B.Comp. Dissertation

Design and Implementation of an Algorithm for a Problem

By

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Abstract

The use of Wireless Sensor Networks for environmental monitoring has become increasingly popular over the past decade due to its affordability, ease of deployment and customisation, as well as its potentiality in the processing of sensed data. One of the greatest challenges in this field would be in the design and implementation of an efficient routing protocol which takes into account the various limitations of Wireless Sensor Networks, such as battery life, limited storage capacities and high probability of packet losses. Besides this, it is also extremely difficult to evaluate the performance of such a protocol under crisis scenarios, due to its infrequency and unpredictability. In our work, we have designed a routing protocol based on optimised Virtual Polar Coordinate Routing (VPCR) (Newsome and Song, 2003) for use with our three-dimensional testbed, comprising of 48 MICAz (Crossbow) motes spread across two floors of a building. We have also developed a Java-based application with features for Event Emulation and simple nodal analysis to assist us in our experiments. The overall performance of our protocol will be gauged based on the average Path Stretch Factor and path length comparisons between optimised and nave VPCR.

Subject Descriptors:

C5 - Computer System Implementation
G2.2 - Graph Algorithms

Keywords:

Problem, algorithm, implementation

Implementation Software and Hardware:

Solaris 10, g++ 3.3, Tcl/Tk 8.4.7

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I would like to thank my friends, families and advisors. Without them, I would not have be able to complete this project.

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Chapter 1

Introduction

Many problems exist in computer science. In this project, we studied one particular important problem and propose a solution for it.

1.1 Background

In this section, we briefly discuss the history and background of the problem. A detail literature survey is presented in Chapter 2.

The problem we study in this report is an important one. This problem is first proposed in 1990 in the context of graph theory (Smith, 1990). Zhang gives the first algorithm to the problem and applied it to solve several problems in artificial intelligence (Zhang & Advisor, 1991; Zhang, 1992). More recently, a slightly different formulation of the problem is studied independently (Kovsky, Chev, & Kov, 1992; Ali & Raman, 1994). None of this previous work uses the technique that we propose in this project. Thus, we believe that our algorithm is novel.

1.2 The Problem

In this section, we formally defined the problem. We adopt the definition given by Kovsky (Kovsky et al., 1992).

1.3 Our Solution

1.4 Report Organization

Chapter 2

Related Work

Chapter 3

Problem and Algorithm

3.1 Formal Description of Problem

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References

Ali, M., & Raman, N. (1994). *Some algorithm to solve a problem in computer science* (Technical Report ISM-TR-506). Kuala Lumpur, Malaysia: Institute of Study, Malaysia.

Kovsky, C., Chev, D., & Kov, E. (1992). *A slightly different formulation of the problem.* Moscow, Russia: Russian National Publisher.

Smith, A. (1990). A problem in graph theory. *Proceedings of International Conference on Graph Theory* (pp. 300–311), New York, NY, January, 1990.

Zhang, B. (1992). The problem: algorithms and application to AI. Master's thesis, National University of USA, Santa Claus, CA.

Zhang, B., & Advisor, H. (1991). First algorithm to solve the problem and its application to AI. *Journal of Problems and Solutions in Artificial Intelligence*, *3*(9), January, 1991, 120–136.

Appendix A

Code

Appendix B

Proofs

In this appendix, we present alternate, longer, but more interesting proof of correctness of our algorithm. This proof is based on induction and proof by contradiction.