CSD337 Wireless Sensor Networks - Class Assignment

Instructions

- **Assignment submitted after due date and time will not be evaluated and a score of zero will be awarded for this assignment.**
- **Materials copied from the Internet or otherwise will attract penalty as per course policy.**
- **Only those students' assignment who are present in class (on January 27, 2017) will be graded.**
- Upload a **pdf version** of the document.

Due Date: 4 pm, Jan 27, 2017

Submitting this Assignment

You will submit (upload) this assignment in Blackboard. Email submissions will not be accepted.

- Write your answer after the given question in this document.
- Name this document as CA2_WSN2017_John_Doe.pdf in case your name is John Doe.

Grading Criteria

This assignment has 2 points (with **weightage of 2%** in your overall 100 points)

Question:

List the characteristic features of sensor networks. Think and describe a concrete WSN application and demonstrate how these characteristics features fit into it. Write your answer in about 700-800 words.

The characteristic features of Sensor Networks are:

1. Fault Tolerance – This is the reliability of the network, that is the network should be tolerant in case a certain node fails. That is, the network should not completely fail in case of the failure of one node.
2. Scalability - The network should be scalable in terms of the number of nodes increasing beyond a certain degree should not affect the network.
3. Production Costs – The cost of production of the nodes and the cost of maintaining the base stations should limited to a certain degree and within a set budget.
4. Sensor Network Topology – There should be an approriate topology defined for

the network and it should be dynamic to the the failiure of the nodes.

5. Operating Environment – The sensor network should be able to work efficiently in the set operating environment. Suppose if the sensor network is to work in a factory environment it should work there.
6. Transmission Media – There should be a specific transmission media for a Wireless Sensor Network like a WiFi, Bluetooth, Zigbee, etc.
7. Power Consumption – Lifetime power consumption of the WSN network should be at a minimum or should be compensated using some specific power harvesting or power scavenging techniques.

Proposed WSN Application

Early Earthquake Monitoring and Warning System

- Current Earthquake Monitoring Systems around the world require the deployment of costly base stations near Earthquake prone areas around the world. These cost a lot of money and consume a lot of power and require a lot of human interference and therefore are costly to maintain. (***Production Costs***)
- Earthquake Monitoring using WSN can accelerate the deployment, installation and maintenance process.
- The challenges for a WSN application for Earthquake data collection are reliable event detection, efficient data collection and high data rates and sparse deployment of nodes in a large area. The nodes will be usually employed in an harsh **operating environment** that are mountainous or hilly.
- Each node will need to be equipped with an omni-directional antenna, a seismometer, accelerometer. A group of nodes will be deployed in sites at a distance of around 200-400m apart from each other. These nodes will use multi hop routing to a gateway node which will be connected to a long distance free-wave radio modem that will transmit the collected data to the base station. (**Transmission Media and topology**)
- This model can be **scaled** to multiple deployments all communicating to the base station. For **fault tolerance**, the nodes will be store the data in local flash memory. Gateway nodes can be equipped with a processor for monitoring the data being collected and can act as aggregator nodes. These will reduce

the data being sent to the base station and also improve the **reliability** of the sensor network. Also, for early warning, the aggregator node can send a "**Pick"** signal to the base station when an interesting event occours, which can then be used to warn nearby cities in real time.

- Therefore, we have discussed the production costs, operating environment, transmission media, topology, and reliability of the wireless sensor networks.