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MATLAB Implementation of Wireless Sensor Network (WSN) in Precision Agriculture in Rural India.

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Abstract- The use of wireless sensor networks is essential to implementation of information and control technologies in application areas such as precision agriculture. Recent advances in communications technology and wireless sensor networks made new trends to emerge in agriculture sector. One such new trend is Precision Agriculture. In this paper we focus on Wireless Sensor Networks (WSN) in Monitoring water level in the farm area for Precision Agriculture. Our algorithm which picks up the information for water level and it is implemented using MATLAB. Precision farming ensures quicker response times to adverse climatic conditions, better quality control of the produce and yet a lower labor cost. Emerging wireless technologies with low power needs and low data rate capabilities, which perfectly suites precision agriculture, have been developed . we propose to implement this type water level in the form. We process real picture in MATLAB in vineyard at village Pindhurli, tahesil sinnar, district nasik, maharashtra, India.

Keywords: Precision Agriculture, wireless sensor networks, sensor node, base station, sink.

Introduction:

Precision Agriculture refers to a set of technologies that introduce the concept of local variation into the large-scale mechanization, which is essential to large fields [2]. With the determination of soil conditions and plant development, these technologies can lower the production cost by fine-tuning seeding, fertilizer, chemical and water use, and potentially increasing production and lowering costs. These can be achieved through the approach of agricultural control and management based on direct chemical, biological and environmental sensing. Wireless Sensor Networks (WSN) plays a major role in this approach.

The Precision farming system has the following parts:

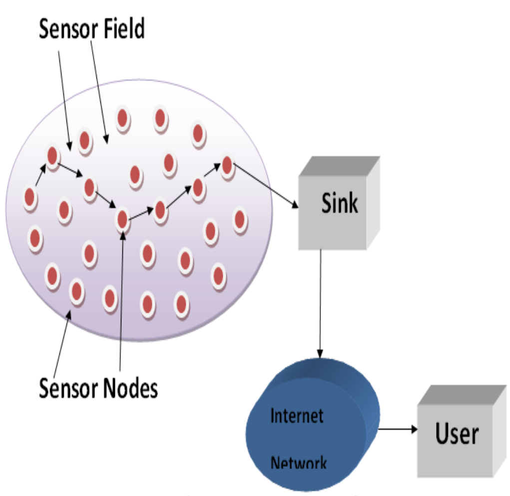
i) Sensing agricultural parameters.

ii) Identification of sensing location and data gathering.

iii) Transferring data from crop field to control station for decision making.

iv) Actuation and Control decision based on sensed data.

Wireless Sensor Network:



Wireless Sensor Network

WSNs usually consist of a large number of low-cost, low-power, multifunctional Sensor nodes that are small in size and communicate in short distances [3]. Their structure and characteristics depend on their electronic, mechanical and communication limitations but also on the requirements of the specific application. One of the most important network limitations is energy conservation. Wireless sensors operate on limited power sources therefore; their main focus is on power conservation through appropriate optimization of communication and operation management. Several analyses of energy efficiency of sensor networks have been realized and several algorithms that lead to optimal topologies for power conservation have been proposed.

Related work:

The concept of precision agriculture has been around for some time now.

Blackmore et al., in 1994 [1] defined it as a comprehensive system designed to optimize agricultural production by carefully tailoring soil and crop management to correspond to the unique condition found in each field while maintaining environmental quality. The Early adopters during that time found precision agriculture to be unprofitable and the instances of implementation of precision agriculture were few and far between. Further, the high initial investment in the form of electronic equipment for sensing and communication meant that only large farms could afford it. The technologies proposed at this point comprised of three aspects: (a) Remote Sensing (RS), (b) Global Positioning System (GPS) and (c) Geographical Information System (GIS). The technology apart from being non real-time, involved the use of expensive technologies like satellite sensing. Over the last few years, the advancement in sensing and communication technologies has significantly brought down the cost of deployment and running of a feasible precision agriculture framework. Emerging wireless technologies with low power needs and low data rate capabilities, which perfectly suites precision agriculture, have been developed [4]. In California, Beckwith *et al* designed deployed and analysed output of a large scale implementation of a wireless sensor network in a vineyard [5]. 65 motes with a maximum of 8 hops were deployed in a planned area where no neighbor discovery features were implemented and a table driven protocol was used rather than a self organizing network. Data was recorded every five minutes with a grid of sensor nodes each separated 15m from the other. when a wine maker would need to take action to deal with a weather problem.

In Europe, the Lofar Agro project is a study of precision agriculture that focuses on tailored management of a crop. This involves monitoring soil, crop and climate conditions in a field, generalising the result and providing a decision support system (DSS) for treatments or taking differential action such as real time variation of fertiliser or pesticide application. The DSS gathers information from a weather station and the wireless network. This is employed to map out a temperature and soil humidity distribution which is used to develop an effective strategy for controlling diseases such as Phytophthora [6].

Methodology: In rural parts of developing countries, many people rely upon farming to provide food, yet lack valuable agricultural information about soil conditions, the weather forecast, pest and plant diseases, efficient irrigation methods, and crops they intend to grow. They also often lack basic literacy skills, and have little or no knowledge about Information and Communications Technologies (ICT). Agricultural information systems are common among large commercial farms in the developed world, but small, local implementations for the developing world require sensitive and participatory design practices, since existing Technologies, interaction design methodologies, and usability testing techniques are all developed by and for the developed world. We propose application of WSN in precision agriculture with some MATLAB implementation. As per as vineyard is concern in is divided into the number of sub-sections as shown in figure 2. with reference to figure 3 we check water flow and process this image in

MATLAB. And calculate the requirement of water.

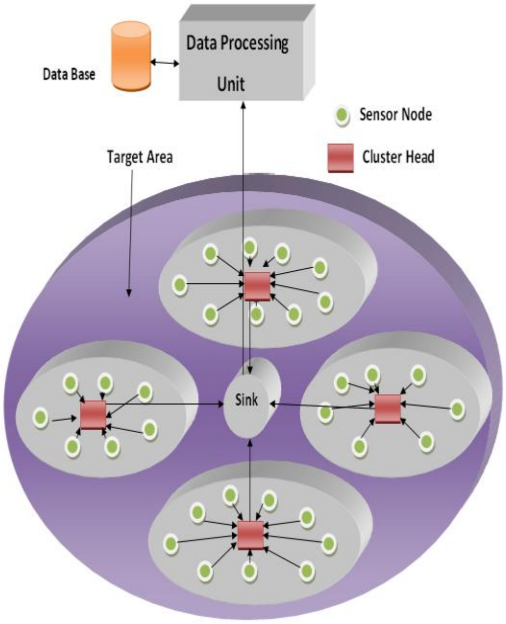


Figure 2: Proposed Architecture of wireless sensor network in precision agriculture

Proposed Algorithm:

1. Read the reference image from database
2. Read the captured image from database
3. Take the difference of these two images
4. Convert the image into black and white
5. Plot the histogram of the black and white image
6. Return the same size of blackwhite image using label
7. Scan the matrix to get isolated region from the difference image
8. If >2 //change is detected
9. Else // No change
10. End

Results:

Figure 3: Reference image from database.

Figure 4: Captured image from database.

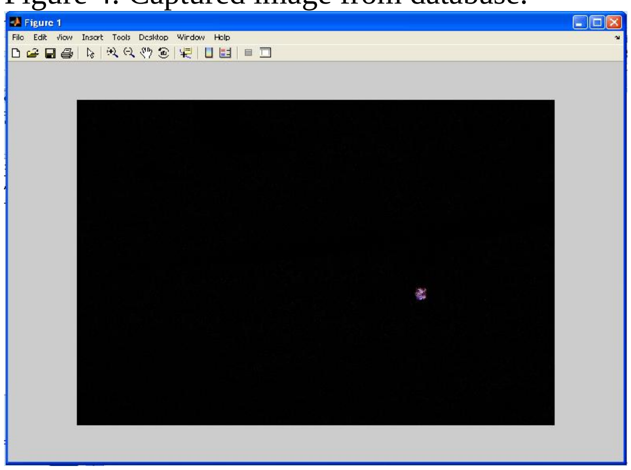


Figure 5: Difference of above two images.

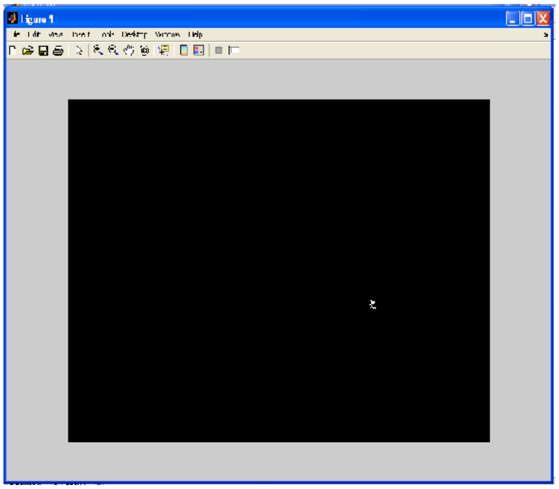


Figure 6: Black and white image.

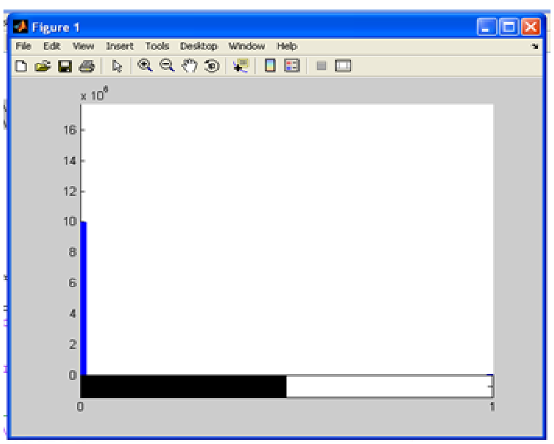


Figure 7: Histogram of the black and white image

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