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REVIEW PAPER ON IRRIGATION SYSTEM USING A WIRELESS SENSOR NETWORK AND GPRS

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Abstract: This project probes into the design of the automated irrigation system based on ARM microcontroller. This Embedded project is to design and develop a low cost feature which is based on embedded platform for water irrigation system. This project uses temperature and soil moisture sensors to detect the water quantity present in agriculture, Humidity sensor for to measure the humidity and water level sensor for detect water level in tank. This project uses ARM micro controller which is 32-bit controller to process the information. Aim of this embedded project is to monitor status of the different sensors on remote PC through a web page. Here temperature, humidity, soil moisture and water level can be monitored on web page through micro controller using GSM/GPRS module. The web-server is connected to the internet. The owner on the PC is also connected to same Internet. By typing the IP-address on the web browser, the owner gets a web page on screen. This page contains all the information about the status of the sensors and ON/OFF status of the motor and Fan as a cooling system.

Keywords: Irrigation System, Wireless Sensor, GPRS

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INTRODUCTION

Indian economy is basically depends on agriculture. Agriculture uses most of available fresh water resources and this use of fresh water resources will continue to be increases Because of population growth and increased food demand. Increased labor costs, stricter Environmental regulations and increased competition for water resources from urban areas Provide strong motivation for efficient Irrigation system. The automated irrigation system is feasible and cost effective for optimizing water resources for agricultural production. Using the automated irrigation system we can prove that the use of water can be reduced for different agricultural production. The irrigation system provide only required amount of water to crop. This automated irrigation system allows it to be scaled up for larger greenhouses or open fields. An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil moisture and temperature sensors placed in the root zone of the plants and water level sensor is placed in tank for checking the water level in tank. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature, soil moisture and water level that was programmed into a microcontroller based gateway to control water quantity.

II. AN OVERVIEW ON SOME PREVIOUS IRRIGATION SYSTEMS

In some of the irrigation system irrigation scheduling is achieved by monitoring soil, water status with tension meters under drip irrigation by the automation controller system in sandy soil. It is very important for the farmer to maintain the content in the field. In this the design of a Microcontroller based drip irrigation mechanism is proposed, which is a real time feedback control system for monitoring and controlling all the activities of drip irrigation system more efficiently. Irrigation system controls valves by using automated controller allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labor to turn valves [1]. In some systems the automatic irrigation and fertilization using embedded system in the field of both plain and slope areas. The main objective is to provide uniform and required level of water avoid water overflow at the slope areas. Some irrigation system monitors solenoid valves for specified location of drips automatically according to the set point of sensors. The fertilization system monitors solenoid valves for specified location of same drips manually according to the field condition. In this system the ZigBee protocols replaces the wired irrigation system provides operating range much higher as compared to other wireless [2]. Some irrigation systems are used to implement efficient irrigation scheme for the field having different crops. The system can be further enhanced by using fuzzy logic controller. The

fuzzy logic scheme is used to increase the accuracy of the measured value and assists in decision making [3]. The green house based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. For this GSM is used to report the detailed about irrigation. The report from the GSM is send through the android mobile [4].

Some design has combined wireless sensor network with fuzzy control system in the intelligent water-saving irrigation system, realized a remote on-line monitoring and controlling. Nodes in the monitoring area have used devices of solar energy and lithium battery to provide power, which has certain practical significance to solve the problem of limited energy; using the set of multiple hops network protocol to communicate, the nodes have the feature of self-organizing, low power consumption and high reliability. The system has adopts control method of double input and single output fuzzy, used Fuzzy Logic toolbox for modeling and analyzing of the system, and demonstrated the relationship between system input and output, made the control system much scientific [6]. The software and hardware combine together provide a very advanced control over the currently implemented manual system. The implementation involves use of internet for remote monitoring as well as control of Drip Irrigation system. This system uses sensors like humidity, soil moisture. These sensors send values to micro-controller. Micro-controller sends values to PC using serial communication. According to real time sensors values continuous graph is display on PC and Android Based mobile using Internet and Android application. Here threshold value is keep, if sensor values cross the threshold value then Drip Irrigation components can be control automatically by microcontroller. User can also control Drip Irrigation from anywhere via Android mobile [7]. The system has wireless sensor network for real-time sensing and control of an irrigation system. This system provides uniform and required level of water for the agricultural farm and it avoids water wastage. This system has real time sensing and control of an irrigation system. When the condition of water in the agricultural farm is abnormal then the system automatically switches ON the motor. When the water level reaches normal level the motor automatically switch OFF. In this system they are interfacing micro-controller through temperature sensor, humidity sensor and also interfacing to GSM through MAX 232. In this system they set specified values of temperature, humidity and the conditioned is uniformly monitored by VB.NET [8].

In the Micro-controller based drip irrigation mechanism, this is a real time feedback control system for monitoring and controlling all the activities of drip irrigation system more efficiently. Irrigation system controls valves by using automated controller to turn ON OFF. This allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labor to turn valves or motor ON OFF. This reduces runoff over watering saturated soils avoid

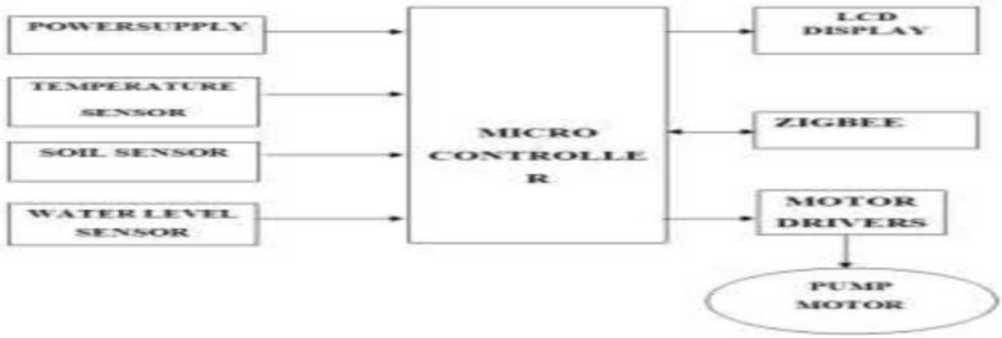

Fig: Wireless Sensor Unit B. WIRELESS INFORMATION UNIT

irrigating at the wrong time of the day. It improves crop performances and help in time saving in all the aspects [9]. In the irrigation area automatic system, high performance embedded micro-controller and low-power technology is used to design the wireless sensor network. The sensor node gathers the hydro graphic information such as water level, gate position and rainfall. The sink node receives the real-time data; the information center stores and processes those data which are transmitted from the sink node through the GPRS network. The system replaces the wired transmission with the wireless transmission, which reduces the costs in installment and maintenance, and improves the system's reliability and extension. It has better application prospect [10]. The management of this kind of farms requires data acquisition in each greenhouse and their transfer to a control unit which is usually located in a control room, separated from the production area. At present, the data transfer between the greenhouses and the control system is mainly provided by a suitable wired communication system, such as a field bus. In such contexts, even though the replacement of the wired system with a fully wireless one can appear very attractive, a fully wireless system can introduce some disadvantages. A solution based on a hybrid wired/wireless network, where Controller Area Network and ZigBee protocols are used. In particular, in order to integrate at the Data Link Layer the wireless section with the wired one, a suitable multi-protocol bridge has been implemented. Moreover, at the Application Layer, porting of Smart Distributed System services on ZigBee, called ZSDS, allows one to access the network resources independently from the network segment they are connected to [11]. The some system highlights the development of

temperature and soil moisture sensor that can be placed on suitable locations on field for monitoring of temperature and moisture of soil, the two parameters to which the crops are susceptible. The sensing system is based on a feedback control mechanism with a centralized control unit which regulates the flow of water on to the field in the real time based on the instantaneous temperature and moisture values [12]. Some system presents Artificial Neural Network (ANN) based intelligent control system for effective irrigation scheduling. The proposed Artificial Neural Network

(ANN) based controller was prototyped using MATLAB. The input parameters like air temperature, soil moisture, radiations and humidity are modeled. Then using appropriate method, ecological conditions, evapotranspiration and type of crop, the amount of water needed for irrigation was estimated and then associated results are simulated [15]

III. AN OVERVIEW ON IRRIGATION SYSTEM USING WIRELESS SENSOR NETWORK AND GPRS

The proposed system has two main units one is wireless sensor unit (WSU) and another is Wireless information unit (WIU).Wireless sensor unit is nothing but transmission section which Transmit the sensor data to the wireless information unit. Wireless information unit is nothing but section which receives sensor data from wireless sensor unit.

A. WIRELESS SENSOR UNIT

A WSU is comprised of a RF transceiver, different sensors, a micro-controller, ZigBee and power sources. Several WSUs can be deployed infield to configure a distributed sensor network for the automated irrigation system. Each unit is based on the micro-controller that controls the radio modem ZigBee and processes information from the soil-moisture sensor, temperature sensor and water level sensor. The soil moisture, temperature and water level sensor data from each WSU are received, identified, recorded, and analyzed in the WIU. TheWIU consists of a master micro-controller, an ZigBee radio modem, a GPRS module This processed information is send to web page where status of all these sensors are display graphically using graphical user interface using the GPRS module.

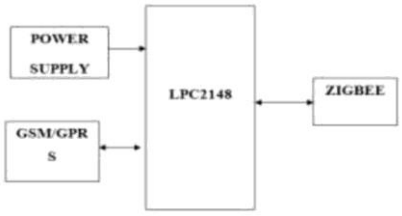

Fig: Wireless Information Unit

IV. **CONCLUSION:** Using this irrigation system of wireless sensor network and GPRS.

1. This system is reduces the water use because it provide irrigation as per the requirement of the crop.

2. This system reduces the human resources as it is automated irrigation system.

3. This irrigation system was found to be feasible and cost effective for optimizing water resources for agricultural production.

4. The irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance.

5. Using this system we can monitor the status of all the sensors (Soil-moisture, Temperature, Water level) and also the ON/OFF status of the motor and cooling system.

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