An Energy Aware Transport Protocol in Wireless Sensor Networks

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One of the most important challenges in the design of Wireless Sensor Networks (WSN) is to maximize their lifetime. Sensor nodes are energy constrained in nature. Therefore, energy efficient communication techniques are necessary to increase the lifetime of sensor nodes. Redundant data increases the energy consumption during data transmission. In this paper, we present an Energy Efficient Transmission Control Protocol (EETCP) for data gathering and data transmission within the network. We aim to minimize the redundant data transmission with the co-ordination of Base-station, to increase the lifetime of the network. The performance of the proposed protocol is studied through simulations. It is observed that the protocol fits to all modes of transmission and it increases the life time of the network and Packet Delivery Ratio.

Keywords: Energy Efficient Transmission, EETCP, Redundancy, Transport Protocol, Wireless Sensor Network.

1. INTRODUCTION

A sensor network consists of hundreds or thousands of inexpensive, tiny resource constrained sensor nodes which has some computational power and sensing capabilities. It is a self configured dynamic Network. WSN can be deployed in various domains and applications like agriculture or environmental sensing, object tracking, wild life monitoring, health care, military surveillance, industrial control, home automation, security \textit{etc.} [1–3]. Some of its application areas deal with redundant data and some deal with non-redundant data [4]. There are many reasons of redundant data in WSN such as multiple sensor sensing same phenomena, slow change in phenomena, presence of malicious nodes in WSN, flooding techniques or multipath data transmission techniques \textit{etc..}\textsuperscript{.} The lifetime of the sensor nodes mostly depend on the power supply unit. Power is stored either in Batteries or Capacitors in a sensor node. A sensor network consumes energy while sensing a phenomenon, transmitting and processing data. Energy required for data communication is more than that for sensing and data processing. Redundant data transmission affects the WSN severely. It drains the energy of the node. Redundant data increases congestion, communication and computational overhead. Malicious nodes may take the advantage of redundant data and cause energy drain by injecting redundant data in the network (\textit{i.e.,} replay attack) [5]. That may lead to routing holes [5].

A sensor network transmits all its collected data using different modes of communication [5–7]. The power consumption of the network depends on the communication mode and type of traffic. Traffic in sensor networks can be classified into one of three categories one-to-many, many-to-one and local communication. In many-to-one mode of communication multiple sensor nodes send sensor readings to a base station or aggregation point in the network. In one-to-many mode of communication a single node (typically a base station or a cluster head) multicast or flood a query or control information to several sensor nodes. In Local communication, neighboring nodes send localized messages to discover and coordinate with each other. In WSNs, sensor nodes sense and transmit the data to the sink nodes in two tech-
Figure 11 and Figure 12, shows the analysis of packet loss ratio in high and low network congestion scenario. These figures show that the percentage of packet loss ratio of our proposed protocol is less than the discussed communication models. Simulation result shows that, the packet loss ratio is less affected by the different level of congestion.

4. CONCLUSION

In this paper, we make a comprehensive study about the effect of redundant data on transmission. We minimize the redundant data transmission with the co-ordination of base station. Our proposed model processes the redundant data at base station without being transmitted by the sensor node. Our proposed transmission control protocol is compatible with different modes of communication. We simulated our proposed protocol with all modes of communication and it is observed that our proposed protocol increases the life time of network significantly. The simulation results show that our proposed protocol out performs in different level of network congestion.

REFERENCES

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