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A PATH FOR HORIZING YOUR INNOVATIVE WORK

IRRIGATION BY WIRELESS SENSOR NETWORK

SHRADDHA W. KHOLE[1], SNEHAL P. CHINCHOLKAR[2]

1. Student, M.E(Digital Electronics), PRMIT & R Badnera, Maharashtra, India.
2. Student, M.E(Digital Electronics), Sipna college of engineering and technology, Amravati Maharashtra, India.

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Abstract: In the developing world, water allocated to irrigation is about (or exceeds) 69% of water resources (Fry, 2005). In view of increased domestic competition for resources and the need for larger agricultural production to ensure food security, such a fraction is unsustainable. It is intended to use affordable and conceptual irrigation constraints and set-ups. Wireless sensor networks (WSN) gives the science basis for using resources water under the technologies of various sensors like soil moisture sensors, air temperature sensors, precise irrigation equipments, intelligent controller, and computer-controlled devices, so that agricultural crop get the best part out of water utilization. This paper describes the approach to towards the development of a wireless sensor network for low-cost wireless real time monitoring and controlled irrigation solution.

Keywords: WSN., Intelligent Controller, Soil Moisture Sensors

Corresponding Author: MS. SHRADDHA W. KHOLE

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INTRODUCTION

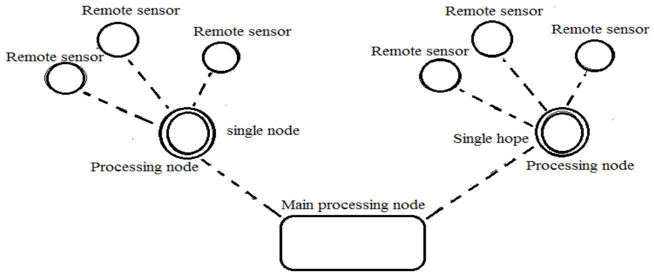
Optimum and precision irrigation control system needs sensors in large numbers that are thrown out on each plot of the field. A wireless sensor network has been developed based on commercially available components. These components have been selected aiming to achieve maximum production within limited area. For quality and real-time irrigation control; controllers and sensors are installed at each plot, each controller performs its own individual irrigation schedule which is set and reprogrammed on a regular basis. The wireless connection technology is mainly to realize the device networking and applications with low-cost, low-power, low complexity, low transmission rate and short distance. The use of wireless sensor networks (WSN) saves a lot of installation and management cost. Battery operated equipment is more reliable and still favorable, in such a way that they become low-power and work reliably under outdoor agricultural conditions [1]. Several applications require hermetically sealed environments, where physical parameter measurements such as temperature, humidity, or pressure are measured and, for several reasons [2]. In the MAC layer scheme, nodes in a nearly as described cluster can make cooperative sleep schedule with each other, which decreases energy consumption drastically [3]. In recent years, WSN nodes have been designed using low power micro-controllers such as the MSP430 from Texas Instrument or Cool RISC.

Wireless sensor networks have become an important tool for modern growers. Sensors provide the ability to monitor conditions from the farm-level down to individual plants. Such sensors include ambient temperature, humidity, and soil water content. Control systems can also be instrumented to monitor parameters such as irrigation pressure, applied water volume, and injected fertilizer concentration. Commercially-available wireless sensor networks for crop monitoring have, until recently, focused on sensing, but not control. Growers using such systems have a wealth of crop information from sensors, but must implement their control decisions using traditional means such as standalone irrigation

controllers or manual labor. Much research has been conducted on developing wireless control systems (Coates & Delwiche, 2009; Dursun & Ozden, 2011; Kim et al., 2008; Lajara, et al., 2011; Lea-Cox et al., 2008). These developments are important for advancing the state of wireless technology and developing best practices for implementation and control methodologies, but ultimately leave growers without the ability to adopt such systems since they are not available as commercial products.

SYSTEM DESIGN

The system consists of irrigation (network control unit) controllers, distributed over the Irrigated farm zones. They are connected through a wireless link to a local remote that regularly readouts the data from sensor and then scheduling the programs running of its own in the controllers. A System block containing an expert system running autonomously on the local remote helps to optimize their scheduler programs in view of the expected water availability and climatic conditions on a long-term as well as short-term basis. During the all growing seasons, the system components are mainly being evaluated. There are three different units which were designed and applied in this schema: Base station unit (BSU), valve unit (VU) and sensor unit (SU). All of these units contain a RF module, an antenna [5]. An irrigation sensor node has been developed to deploy in the field and to sense the environment for the crop. The WSN node is consisting of temperature sensors, soil moisture sensor, microcontroller MSP430 and low power radio transceivers CC2500 to collect data from the field and transmit the data to a remote receiver outside the field. To prevent node from the environmental condition such as heat, rain, dust in the field a corrosion proof casing (hermetically sealed) is used. After setting up the network arrangement, node runs its application software. The application software starts its active period by turning ON its sensors and sensing the environment of the field. The application software reads the parameters such as humidity, temperature and soil moisture of the field crop from sensors and reports it to the base via its other WSN nodes. If the node receives any packets from its supporting nodes during the active time, it releases the packets to its other nodes. After the transmission of its sensing data, node waits till its working schedule such as sensing period. As it receives its sensing period, the application software turns OFF its attached sensors and puts the transceiver to sleep mode. Finally, it sets up the internal sleep timer, goes to its sleep period and waits for the end of the timer. After the expiration of the timer, the application restarts its next active periods by turning ON the transceiver and the sensors and continues to sense the environment of the field [6].



Typical sensor network arrangements.

The Chipcon CC2500 transceiver has been chosen to use for the application because it is readily available, well supported and applications information, and has relatively inexpensive evaluation tools. The family of Transceiver is designed specifically for low-power, extended battery-life applications as prime design objectives. Rather, the easy-to understand the architecture, instruction set, and family structure contributed significantly to the selection [7].

CONCLUSION

The system presents an conceptual innovative, simple and affordable, hard- and software based; a wireless and low-power sensor network(maintenance); an expert system for irrigation planning in view of less water availability and an irrigation scheduler for water sources. This involvement already ensures that the results will be implemented in a short time into adequate and appropriate products for the end-user irrigation market. Also the power consumption of the final products leads to the battery long life ,will also be fine-tuned to the economic and physical conditions of markets, where the largest growth for irrigation equipment is expected.

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