Chapter 7
Prospect of Low Power Sensor Network Technology in Disaster Management for Sustainable Future

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ABSTRACT

Countries with better disaster management plans can better signify their existence. The earthquake is one such hazardous catastrophe that leads to heavy damage. Disaster management does not avert or eliminate the threats fully; instead, it focuses on use of technology, creating plans to lessening the effect of disasters up to significant level. Depending on the magnitude and type of waves, earthquakes crush everything, from buildings to small houses, from towers to trees, and from roads to bridges. Tsunamis and landslides follow its way as well. After the earthquake comes, the settling of things back to normal involves a lot of time, money, and manpower as well. Hence, the only solution of this is leading-edge technology support. Sensor network technology is one of the proven techniques for not only varieties of early warning, prediction, and detection systems but also post-phenomenon rescue and support. This chapter will help researchers and policy makers to think fresh on disaster management with sensor network technology.

INTRODUCTION

Disaster can be considered as a cycle and a great concern in today's developing world. Although it can be bore with the situation caused by the disaster in every disguised way it comes, the major challenge is bringing things back to normal after the diverse effects of it. Hence some technology is required to manage the scenario for which Disaster Management is the key and the plethora of technologies involved in

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it play major role. Many Disaster Management Techniques have been developed, and are being followed by scientists and researchers for the betterment of the environment (Carter, 1991). The technology that has drawn into most researchers, in the near past is Wireless Sensor Network (WSN). This is responsible for many quick and feasible actions to be taken prior to or after any disaster. WSNs are easier, better and cheaper. Earthquake is a kind of disaster which comes without any warning, precisely speaking; the speed of onset is very sudden. This is the same traditional way of describing this disaster and yet is very difficult to predict. But, technology at this current age has widened its bed to good extent to attend both pre and post disaster circumstances. Prior to the discussion on technology support in this direction, a background study related to the earthquake is a necessity.

BACKGROUND

Earthquakes (Howell, 1986) occur naturally in almost all parts of the world but majority occurs along narrow belts which are extended up to 10-100kms wide. These are the geologically active regions which mark the boundaries. Earth's tectonic plates are in constant motion and due to this movement there is pressure on the lithosphere for which the surface of earth tends to break. This breakage occurs when the pressure or stress is large. The stress comes in the form of waves which is felt as earthquake. Vibrations due to the energy of the waves are called as seismic waves which travel with a speed of approximately 14kmph. With this speed it may take 20mins to reach other side of the earth if it goes straight through its center i.e. a distance of 13000 kilometers. The term Epicenter is the point directly above the source of the earthquake. The source is approximately 700 kilometers deep, also called as focus. This is the minimum because at high temperature and pressure rocks are not rigid and the reduced plasticity doesn't allow storage of stress. After an earthquake, aftershocks are observed that is the adjustment period for the plates. This adjustment period may last for months. Earthquake can occur in any place of the world, there is no certainty of a place being safe from an earthquake. It is only that in some places like plate boundaries, where different tectonic plates meet, the waves are frequent and nearly 80% of earthquakes occur at Circum-Pacific seismic belt, The Ring of Fire. Other than this there also occurs an intra-plate earthquake which originates at more shallow level, away from the plate boundaries.

With the developing and rushing world, researchers are going in pace with the technology developments as well. The world cannot compromise and stay back after any disaster; to keep up with the pace the scenario needs to be managed properly and efficiently. Use of various technologies in the disaster management is hence very effective, rather than any primitive practice or methodology.

Wireless Sensor Networks (WSNs) offer an interesting alternative to wired networks when infrastructures collapse, like, after an earthquake or a tsunami. In addition, WSN have extravagant features, they are known to be auto-configurable, auto-organizing, have small dimensions, etc. Diverse environment factors can be detected by sensors, such as, the atmosphere humidity and temperature for sensing forest and building fires, toxic gases instigated by an explosion, water level to notice and prevent floods, vibration level to detect chocks and earthquakes and numerous additional data. The character of a sensor node is to sense the environment, communicate and exchange sensory data with further nodes in the space, locally process its own data and make smart judgments about what it observes. Sensors can also deal with additional valuable services. For instance, a guesstimate of the victim number by counting and identifying the number of persons holding Bluetooth devices, a quick localization of incidents and victims, a quick wireless communication between sensors, major responders and command centers with