Analysis of Energy Efficient Routing Protocol for Wireless Sensor Network in Environmental Monitoring

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Abstract Wireless sensor network is now being increasingly popular in today's world and is getting used in many kinds of fields and applications where different protocols are being used for the better communication. There is also a great requirement for the improvement of different parameters related to the different issues in this domain. This paper specifically discuss the performance related to increasing the energy efficiency of the hybrid protocol. In new hybrid protocol design which will increases life and energy efficacy of the network using the specifications of the various network QoS tools more particularly system concerns with network simulator NS2 and different parameters and issues regarding the same.

Keywords Energy efficiency · Hybrid protocol · Lifetime · QoS

1 Introduction

Wireless medium consist of various small power microdevices which are used in communication such as nodes sensors have high capability of sensing which incrassating the network performance before sending their results to the synch. Scarcity of the resources and battery power loss lines which no infrastructure and non-renewable energy supply must require the protocol which will provide efficient management of the different network resources which include following issues.

1. Consumption of power limits for nodes that use batteries and energy harvesting.
2. It has ability to handle node failures.
3. Nodes are heterogeneous.
4. Nodes are mobile.
5. It has capability to stand in strict environmental conditions.

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6. Scalable for huge development scale.
7. It supports cross-layer design.
8. It is simple and easy of use.

Cross-layer design has become a significant study part for the wireless communications. Traditional layer approach has presented by the three major problems. Previous layer approach cannot exchange the information between different layers due to this layer did not have the entire information. Traditional layer approach does not guarantee optimization of entire network. It didn't accept to environmental change. Traditional layer approach for the wired network is not considered and valid to the wireless level networks owed to management of environment in to the WSN [1]. So, cross-layer is measured to create the best inflection in order to expand the protocol performance. These are data rate, power effectiveness and value of service. Nodes consist of a processing unit which is having a restricted computational energy and imperfect memory. One or exceeding components of wireless sensor networks are base stations which are more calculation, energetically, and communicational. Routing based other main components are routers, which are designed to calculate, compute, and dispense routing tables.

The routing table consists of suitable route to transfer the data. It allows transmission of data without any issue to different routes. This table chooses the path which will be shorter to transfer the data. The short path selection helps in fast data transmission as well as it reduces the probability of loss of data during transmission.

2 Background

A wireless sensor network (WSN) consists of large number of low power, low cost, and tiny communication devices, called sensors. Like nodes (i.e., computers, laptops, etc.) in traditional wireless networks such as mobile ad hoc networks, sensors have energy, storage, processing, and communication capabilities. Also, sensors have a sensing capability by which they sense phenomena and perform in-network processing on the sensed data before sending their results to a central gathering node, called the sink. WSNs can be used in a variety of monitoring, control, and surveillance applications [2]. Particularly, the sensors possess several scarce resources, with battery power (or energy) being the most critical one. One way to extend the lifetime of a WSN is through load balancing so that all the sensors deplete their energy as slowly and uniformly as possible. Also, the behavior of the sink has an impact on the network lifetime. Indeed, sensors in the proximity of a static sink act as the traffic hot spots have significantly reduced lifetime than all other sensors in the network. Those sensors nearer a static sink would suffer from a severe depletion of their battery power, which may result in possible network disconnection and disruption of the data from reaching the sink. Sariga Arjunan et al. Elsevier, (2017). A survey on unequal clustering protocols in wireless sensor networks; a comprehensive survey of various unequal clustering approaches with their objectives, characteristics, etc.,

is presented. Also, the classifications of unequal clustering approaches are made and compared based on various cluster properties, cluster head (CH) properties, and clustering process.

3 Previous Work Done

Most of the monitoring system evolved from the previous few years used the wireless sensor network technology for providing the facilities regarding the monitoring of plant health such a system are also using the Radio + CPU + sensing technology for the continuous monitoring [1].

Such systems consist of the autonomous devices called as sensors which monitor the different environmental and physical conditions. The environmental conditions may differ from location to location and area [2] specific constraints are also involved.

In recent technology also there is continuous need of the wireless sensor network as an important technology in the field of agricultural domain. The another advantage which must be noted while using the IOT as latest trend in the application of the agricultural monitoring of the crop plant is the speed and accuracy of data which is considered as one of the significant parameter in this process.

4 Existing Methodologies

Trends in area of research are in the field of different domain and field:

i. Agriculture domain
ii. Environmental monitoring
iii. Urban terrain
iv. Trackingsssss and civil structure monitoring.

International Trends:

i. Health care systems
ii. Transportation and logistics
iii. Security and surveillance.

To generate minimum cost and also used the smallest sensor nodes for better efficiency is the main objective of the such a system. Counting of small companies which produce wireless sensor networks hardware is increasing as compared to counting in 1970s. Intrinsic to the sensor networks implementation is in use of the least amount of power methods for the two way radio communication and data attainment. This gateway plays an overpass between other networks with wireless sensor networks. Now data is able to be processed as well as stored by devices with added resources, for example, in any server located at a distance.

The scarcest causes of sensor networks that are wireless nodes are energy. Survival time of networks that are wireless sensor based is also resolute by it. Wireless sensor networks could also be deployed in a large number in the several environments, which consists of hostile as well as remote areas, where ad hoc communications are the main component.

The operating system complexity of the WSN knobs is characteristically fewer than the common purpose working schemes. Due to the two reasons, these are the extra strong resembled implanted systems. The first motive is that the WSNs have been organized with unique client in to the brain, besides the common platform. The other one is needed of low cost as well as low power. It leads to that the mainly WSN knobs should also have the low-control consuming micro-controllers which ensure that the essential memory mechanisms moreover pointless or the most costly for the implementation.

5 Analysis and Discussion

First, we analyze the AODV protocol and find out the energy efficient and life time maximization based on quality of service parameter. Then we form clusters of the nodes assign cluster head virtual cluster head and calculate the energy based on quality of service Qos metrics such as energy packet delivery ratio throughput, and dropping of packet. Communication and packet transfer between different nodes by using virtual cluster head in single cluster and multiple clusters also. Performance analysis of all the different techniques is also done regarding the different parameters. The method also discusses comparative analysis with other protocols of warless sensor networks.

Life time is measured using the throughput of the network. Wireless sensor network different protocols and their comparison [3] AODV and DSR study of these protocols quality of service parameters. The analysis is also made for cluster forming process. Optimization of energy and increasing the life span of the network are the most significant issues in maximization process. Routing energy efficiency for better performance and security must also be considered. For the proper analysis of the monitoring system, there are certain parameters are very important and those needs to be studied and addressed very carefully. Another important aspect is the use of transmission protocol to transmit the essential information in various forms such as image. The image coming from different devices particularly camera used in the system for monitoring of various constraints. The system must suggest the correct alternative for the proper operation and must maintain the various environmental components like pressure, temperature and humidity essential for the growth of the particular plants [4].

The success of any system used for monitoring depends on many components, but the finally it has to deal with the crucial aspects of the network transmission time and speed. There are many challenges that need to be addressed in the concerning to the monitoring of the wireless network system.

6 Proposed Methodology

The method for the proposed system includes the different parameters regarding the improvement of the performance of the complete system for the wireless network using the specific hybrid protocol.

Simulation parameters tables indicate the different regarding the wireless network and other related issues like terrain size 1200 m^2 simulation time 30,000 millisecond number of nodes 30 or 40 and transmission range 250–280 m. Another important aspect of this research and about the proposed system is that there is proper transmission of the data in the system. As it is being continuously being generated in the system with the help for the different sensors like temperature and humidity sensors these available data has to be first converted in the proper form and must be communicated over the different modules of the system in order to take the proper decision by the monitoring system (Fig. 1).

The algorithms works as follows,

1. Take input from temperature, humidity and moisture sensors.
2. Convert it into digital format using inbuilt analog to digital convertor placed on Adriano board.
3. Transfer data to server using Zig-Bee wireless communication protocol and store in database.
4. Find Euclidean distance at each point is calculated.
5. Communication and packet transfer between different nodes without forming cluster by using protocol and Euclidean's distance algorithm **DRWSN**.

The above model helps to take the decision in the system according to different sensor values. A hidden Marko model is a statistical model that can be used to describe the evaluation of observable events that depend on the internal factors which are not directly observable.

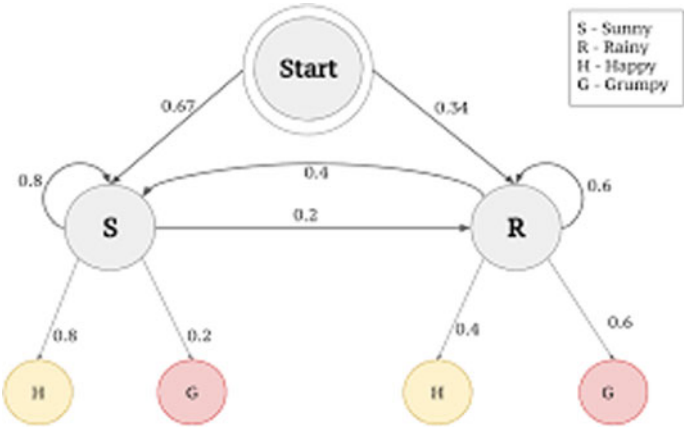

Fig. 1 Proposed hidden Markov model

7 Outcome and Results

This will include the how to deploy the nodes and packet drop simulation method and other simulation parameters like number of rounds. How it is enhances the network energy and throughput and other significant parameters in the wireless sensor network.

The system can be installed on various platform for the accessing the various kinds of environment variables based on the need of the application. In more particular, it is likely be implemented in the agriculture domain for improving the performance issues. Since then, the continuous evaluation and assessment of the various components can be done according to the various demands of the applications, and further, the need can be converted into the part of the facility which is very essential for the implementation of the other aspects and dimensions regarding the application domain. This proposed system can be efficiently and conveniently used for the implementation and design of the new hardware model which will be more useful in the various domains. Further, this proposed work is very much useful in many applications and also supportive in all environmental situations. So it can find effective results for yielding high-quality crop plants in different weather conditions.

Within this system the number of a live node greater as compared to dead nodes. The network lifetime can also be enhanced using the method of multi-hop routing between the cluster heads and sink nodes. Such kind of system is very useful and essential for the various levels of the user. The user may be the famer or it may be the merchant or may be the businessmen. It is expected that the system once installed on the field will perform considering the various parameters in to the consideration.

The analysis is taken from the various kinds of the events and may produce the different features depending on the scenario for the various inputs and the performance of the system can be increased by increasing the accuracy of the system. Different methods discussed in earlier sections are compared in different scenarios. It can also be shown by making comparative analysis of both the methods. From this, it can be easily be conclude that the performance and accuracy of the proposed system is higher than statistical methods mentioned earlier.

8 Conclusion

The mechanism discussed in this paper is all about increasing the performance of the protocol which is used in implementing the system which increases not only the efficiency and but also reduces the energy consumption of the overall network.

Such a system can be implemented in various domain and fields such as agriculture where the actual sensing of the different soil and agricultural parameter such as moisture, wind pressure, heat, and other environmental parameters has to be accurately being measured according to the favorable situation of the plant crop.

Many such fields will be getting benefitted by using this model and can improve the performance and output by implementing the minimum energy requirement model.

9 Future Scope

It is estimated that work in this domain and continuous improvement will definitely results in a several applications of the discussed model. These methods and implementations may increase the performance and effectiveness of the previous designs.

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