Chapter 4

A Survey on Routing Protocols of Wireless Sensor Networks: A Reliable Data Transfer Using Multiple Sink for Disaster Management

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ABSTRACT

Disasters are happening due to drastic environmental destructions that may cause damage to wireless data transmission networks. There must be a system that monitors and takes necessary actions for reliable communication which can be provided by the wireless sensor network (WSN) that were organized as multiple nodes. In the heterogeneous environment these ubiquitous nodes are able to handle disasters like floods, drought, earthquake, and cyclone, or network fluctuations through fire accidents. Disasters can be monitored by augmenting a variety of sensors to sense and detect sudden changes in temperature, pressure, seismic wave, noises, etc. Large numbers of sensor nodes are distributed over a geographical area in WSN providing trustable data transfer with multi node sink. In this chapter, the authors review various WSN routing protocols for reliable data transfer in disaster management using multiple sink. The main objective of this chapter is to provide future research directions to enhance QoS in disaster management.

INTRODUCTION

Natural Disasters have been continuously increasing worldwide due to environmental destructions, happening due to huge human population. The situation is highly severe in developing countries as advanced detection technologies are either impractical or unaffordable. The environmental intensity of disaster makes it hard and, in some cases, entirely not possible for humans to react or face that critical
problem immediately (Erdelj. et al., 2017). The first and foremost issue that needs to be addressed is to preserve human lives during and after disaster. At present efforts has been made in order to recognize and forecast the possibility that when a disaster happen, react as soon as possible and efficient manner in course of happening, quickly assess the damage, fix and restore to normal state.

Recent developments in wireless communication technologies, energy storage, computing power make a system composed of WSN, plays a critical role in natural disaster. Today the world, which is vastly developing in technologies, is much likely to find a way to control the occurring of disasters. Disasters can be identified by enlarging a variety of sensors such as Temperature, pressure, seismic wave detection, noises. Large numbers of sensor nodes are distributed over a geographical field in WSN providing trustable data transfer with multi node sink. By using WSN one can manage occurring disasters by implementing reliable data transfer between nodes. WSNs have been successfully make use for a number of purposes when dealing with disasters, like environment controlling, pre-disaster forecast and prevention, emergency preparedness, early warning system, post-disaster response (Chen et al., 2013).

In this chapter, our contributions are as follows:

- We present various state of art hierarchal routing algorithms under WSN, suitable for disaster management, like LEACH, PEGASIS, TEEN, APTEEN and HEED.
- We discuss the merits and demerits of these algorithms in the real time environment.
- Finally, we make a summary note on hierarchal routing algorithms, in a tabular form, based on the parameters that influences the lifetime of the network when it is applied in real-time environment.

An over view of WSN is discussed in the Section 1. Section 2 discuss different applications of WSNs. Section 3 and 4 presents data aggregation and reliable data transfer in WSN, based on single sink and multiple sink, respectively. In Section 5, we describe formation of Clusters in WSN using different algorithms. In Section 6, hierarchal protocols that are used in WSN are reviewed. We review Routing procedure in WSN in Section 7. In Section 8 the role of machine learning in WSN routing is discussed. Finally, we present conclusion and future scope in Section 9.

1. WIRELESS SENSOR NETWORKS

WSN is the outcome of sequence of wireless communication, internet and sensor technologies. It can be applied in various fields like military, health care monitoring environmental monitoring, natural disasters and many other fields. The WSN technology has been applied in controlling naturally occurring disasters for more than a decade. A WSN is an upcoming technology which is taken as a major consideration by the research community. WSN consist of various small, low cost devices that contain the motes, also referred as sensor nodes, placed in a network, which is actually a self-organizing ad-hoc system. The main functionality is to examine the physical environment, collect and transmits information (sensed data) to one or more sink nodes. The internal functionality of a sensor node is represented in Figure 1. The main operations performed in WSN are related to monitoring how the physical environment is, processing of sensed data and transfer these data to particular nodes. To perform these tasks, the sensor nodes are filled with powered batteries which contain limited energy (Yacoob & Sundaram, 2011). The important issue to be considered while dealing with wireless sensor is their energy consumption.
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