

Increasing Growth of Agriculture using Efficient Wireless Sensor Network System

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ABSTRACT

Today wireless sensor network is growing field in the development of agriculture management, disaster management, health monitoring, industrial automation and many more. In this paper we focus to developed agriculture system design and model based on wireless sensor network. This system monitor and controls all the activities of agriculture such as real time sensing of soil parameters and remote sensing. Wireless Sensor Network, composed of tiny sensor devices and wireless network, is mainly responsible for any kind of ambience surveillance. Due to the peripheral atmosphere in which it is deployed, tiny sensors or the network might be too much fault prone. It is beneficial if and only if sensed values are fault free and it can traverse through fault free path. Thus it is necessary to monitor the network and the sensor nodes in regular interval to generate required result for application specific decision making. Network lifetime play the crucial role in order to monitor network health. This system is also useful for enhancement of the production of crops and also improves the growth of farmers in new era.

Keywords: Agriculture system, Real time sensing, Soil parameters, Wireless Sensor Network

I. INTRODUCTION

Growth in agriculture is one of the fundamental problems in progressive countries. In india growth of economy is based on the agriculture and climate conditions are changing rapidly. Till now full resources of agriculture is not used by farmers. Due to decreasing rains and crisis of water many acres land slowly converting into non – irrigated land. Second very important point that we are using proper utilization of water, so large amount of water goes waste. Wireless sensor networks are very useful for monitoring agriculture system. Efficient water management plays an important role in irrigated agricultural. Under conventional blanket irrigation many parts of irrigated fields are effectively over or under irrigated due to spatial variability in soil available water holding capacity, water infiltration and runoff. Under irrigated areas are subject to water stress, resulting in production loss, while over-irrigated areas suffer from poor plant health and nutrient leaching.

Tomato is the world's largest vegetable crop after potato and sweet potato, but it tops the list of canned vegetables. The total global area under tomato is 56.10 lakh ha and the global production is to the tune of 1579.40 lakh tones. The world trade in tomato consists of an export of 59.50 lakh tones valued at 60718.55 lakh US\$ and imports are to the tune of 57.20 lakh tones estimated at 60621.62 lakh US\$. The study has revealed that adoption of precision farming has led to 80.5 per cent increase in yield in tomato production. Increase in gross margin has been found as 175 in tomato farming. The contribution of technology for higher yield in precision farming has been 43.61 per cent in tomato production. The elasticity of 0.49 for the adoption in tomato has indicated that as the probability of adoption increases by 15 per cent, net return increases by 43 per in tomato cultivation. Recent low-cost, low-power wireless mesh networking technology is well suited to replace wires as the communication medium in many agricultural applications. The networks consist of a number of wireless nodes, which are battery powered and backed up by solar energy, and attached to sensors in the ground; the nodes transmit data via other wireless nodes to a base station. The WSN which is capable of self-organizing and self-healing (mesh networking) requires minimum

maintenance. Although the WSN uses low power radios, mesh networking technology enables transmission of data from one node to any other node in the network, without using high power radios. The mesh network allow greater flexibility in node placement since inability for two nodes to communicate (e.g. due to a physical obstruction) is handled by re-routing through any other possible alternative route within the network. Another advantage is that a failed node does not disable the network, as the other dependent nodes re-route through other available nodes (self-healing). Once the wireless sensor nodes are placed in management zones and the base station is activated, the sensor network is self-formed by allocating unique addresses to each node and defining the most efficient communication path to relay data from each node to the base station. The base station which processes the data also acts as a web server. Interested parties can access the real time data by directing a standard web browser to the URL of the web server in the base station.

It is observed that farmer bear huge financial loss because of wrong prediction of weather and incorrect irrigation method to crops. With the evolution of WSN now it is possible to use them for automatic environment monitoring and controlling the parameter of field for precision agriculture application.

II. LITERATURE REVIEW

Mobile data collectors were proposed in [1], assuming centralized knowledge and decisions made at the Base Station (BS). These mobile nodes move along a set of predefined tracks in the sensing field. It was shown that using data collectors (mobile relays) extends the network lifetime compared to conventional WSNs using static Sensor Nodes (SNs) only. In fact, data collectors were used earlier in [2] and [3]. The network lifetime was divided into equal length time intervals, called rounds. The data collectors are relocated at the beginning of each round based on a centralized algorithm running at the Base Station. The objective was to minimize the aggregate consumed energy during one round. It was shown that the optimal locations according to this objective function remain optimal even when the objective becomes to minimize the maximum energy consumed per SN. It should be remarked that these two energy metrics are not suitable for finding the optimal locations of mobile nodes since the optimal solutions will not be functions of time, i.e. time-independent. Consequently, the locations calculated may be far from optimal.

The energy effective WSN for agriculture proposed in [5] utilizes the sensor node hardware with CC1110 framework on chip with low power RF Tran's collector and 8051 MCU from texas. The proposed configuration of node framework in [6] [7] utilizes the CC2420 zigbee/RF module as RF Tran recipient center unit of remote correspondence framework and MSP430 as microcontroller unit. The RF module is associated with SPI through MCU. The framework likewise incorporates the correspondence web server, the focal point of screen taking into account web, master arrangement of agribusiness. So the real time information joined through the sensor hub is transferred to the sink node and afterward

III. PROPOSED WORK

According to the above information, it is clear that growth of tomato is highly dependent on few climatic factors like air temperature, humidity, soil temperature and soil moisture. So it is essential to monitor few climatic conditions for the better yield of tomato. This work makes an attempt to outline a design that can monitor the soil moisture, soil temperature and reserve water tank level of an agrarian field and transmit it to a remote collector outside the field. The framework in this paper is made out of the microcontroller, WSN base station, Information gathering nodes and sensors. The WSN information gathering node is associated with thermistor, soil moisture, LDR (light dependent resistor) and pressure sensor. The framework, indicated in Fig. 1, embodies a general self-sorting cross section WSN with detecting abilities, a Passage, which assembles information and gives data to the last client fit for observing and associating with the instrumented environment.

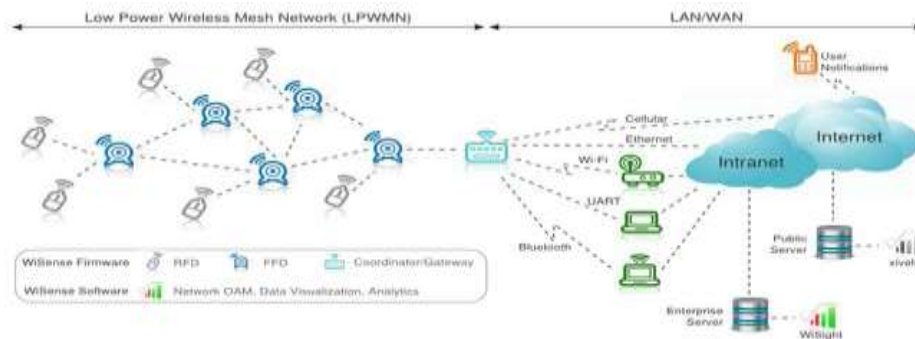


Fig 1: WSN architecture of nodes

The architecture then to be implemented in the sensor nodes will construct a wireless networking data collection at crop field likely to replace the conventional manually data collection system. A general “LITE” mote shown in fig 2 has microcontroller for local processing, a radio module that provides wireless connectivity and external terminals to connect various sensors like soil moisture, thermistor, LDR and pressure sensors are integrated to all nodes. All the deployed nodes collect the parameters and report to the central coordinator /sink shown in fig 3. The coordinator coordinates the data collection. The individual nodes based on the soil moisture sensor content attached to it will excite the water sprinklers in that particular region. There by we can conserve water using this project.

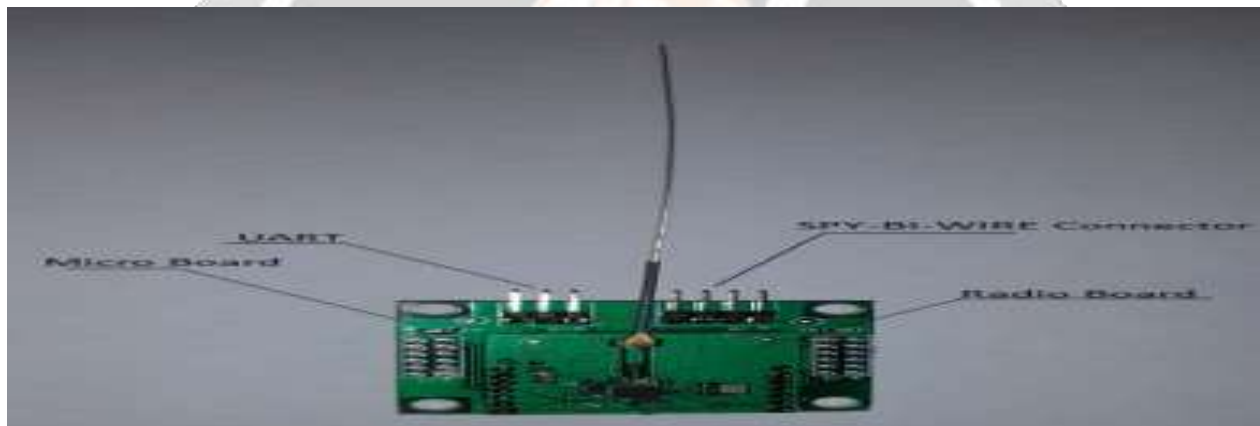


Fig 2:Node



Fig. 3: Gateway Node



Fig 4: Proposed System setup

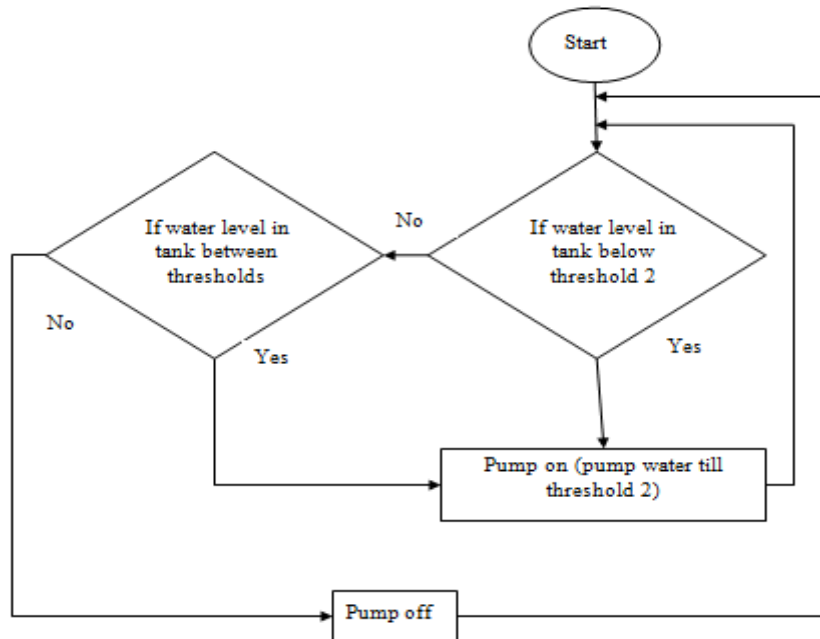


Fig6: Flowchart of Proposed System

The proposed system as shown in fig 4 and 5 automatically maintains desired moisture level around root zone of plant. Sensor senses moisture level in root zone sends the data to control system via CC1101. Software control system receive data from sensor and take decision whether the electric pump has to turn on or turn off and send control signal to irrigation control unit. The MSP430 will receive signal from computer and send control signal to electric pump to make it turn on or off.

V.CONCLUSION

The soil moisture response monitoring system designed is very simple to understand and handle. It can be operated by all age-groups of farmer. It can be reprogrammable to add more features. The proposed system is able to determine the soil moisture and necessity of water to crop in order to supply to the soil plant system the just enough amount of water to maintain the moisture level around the levels set by the user. This system continuously monitors agriculture soil to get moisture level so avoids crops drying up or drained out by too lengthier irrigation period. Also monitors the reserve water tank storage so that overflow of tank will be avoided as well as it helps to do the efficient

water management in order to get more profit with less cost. Another innovation involves data from farm, which are currently collected wirelessly at the gateway can be uploaded to web, xively. Data will be updated every 5 sec so that a farmer can look on farm condition from anywhere and anytime. Using this system, one can save manpower, as well as water to improve productivity and ultimately the profit.

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