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Research paper

Testing and Implementation of Different Wireless Sensor Network Algorithms in Agriculture Area

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Abstract

The paper demonstrates the Testing and Implementation of Different Wireless Sensor Network Algorithms in Agriculture Area. From this algorithm, it will be finalized that which algorithm is more suitable in agriculture area. Agriculture areas are large areas geographically, so to monitor agriculture parameters the wireless sensor networks are more suitable. Graham, Jevis, LPCN l algorithms explained and one personal algorithm implemented. All the results of algorithms are explained in the paper. The results are obtained using wireless network simulator.

Keywords: *Wireless Sensor Networks, Algorithms, Agriculture area, Battery consumption, Map.*

1. Introduction

Agriculture is the backbone of Indian economy. Lots of moderenization is going on in agriculture area. A lot of researchers are working on development of agriculture. Wireless Sensor Networks are most trending research fields. Using wireless sensor networks, it is more suitable to monitor, control and test agriculture parameters. For development of wireless sensor networks, different algorithms have to be written. Before implementing the real time wireless senor networks in the field, it is necessory to test the properties, parameters and working of wireless sensor networks. To test which wireless sensor network is most suitable and to implement the algorithm to improve the performance of the wireless sensor networks in agriculture field was explained.

2. Literature Review

In the paper authors explained Wi-Fi, Bluetooth, RF and Zigbee based Wireless Sensor Networks. Authors had discussed various design and development issues in wireless sensor networks. Authors also explained the new techniques developed in the field of wireless sensor networks. The paper was a survey paper. No practical results had been provided. [1]

Researchers demonstrated the implementation of wireless sensor network algorithm in MAC layer. They selected the area 1km by 1km area for testing in simulation. Development steps and flowchart was demonstrated. Different routing algorithms were given. Routing, localization and energy had clearly demonstrated. This paper was based on simulator. [2]

Researchers illustrated hardware structure and software structure. In hardware structure wireless sensor node as well as cluster head architecture had shown. They explained the functions of wireless sensor network protocols and protocol stack. No evaluated results had been published in the paper. [3]

Authors interpreted architecture of field monitoring system and monitoring devices. They measured data of monitoring devices. They measured air, soil temperature, humidity and solar luminance. They constructed the plant growth evaluation method. They also composed the relation between plant height and growth period. [4]

Researchers expressed the environmental monitoring system based on wireless sensor networks in agriculture field. Researchers had used the hardware of wireless sensor nodes with parameters such as barometric sensor, temperature, humidity and luminosity. Wi-Fi connection had estimated. Senor node data had been displayed for evaluation. [5]

Researchers demonstrated the drone application for smart agriculture in wireless sensor networks. Authors constructed prototype for experimentation. They evaluated the results based on base station i.e. drone and sensor node. With the help of drone researchers collected the temperature near crops and above crops. [6]

Researchers analyzed the wireless sensor networks in agriculture field. Authors devised wireless sensor networks in multilayer for data acquisition and data processing in precision agriculture farming. They concentrated on IEEE 802.15.4 [7]

3. Implementation of Wireless Sensor Network

Wireless sensor networks are implemented in Sangli, Asta and Islampur agriculture area. Sink Node is placed at Sangli. The fig.

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below gives the actual connection of sensor nodes in agriculture area.

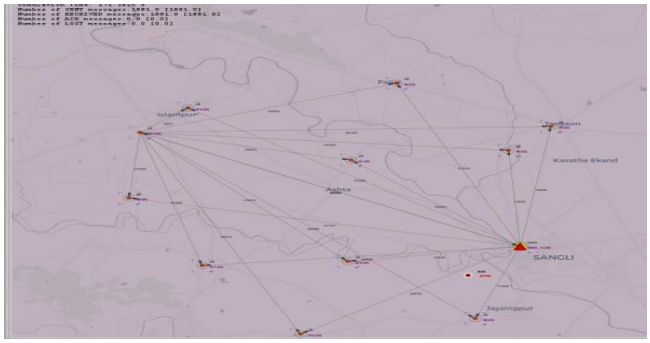


Fig 1 Wireless sensor networks implemented in Sangli, Asta and Islampur agriculture area

The sink node was placed in Sangli collects all required agriculture parameter information. Eleven sensor nodes and one sink node was implemented. Eleven nodes send the information to sink node. Nodes placed at Tasgaon, Palus, Jayasingpur, Tung, Islampur, Ashta, Karandwadi, Mirajwadi, Budhgaon, Kavthepiran, digraj, etc. All wireless sensor nodes senses the agriculture information such as temperature, humidity, wind direction and chemical levels information.

4. Results of Wireless Sensor Networks in Agriculture Field

Fig. 2.1 and 2.2 below demonstrates the battery consumption of sensor nodes. Battery consumption of WSN nodes increases as per events. If number of events goes on increases the energy goes down. Life of wireless sensor nodes depends on energy consumption. Wireless sensor nodes communicate with each other by transferring data. Energy consumption is major challenge in WSN networks. Figure 2 demonstrates the energy levels of WSN nodes when transferring the data with each other. Life of WSN networks was maximized considering the energy consumption. Instead of communicating continuously delayed i.e. sleep mode of nodes are utilized.

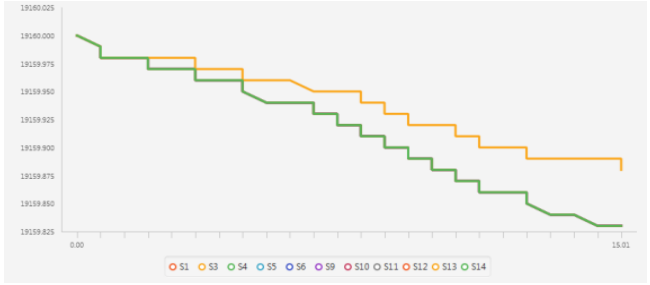


Fig. 2.1 The battery consumption of sensor nodes

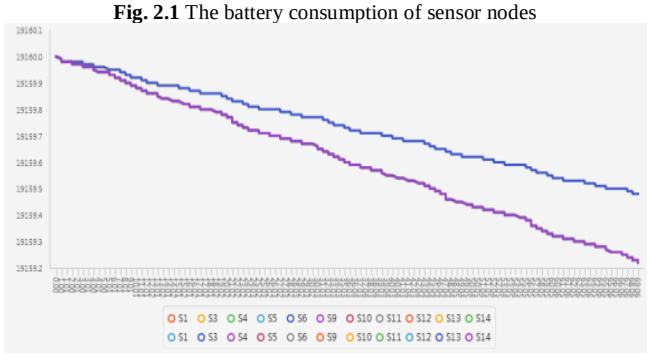


Fig. 2.2 The battery consumption of sensor nodes

5. Implementation of Different Wireless Sensor Network Algorithms

Jevis, LPCN, Graham and personal algorithms are implemented in agriculture area of Sangli district. All these algorithms are expressed below:

5.1 Javis algorithm

The algorithm connects all outside nodes and form close loop. This algorithm provides the area of sensor nodes. The algorithm is self-regulating and it is updating sensor information algorithm. This algorithm is more suitable for monitoring and controlling the outer side or edge of agriculture field. The developed algorithm is shown in Fig. 3.

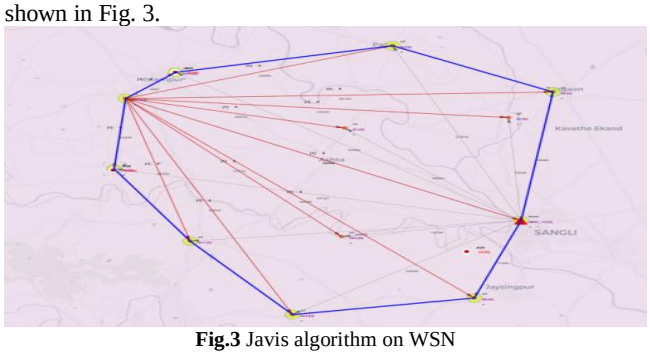


Fig.3 Javis algorithm on WSN

5.2 LPCN algorithm

LPCN algorithm means Least Polar Angle connected algorithm. This algorithm works in any type of wireless sensor networks. The consumption of energy will be calculated using boundary nodes and their neighbors. This algorithm mathematically calculates least polar angle of wireless sensor nodes. The algorithm overcomes the boundary connected in Javis algorithm. Fig. 4 and 5 shows the implementation of different LPCN algorithm.

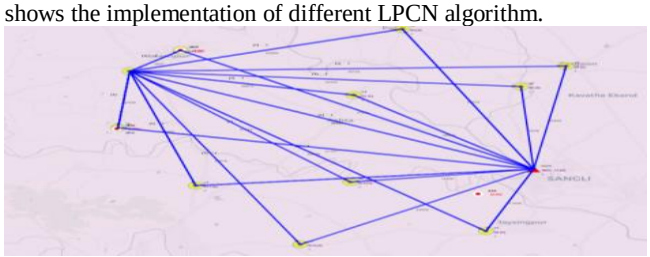


Fig. 4 LPCN Algorithm



Fig. 5 LPCN Algorithm 2

5.3 Graham Algorithm

Graham algorithm is the simplest algorithm. This algorithm maintains the convex chain. This algorithm is time suitable. The algorithm finds all vertices of boundary using convex hull method. The points process in their order form to complete the boundary. Fig.6 demonstrates the implementation of Graham algorithm.

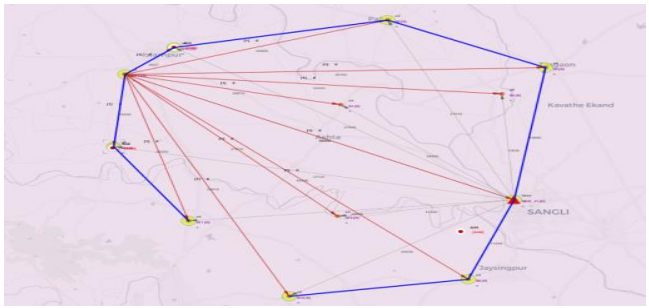


Fig. 6 Graham Algorithm

5.4 Personal algorithm

Based on all algorithms the personal algorithm was developed. The personal algorithm is having features of Javis algorithm and Graham algorithm. Depending on how much area is required to cover and which nodes information is most important, the algorithm was developed. Fig. 7 shows the implementation of personal algorithm. As the algorithm covers all nodes information and is the useful algorithm for planned agriculture area. The algorithm was developed because all nodes are connected in closed loops as Jevis algorithm and Graham is the simplest algorithm to find all the vertices of nodes. In the personnel algorithm using Graham and Jevis algorithm all boundary nodes were connected very fast, which saved the energy of WSN. Time complexity of Jevis algorithm was reduced using combination Graham algorithm. For monitoring system the Personnel algorithm helped to monitor the required geographical area.

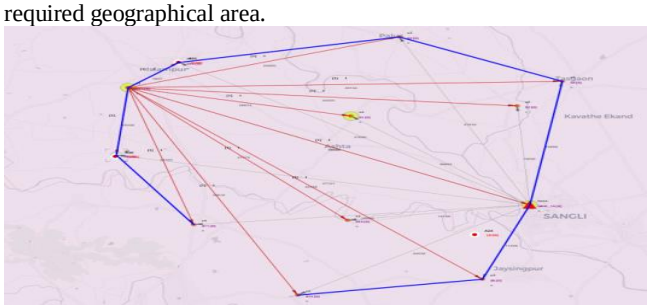


Fig. 7 Personal Algorithm

6. Conclusion

The paper demonstrated the different algorithm implementation and the importance of algorithm developed in agriculture field. One personal algorithm was developed. The paper also demonstrated the importance of algorithm development in agriculture field. The wireless sensor network developed considering the energy consumption. The paper gives the importance of battery consumption. All algorithms are important in agriculture field based on their requirement. Based upon application and data collection requirement different algorithms are suitable for different applications.

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References

[1] Deepika G and Rajapirian P: Wireless Sensor Network in Precision Agriculture: A Survey. IEEE International Conference on Emerging Trends in Engineering, Technology and Science (ICETETS), pp. 01-04, 2016.

[2] Durga P, Gayathri Narayanan, Gayathri B, Dr. Maneesha and Divya P:Modelling a Smart Agriculture System for Multiple Cropping using Wireless Sensor Networks.IEEE International Electric Machines and Drives Conference (IEMDC), pp. 01-07, 2017.

[3] Lei Xiao and Lejiang Guo:The Realization of Precision Agriculture Monitoring System Based on Wireless Sensor Network. IEEE International Conference on Computer and Communication Technologies in Agriculture Engineering, pp. 89-92, 2010.

[4] Takashi and Etl.: Affordable field environmental Monitoring and Plant Growth Measurement System for Smart agriculture. Eleventh International IEEE Conference on Sensing Technology (ICST), pp. 01-04, 2017.

[5] Tien Cao-hoang and Can Nguyen Duy: Environment Monitoring System for Agriculture Application Based on Wireless Sensor Network.. Seventh IEEE International Conference on Information Science and Technology, pp. 99-102, 2017.

[6] Tomoya , Hiraku, Kentaro and Masaaki: Combination of a Wireless Sensor Network and Drone Using Infrared Thermometers for Smart Agriculture. 15th IEEE Annual Consumer Communications & Networking Conference (CCNC), pp.01-02, 2018.

[7] V. Romanov, I. Galelyuka and Yeo Sarakhan: Wireless sensor networks in agriculture. IEEE Seventh International Conference on Intelligent Computing and Information Systems (ICICIS'15), pp.77-80, 2015.

[8] Patil V. S and Etl..: Application of Wireless Sensor Networks for Agriculture Parameters, International Journal of Agriculture Sciences, Volume 4, Issue 3, pp-213-215, 2012.

[9] Patil V. S and Etl..: Wireless Sensor Multimeter, Advances in Agriculture, Science and Engineering Research, Volume 2, Issue 11,

[10] PP 450-454, 2012.