UNIVERSITI TEKNOLOGI MARA

ANALYSIS OF WIRELESS SENSOR NETWORK LIFETIME

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"*In the name of Allah, the most Gracious and most Merciful"*

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ABSTRACT

Analysis Wireless Sensor Network Lifetime Using MiXiM Omnet++

Keywords: WSN Lifetime, MiXiM, Omnet++, Lifetime

Sensor technologies are common in the past for collecting information about specific environment but nowadays wireless sensor network are getting popular and widespread used in every sector. A wireless sensor network is characterized by number of sensor nodes distributed in the field to monitor certain environment parameter. Usually these tiny sensor nodes are powered by small battery. Due to the limited energy capacity, power efficiency is a big challenge to maintain the availability of the network. Some of the network characteristic and behavior has a direct impact on the network lifetime. Configuring the optimal parameters is vital for sensor nodes to handle energy resource efficiently. This research studies the parameters that most significantly impact the energy consumption and find their correlation and trade offs with respect to network lifetime. In this research the trade offs were investigated in detail in various combinations. To fulfill this objective a discrete simulation tool OMNeT++ (with MiXiM framework) has been chosen to model and simulate the real environment of the sensor nodes. Using this tool the correlation of the selected parameters with regards to network lifetime has been analyzed. Finally, results of extensive simulation are presented and hopefully can become guidance for the sensor network designers to optimally configuring the correct parameters for prolonged network lifetime.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

A wireless sensor network is a collection of nodes organized into a cooperative network [1]. Each sensor network node has typically several parts, a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting [2].

In the near future, the improvements in digital circuit technology will allow the integration of functionalities for information gathering, processing, and communication in tight packaging, perhaps even on a single chip. Environment data collection is performed by the various actual sensors such as temperature sensor, air humidity sensor, pressure sensor, etc. Information processing functionalities rely essentially on processing units like microprocessors or microcontrollers, memory, and their interconnection. Information communication functionalities are performed by wireless communication devices, typically communicating in the radio spectrum, sometimes visible or infrared light being other options. Finally, some other support functionalities like power supply, etc., are required to build a complete sensor node. It is envisioned that, in future, wireless sensor networks will be an integral part of our lives.

Sensor nodes can be used for continuous sensing, event detection, location sensing, and local control of actuators. The concepts of micro-sensing and wireless connection of these nodes promise many new application areas. Some application categories are military, environment, health, home and other commercial areas.