TU Clausthal

ROUTING IN WIRELESS SENSOR NETWORKS: AN EXPERIMENTAL EVALUATION OF HETEROGENEOUS WIRELESS SENSOR NETWORK (WRITTEN IN LaTeX)

ITIS RESARCH PROJECT REPORT

presented by

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ABSTRACT

The design goals, e.g. wide connectivity, minimal energy consumption, symmetry and more, of a Wireless Sensor Network (WSN) hugely depend on the topology and the internal node architecture. A practical step towards implementing a functional Wireless Sensor Network (WSN) is to determine the best suitable topology control depending on the application area. Generally speaking, an efficient topology ensures minimum message loss and the proximity of the neighbors. This research aims to present an efficient and an easily deployable solution to set up a heterogeneous Wireless Sensor Network (WSN) (in terms of MCU(µController Unit) Power). The scope of this research also includes studying an important aspect of Wireless Sensor Network (WSN), the hybridization of several technologies: Networking, Data Dissemination, Data Collection, Mobile Communication and Clustering. Moreover, Sensor Nodes (SNs) in a Wireless Sensor Network (WSN), need a cost-effective and fair communication channel access arbitration. Therefore, selection and implementation of efficient Routing protocols, implemented at Network layer, is necessary for efficient routing of traffic after the topological set up has been done. Additionally, coherent Layer2 and Layer3 protocols are needed to test a working model of heterogeneous Wireless Sensor Network (WSN).

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ACRONYMS

WSN Wireless Sensor Network

SN Sensor Node

1 INTRODUCTION

2 BACKGROUND

3

LITERATURE REVIEW

4

SYSTEM DESIGN AND IMPLEMENTATION

Procedures used to complete the study

5

EVALUATION MEASURES:

The proposed network model has been evaluated in the mentioned WSN topolgies

1. Cluster-based: The processing centre is assigned to each group of cluster of WSNs and the SNs route using CTP tree routing.
2. Tree-based: In this mechanism, some parents of the tree are Processing centres and others are either using CTP protocol to send the data or they use NFS-SIS scheme to send the data to their parents.
3. Ellipsoidal: Nodes are arranged in ellipsoidical fashion, where some nodes in the ring are Processing centre.
4. Random: Randomly distributing nodes in a network based on random location generated by Contiki for each SN

In each of the above mentioned topological order of the nodes, the following parameters are evaluated:

ENERGY CONSUMPTION

1. Overall Energy Consumption: Energy dissipation of each sensor node. Plot for each SN on 2D Cartesian axes, where X -> Time (In hrs) Y -> Energy(In Joules)
2. LifeCycle of a WSN:
    a) Time till first SN dies on 2D Cartesian axes, where X -> Time (In hrs) Y -> Energy(In Joules)
    b) Time till all SNs dies

ENERGY CONSUMPTION

1. Gantt Chart for each SN to show CTS-RTS time frame on time as X-axis
2. Time when data delivery to BaseStation falls below a certain threshold

SCALABILITY

1. Network Performance on increasing the number of nodes. Plot for each SN on 2D Cartesian axes, where X -> Number of SensorNodes Y -> Simulation running Speed in contiki

OVERHEADS AND EFFICIENCY

1. Control Overhead: Number of Control Messages to Data Messages

OTHER EVALUATION DATA

1. Algorithm Storage requirement of Collection Tree Protocol (CTP) vs Neighbor Finding Scheme for Sensor Information Systems (NFS-SIS)
2. Mobility of SNs in Neighbor Finding Scheme for Sensor Information Systems (NFS-SIS)
3. Performance ratio on $\mathrm{NumSensorNodes} \div \mathrm{NumProcessingCentres}$

6 CONCLUSIONS/DISCUSSIONS

A

APPENDIX

A.1 INSTALLATION OF TINYOS ON MACOSX

A.2 INSTALLATION OF TINYOS ON UBUNTU