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Case Study on WSN Based Smart Home Garden with Priority Driven Approach

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ABSTRACT

The proposed system focuses on utilizing the available water for a home garden in an effective way. The same approach is applicable to agriculture (large field), as our country's economy depends up on the agriculture. Therefore, agriculture is the backbone of Indian economy. In this paper, the authors have proposed a novel approach priority driven scheduling based irrigation model (for home garden) which supplies optimum and good quality water to the crops. The most important part for such system is Wireless Sensor Network which irrigates the plants. The proposed system will be very useful as it immediately irrigates the plant. In this process, soil moisture values will be sensed and compared to find out the lowest value. It means water will be given immediately to such plants where moisture values are low. Such systems will start new era in agriculture and will prove itself as a major requirement in the future due to many critical factors such as irregularity of monsoon, less availability of water, etc.

KEYWORDS

Humidity, Moisture Sensors, Priority Driven Scheduling, Smart Irrigation, Temperature, Volumetric Water Contents, Wireless Sensor Network

1. INTRODUCTION

Agriculture is the biggest component of Gross Domestic Product (GDP) of Indian economy. Garden as well as agriculture requires a huge amount of water for better crop yielding. Several factors affect the growth of a crop like irrigation, fertilization and field monitoring. The most important factor in irrigation is water which important natural resource. Proposed system focuses on utilizing available ground water in an effective way as it is valuable asset.

We have proposed a novel approach which supplies sufficient amount of water to the plants to maintain the moisture. This proposed model is based on Wireless Sensor Network technology and Priority based scheduling algorithm. Monsoon, everyone always wait for it, blows from the southwest half the year and from the northeast during the other half. The seasonal reversal of the wind direction occurring in May and June brings copious moisture from the warm waters of the tropical ocean to the Indian continent through southwesterlies, but sometimes it can be delayed up to July too. Usually most of the annual rainfall in India occurs from June/July to September. The winter monsoon or the northeast monsoon brings rainfall to the southeastern part of India through northeasterlies during October to December and contributes a small percentage to the annual Indian rainfall, as compared

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to rainfall in June/July to September (Hal Warner. 2002, April 01). Wireless sensor network as shown in Figure 1 in which 'n' nodes are present and communicate with each other. This paper consists of various aspects, development and applications of WSN and also focus on communication with minimal efforts by introducing the efficient and effective strategies to save the available water. In the proposed system, we are using sensor nodes such as pH sensors, Humidity Sensors, Level Sensors, Soil Moisture Sensors, Temperature Sensors to perform desired task. These sensor nodes (slave nodes) require a master node to control the operations. As discussed earlier, temperature, soil moisture, and humidity these parameters will vary every time and therefore we will note these values in periodic manner.

2. WIRELESS SENSOR NETWORK AND PROPOSED SYSTEM

Wireless sensor network is the network of different sensor nodes. It is expected that it should exhibit like a self-organized network. (Aditi Chatterjee, Debaprasad Mukharjee 2014). There are various applications where Wireless Sensor Networks can be useful like Climate Monitoring, security monitoring and many more. It has a vital role in defense field also (Ananthram Swami, Qing Zhaho, Yao-Win Hang, Lang Tang 2007; Anna Hac. 2003).

Algorithm will require handling various events to execute a priority based scheduling. Scheduling of the sensing real time values of pH, temperature, moisture, and humidity will be a complex task. Comparing moisture values to find out the lowest value and automatically starting the irrigation is important. There are many scheduling algorithms available based on First-Come First-Served (FCFS), non-pre-emptive priority, and pre-emptive priority scheduling. But, these algorithmic strategies incur a large processing overhead and data transmission delay and are not dynamic to the data traffic changes. We have selected priority driven scheduling strategy. Various sensors devices in the system will sense the moisture, temp, humidity values and will send them to the control station (coordinator). This step will invoke the priority driven scheduling algorithm and immediately water will be given to the plant. Emergency real-time packets are placed into the highest priority queue and can pre-empt the processing of packets at other queues. Other packets are prioritized based on the location of sensor nodes will be placed into other queues. To make scheduling decisions based on the priorities assigned to tasks, when events such as releasing of task and task completions occur in that case priority scheduling algorithms can be known as an event-driven scheduling algorithm. At each event, the ready job with the highest priority will be executed & assignment of tasks to priority queues, along with rules such as whether pre-emption is allowed or not, completely defines a priority scheduling algorithm. Therefore, we can say that our focus in such case should be on pre-emptive scheduling strategy in which run time resource allocation will be important.

Figure 1. Basic structure of WSN