

UNIVERSITI TEKNOLOGI MARA

TOPOLOGY CONTROL IN HETEROGENEOUS
WIRELESS SENSOR NETWORKS

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Master dissertation submitted in fulfilment of the requirements

for the degree of

Master of Science (Computer Networking)

Faculty of Computer & Mathematical Science

April 2011

ABSTRACT

The most challenging issue in a wireless sensor network is energy consumption that affecting to lifetime of the WSN. Topology control algorithms are energy efficient mechanisms that extend lifetime of the WSN witch include tow processes, construction and maintenance. Topology control manages connectivity and coverage with the least active node with the goal of extending its lifetime.

The sensors interact with each other via radio communications to the WSN gateway. Wireless nodes with uniform transmission ranges, homogeneous, are assumed in most of researches on topology control. Various types of power capacities, sensing and transmitting range, and computing/processing abilities are usually more practical for constructing highly reliable networks. In heterogeneous sensor networks communication is very diverse and nodes have different transmission range.

In this thesis we deployed heterogeneous wireless sensor network in Atarraya simulator to compare CDS-based construction algorithms(A3, EECDS, CDS-Rule K) and KNeigh-tree, also The A3 protocol with 4 type of topology maintenance protocol,(DGTTRC, SGTTRC, HGTTRCROT and DGETTRC) are tested. The result shows that using a heterogeneous architecture DGTTRC has better performance in term of connectivity and coverage during the lifetime of WSN and SGTTRC has a decrease trend in its lifetime and it is because of maintenance approach that does not have any flexibility to respond the event in real time.

ACKNOWLEDGMENTS

I would like to express my gratitude to Allah for providing me the blessings to complete this work.

I would like to express my sincere appreciation to my thesis supervisor Assoc. Professor Dr Adnan Ahmad for all his invaluable guidance, support and encouragement.

Thanks to all the lecturers who Taught me a wide range of knowledge to help me doing my thesis .

My deepest gratitude to my husband and my parents for their love, encouragement, patience and support me through my master study.

Nafiseh Ahadi

Table of Contents

ABSTRACT.....	II
ACKNOWLEDGMENTS	III
List of Tables	VI
List of Figures	VII
CHAPTER 1	1
INTRODUCTION	1
1.1 Wireless Sensor Networks	2
1.2 RANGE OF APPLICATIONS	7
1.3 WSN Architecture and Protocol Stack.....	9
1.3.1 Physical Layer.....	12
1.3.2 Data Link Layer	12
1.3.3 Network Layer	14
1.3.4 Transport Layer.....	15
1.3.5 Application Layer	16
1.4 Topology Control.....	19
1.4.1 Network Topology	20
1.4.2 Definition of Topology Control	21
1.5 Problem Statement	22
1.6 Objectives	23
1.7 Scope.....	23
1.8 Structure of the thesis.....	24
Chapter 2.....	25
Literature Review.....	25
2-1 Derivation of Optimal Topology for Each Topology Type and its Delay	26
2.2 Topology Control and the Communications Protocol Stack.....	29
2.3 Topology Control Taxonomy.....	30
2.3.1 Topology Construction	32
2.3.2 Topology Maintenance algorithms	42
2.3.2.1 Triggering Criteria	44
2.4 Topology Control Problems.....	46
2.4.1 Sensor Coverage Topology	46
2.4.1.1 Static Network.....	46
2.4.1.2 Mobile Network	48

CHAPTER 1

INTRODUCTION

A Wireless Sensor Network, WSN, is a network of many smart sensor devices, called nodes. The smart device has five essential components: sensor, processor, memory, radio transmitter, and an energy source. The sensors records data, such as temperature, humidity, sound, intensity, vibration, pressure, motion, and pollutants from places that are not easily accessible or that are dangerous to humans. Each smart device within the network is small and inexpensive, so that it can be manufactured and deployed in large quantities. (Mahalik, 2007)

The radio in a sensor node is the primary source of energy dissipation Since nodes consume a considerable amount of energy to transmit/receive messages, reducing the energy consumed for radio communications is an important issue (Santi, Topology Control in Wireless Ad Hoc and Sensor Networks, 2005).

The limited and often non-renewable energy of sensor nodes has its direct impact on network lifetime and it dominates the problem of wireless sensor networks. one cause of overcome this problem is to use the topology control mechanism.

Topology control protocols exploit node density in the network to reduce energy consumption. The principles listed below are some of the common principles used for topology control in wireless sensor networks:

- The sensor nodes self-configure themselves to accommodate changing network dynamics.
- Selection of active nodes should be done based on distributed localized algorithms.
- Minimum connectivity in the network topology control protocols required, so that the network is not partitioned.