UDC 004.73 (043.2)

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ANALYSIS OF THE RELIABILITY OF THE WIRELESS SENSOR NETWORKS

Wireless sensor networks (WSNs) provide a way to bridge the gap between the physical and the virtual worlds. They promise unprecedented abilities to observe and understand large-scale, real-world phenomena at a fine spatial-temporal resolution. Their application in developing countries is even more interesting: they can help solve problems that affect communities. The number of potential applications in such an environment is huge: water monitoring and crop modeling are just two examples.

Let's consider the main factors that influence on the reliability of WSN:

1. Power. Power consumption is an important issue in deployments. For WSN nodes this is a well-addressed issue. Most commercial solutions today assume that WSN gateways (the devices that provide the interface between the nodes and the network infrastructure) will encounter ideal scenarios in terms of power when deployed. In a developing world scenario, the gateway must operate with bounded energy supplies.

2. Connectivity. Network connectivity in many developing countries is unreliable. Data gathered by the sensor nodes (motes) must therefore be stored safely in the gateway and transferred when a network connection is available. WSN deployments can encounter different network topologies such as wired, wireless and mesh, and should be flexible enough to interact with each of them.

3. Quality of WSN links. To implement reliable and robust sensor networks, we need to understand the variation of link quality and battery behavior in a real world environment. Low-power transmitters have a limited range, and it is important to understand communication patterns. Energy is the scarcest resource of WSN motes, and it determines the lifetime of WSNs. Motes are meant to be deployed in various environments, including remote and hostile regions; consequently, they must use little power and one need to make sure that all batteries last the same amount of time.

Therefore, a low-power gateway is needed to save data coming from the motes and store them in a data-base. The two-level architecture is best suited for environments where power supply is not stable and network connectivity is not reliable. Database synchronization provides a way to exchange data between gateways to ensure that no data is lost.

Link quality estimation also is very important since it has a deep impact on battery life and battery lifetime is the most important variable in a WSN. The distance between motes and the base station has an impact on battery life, and this should be kept into consideration when planning a deployment.

The most interesting phenomena usually happen in remote places, and long wireless links can be used to connect the gateway collecting data from the motes to the Internet. As we see wireless sensor networks represent a great opportunity for scientists.

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