

Review on Forest Monitoring using Wireless Sensor Network

Sagar Paddhan¹, G. M. Asutkar²

Research Scholar¹, Professor²

Department of Electronics and Communication Engineering
Priyadarshani Institute of Engineering and Technology, Nagpur, India
sp8728@outlook.com; g_asutkar@gmail.com

Abstract – A wireless sensor network is the combination of low cost, low power, small and multi functional sensor nodes. In wireless sensor network we are deploying multiple individual nodes that work on applications of the network and its based topology. Each wireless sensor node is made up of various parts which individually has its own research area as per the need of the system. Energy efficiency is the most popular research area which would lead towards the energy wastage of nodes in wireless sensor network. The limited energy resources of the sensor nodes and environmental conditions can hinder the success of forest environmental monitoring system that base on wireless sensor nodes. So we have gone through the various shortcomings to overcome this problem. In this review report we will be discussing about various scheme for energy-efficient, Wireless Sensor Network.

Keywords- Energy Efficient protocol, Wireless Sensor Network,

I. INTRODUCTION

Wireless Sensor Network (WSN) is a device for gathering information about the natural world. WSN technology introduced a low-cost, low-power featured hardware consisting of microcontrollers, storage memory, power supply, single chip radio transceivers, one or more sensors. Forest monitoring needs some technological requirements such as high level of system incorporation, performance, reliability, productivity, accuracy, robustness, flexibility etc. Natural phenomenon information are collected by sensors and then transmitted to a server. These battery powered sensor nodes are used to monitor and control the physical environment of forest from isolated locations. The sensors are able with small amount of computing

and communication capability and can be deploy in ways that wired sensor systems could not be deployed. Even sensor nodes are capable for judgment of illegal logging of some objects in Forest. In the past few years, the applications of Wireless Sensor Network have been widely used and applied in forest and agricultural for environmental monitoring.

II. RELATED WORK

Sensor nodes are powered by batteries and these are non replaceable and non chargeable in this situation energy saving for each sensors nodes is very essential, there are several techniques and protocols used by many researchers so that energy consumption is cut-down to its root and still there are many open challenges in building suitable energy saving techniques for sensor nodes in Wireless Sensor Network's. It is essential to increase the life time of the nodes in Wireless Sensor Network because the use of this network is non reachable for most of the time and replacement of the batteries or defected nodes are impossible. So many researchers have carried out different solutions for energy efficient model in various situations.

WSN technology can be used for various large scale monitoring purposes, providing sensor measurements at high resolution. This technology, therefore, provides various information regarding different monitoring applications such as forests, waterways, buildings, security, agriculture, battlefield etc. Wireless Sensor Networks (WSNs) can also perform operations such as event detection, aggregation, sensing^[1]. Author^[2] illustrates the kind of WSN in forest based on Zigbee communication. Authors^[3] explain the various frequency spectrum of WSN in regards with its application. Air pollution monitoring using WSN had

been explained [4]. The networks allow coordinated signal detection, monitoring, and tracking to enable sensor nodes to simultaneously capture geographically distinct measurements [5]. Authors [6] discussed long-term challenges for WSN technology in environmental monitoring.

III. FOREST MONITORING

Forests are important sources for biodiversity and ecological balance. They provide many benefits and it is the main functions for water and soil conservation, genetic resources for plant and animal, and also source of wood supply and other forest goods. However, recently the green forest environment has been interrupted by non ethical activities such as illegal logging and also country development activities that decrease the benefits of the forest contribution. Thus, in order to ensure long term forest autonomy, it is important to implement a monitoring system that is responsible in providing effective monitoring for forest environment. Forest monitoring is not limited to environmental issues only, but it also includes monitoring and detection in forests. Therefore, based on this awareness, we will develop a framework on forest monitoring which discovers sensor nodes deployment approach.

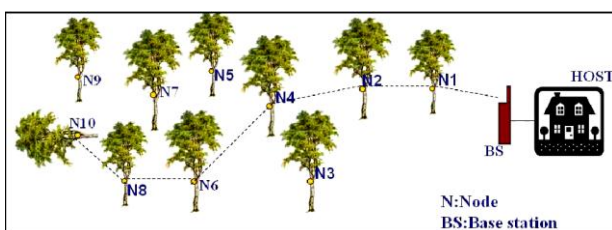


Fig. 1: Forest Monitoring system with sensor node and base station

Following parameters are considered for forest monitoring

1. Temperature
2. Rain forecasting
3. Fire detection
4. Acoustic (Unwanted) signals detection
5. Illegal logging. etc.

IV. LITERATURE REVIEW ANALYSIS

We have gone through the various research article for forest monitoring and energy efficient scheme using wireless sensor network the existing techniques are

- ✓ LEACH (Low –Energy Adaptive Clustering Hierarchy) Forest Monitoring System [7][4][2]
- ✓ Multi-hop Routing Scheme for Large Scale WSN[4]
- ✓ Complex Integrated Emergency Response System[3]
- ✓ Distributed Energy Efficient Adaptive Clustering Forest Monitoring System [7][8]
- ✓ Motion Tracking System[7]
- ✓ Mobile Animal Tracking System[7]

With referring to all above available techniques, they have certain drawback in power consumption and signal processing. [7]

Table 1 shows the list of Protocols used for Energy Efficient system in forest monitoring.

Table 1: Protocols used for Energy Efficient system in WSN

1. Source and Destination Based		
SPIN (Sensor Protocol for Information via negotiation)	DC (Data Centric)	LEACH (Low –Energy Adaptive Clustering Hierarchy)
2. Path Establishment based		
Proactive DD, SPIN	Reactive PEGASIS	Hybrid RR (Rumor Routing) APTEEN (Adaptive Threshold Sensitive Energy Efficient Sensor Network Protocol)
3. Network Structure Based		
Flat Based Routing EAR (Energy Aware Routing) Flooding Gossiping SPIN	Hierarchical Based Routing PEGASIS (Power Efficient Gathering in Sensor Information System)	Location Based Routing GAF (Geographic Adaptive Fidelity) GEAR (Geographic Energy Aware Routing) SAR (Sequential Assignment Routing)

	LEACH HPAR(Hierarchical Power active Routing) - HEED (Hybrid Energy Efficient Distributed Routing)	
--	--	--

With the aids this review work researcher wants to design best algorithm for forest monitoring using Wireless sensor network. The research includes design and development of routing protocol / algorithm for energy efficient approach. Further the design network will test for QoS Analysis and energy optimization in WSN.

V. CONCLUSION

The proposed review is expected not only to solve most of the challenges affecting routing process in WSN, but also to have a network with high throughput, minimal delay and able to predict the communication between the nodes. The best result for increasing the quality of forest environmental sensing with low power consumption and low cost is what we expect from the proposed model. The proposed model will extend the network lifetime.

REFERENCES

- [1] Peijum Zhong, Feng Raun. An energy efficient multiple mobile sinks based routing algorithm for wireless sensor networks. In *IOP conference series: Material Science and series*. 2018.
- [2] Akila , Uma Maheshwari. A Survey on recent Techniques for energy Efficient Routing in WSN. In *International Journal of Sensors and Sensor Networks*. ISSN (Print): 2329-1796, (Online): 2329-1788. Pp. 8-15 January 2018.
- [3] Sakib Abdulla and et.al. A wireless Sensor networks for Early forest fire detection and monitoring as a detection factor in context of a complex Integrated Emergency Response system. In *IEEE Transaction* 2017.
- [4] Zhihua Li and Ping Xin. Evidence- Efficient Multihop Clustering Routing Scheme for Large Scale Wireless Sensor Networks. In *Wireless Communication and mobile computing*. Publisher **Hindawi**. Article Id: 1914956, 2017.
- [5] Albert Lutakamle, Shubi Kaijage. Wildfire Monitoring and Detection System Using Wireless Sensor Network: A Case Study of Tanzania. In *Wireless Sensor Networks Scientific Research Publishing*. ISSN (Online): 1945-3086 , (Print): 1945-3078. Pp. 274-289. August 2017.
- [6] Suraj Sharma. On Energy efficient Routing Protocols for Wireless Sensor Networks. In *Phd. Thesis. Department of Computer Science Engineering , NIT , Rourkela*, 2016.
- [7] Rachit Singh , G. M. Asutkar. Survey on various wireless Sensor Network Techniques for monitoring activities of wild animals. In *IEEE sponsored 2nd International conference on Innovations in Information, Embedded and communication systems (ICIIECS)* 2015.
- [8] M. Angeles Serna and et. al. Distributed Forest Fire Monitoring Using Wireless Sensor Networks. In *International Journal of Distributed Sensor Networks*. **Hindawi** Publishing Corporation. Article ID; 964564. 2015.
- [9] Teng Ma and et. al. Forest Fire Monitoring Based on Mixed Wireless Sensor Networks. In *International Journal of Smart Home*. Vol. 9 Issue. 3 Pp. 169-184, 2015.
- [10] Shalli Rani and et. al. A novel Scheme for an Energy Efficient Internet of Things Based on Wireless Sensor Networks. In *Journal of Sensors*. ISSN 1424-8220, 2015.
- [11] Priyanka Tambat, Arati Dixit, Energy Efficient Scheme for Wireless Sensor Networks. In *International Journal on Recent and Innovation Trends in Computing and Communication*. Volume 3 Issue 2. ISSN 2321-8169. Pp: 646-653. Feb. 2015.
- [12] Prachi Sharma. Wireless Sensor Networks for Environmental Monitoring. In *International Journal of Scientific Research Engineering & Technology (IJSRET) IEERET-2014 Conference Proceeding, 3-4 November, 2014*.
- [13] Kechar Bouabdellah and et. al. Using Wireless Sensor Networks for Reliable forest fires detection. In the 3rd International Conference on sustainable energy Information Technology. Publisher **Elsevier**. ISSN 1877-0509. 2013.
- [14] Josef Papan and et. al. WSN for Forest Monitoring to prevent Illegal Logging. In *Proceeding of the Federated Conference on Computer Science and Information Systems*. Pp. 809-812. Publisher **IEEE**. 2012.
- [15] Mohd Fauzi Othman, Khairunnisa Shazali. Wireless Sensor Network Applications: A study in Enviromental Monitoring System. In *International Symposium on Robotics and Intelligent Sensors*. Pp.: 1204-1210. 2012.
- [16] Alice Abraham, et. al. Energy Efficient Detection of forest fire using Wireless Sensor Networks. In *International Conference on Wireless Sensor Networks*. Vol. 49. 2012

- [17] K. P. Chetan. *Sustainable Forest Management Techniques*. From open access of intechopen.com 2012.
- [18] Jahangir Mohammadi and et. al. *Estimation of forest stand volume, tree Density and biodiversity using Landsat ETM+ data , compression of linear and regression tree analyses*. In 1st Conference on spatial statistics. **Elsevier** Publication . 2011.
- [19] G. M. Asutkar, Bhalchandra Hardas, K. D. Kulat. *Enviornmental Monitoring using Wireless Sensors: A Simulation Approach*. In 1st International Conference on Emerging Trends in Engineering and Technology. Publisher **IEEE** Computer Society. 2008.
- [20] Ankur Suri, S.S. Iyengar, Eungchun Cho. *Ecoinformatics using wireless sensor networks: An overview*. In *Journal Of ECOLOGICAL INFORMATICS I Elsevier* Publication Pages. 287 – 293, 2006.
- [21] Peter Corke and et. al. *Environmental Wireless Sensor Networks*. In **IEEE** Transaction. Volume 0018 No. 11, November 2010.
- [22] Han Liu and et. al. *Forest Density Estimation*. Article from Carnegie Mellon University. 2010.
- [23] Kazem Sohraby, Daniel Minoli, Taieb Znati. *Wireless Sensor Networks Technology, Protocols, And Applications*. ISBN: 978-0-471-74300-2. Wiley Publication.