 2010.