TRAVELING USING MASS RAPID SYSTEM: A COMPARATIVE STUDY OF BLIND SEARCHING STRATEGIES

This thesis is submitted to the Faculty of Information Technology in partial fulfillment of the requirement for the degree of Master of Science (Intelligent System) Universiti Utara Malaysia

By:
Syed Nidzamuddin bin Syed Hassan

KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PROJEK
(Certificate of Project Paper)

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certify that)

SYED NIDZAMUDDIN BIN SYED HASSAN

calon untuk Ijazah
(candidate for the degree of) **MSc. (Intelligent System)**

telah mengemukakan kertas projek yang bertajuk
(has presented his/ her project paper of the following title)

TRAVELLING USING MASS RAPID SYSTEM – COMPARATIVE STUDY ON BLIND SEARCHING STRATEGIES

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan.
(that the project paper acceptable in form and content, and that a satisfactory knowledge of the field is covered by the project paper).

Nama Penyelia Utama
(Name of Main Supervisor): **MR. WAN HUSSAIN BIN WAN ISHAK**

Tandatangan
(Signature) : _____

Tarikh
(Date) : 22/5/08

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in absence by the Dean of Graduate Study, College of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Request for permission to copy or make other use of materials in this thesis, in whole or in part should be addressed to:

Dean of Graduate Study
College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Kedah

ABSTRACT

Comparative study of blind and heuristic searching techniques are investigated for Kuala Lumpur mass rapid system. High volume of traffics and people made the mass rapid system such as Light Rail Transit (LRT), a likely candidate to use in daily life. However, since there are quite a number of transportation modes available, making choices may not be easy. The best travelling direction in terms of the least number of nodes traversed need to be ascertained before starting the journey. This research analyze the efficacy of blind search strategies namely breadth of search and depth of search to discover the best route to travel. The best route is defined as the shortest path that one should travel to reach his destination.

TABLE OF CONTENTS

ACKNOWLEDGEMENT

Firstly, I must thank Allah who gave me the strength to complete this thesis. It has been almost 20 years ago since I received my degree in Engineering but the search of knowledge must continue and never die. I am very grateful to be given the opportunity to embark on this ambitious dream to do a Master degree. Allah is great.

My sincere appreciation to my supervisor, Mr Wan Hussain b. Wan Ishak who has given me the whole support in all aspects whether it be documentation, programming, ideas and moral support throughout this course. Thank you very much for your help, Mr Wan.

I also cannot complete this Master without the support from my family. Indeed, they have suffered for two years since I am doing my master. This is partly due to my lack of time for them since I have to divide my attention between working and studying. Moreover, we do not have much quality time together and I am grateful they do not complain about it.

Special thanks to all of my lecturers in FTM who have given a valuable lesson. I learned a lot during my tenure here. I really appreciate all the helps rendered to me in completing the assignments and projects.

I want to express my gratitude to all of my colleagues who have collaborated together for our assignments and projects for the past years. May the working spirit still continue and we all excel together to achieve our dreams.

Last but not least, I want to thank to others who have helped me directly or indirectly since I could not remember all the parties involved. Only Allah knows best and may Allah rewards them in kindness.

LIST OF FIGURES

LIST OF TABLES

Chapter 1

INTRODUCTION

Kuala Lumpur (KL), the capital of Malaysia, covers an area of 243.6 sq. km with a population of 1.5 million. Vehicle ownership growth rate at 8% per annum and human population contributed to the environmental deterioration and traffic jams not to mention traffic accident that might happen. Mass Rapid Transportation System in Kuala Lumpur commonly known as Rail Transit System has been established by the government since the last 10 years as an alternative transportation route for urban people. It consists of Putra-LRT, Star-LRT, Express Rail Link (ERL), Monorail and KTM Komuter. With the exception of KTM Komuter which is operated by Keretapi Tanah Melayu(KTMB), other railway systems were constructed according to build-operate-transfer (BOT) formula. In these respect, the private companies / consortiums signed concession agreements with the government to build the railway systems and operate them for some period.

KTM Komuter was the first to start electrical rail service in Malaysia on 14th August 1995 between Kuala Lumpur and Rawang. The service was later expanded to cover 153 route-km of electrified double rack between Rawang and Seremban, and Sentul and Port Klang. The electrification system consists of a 25-kVac catenary with six substations drawing power from Tenaga Nasional Berhad (TNB). The meter gauge track with multiple aspect signaling enable the train to run at up to 120 km/h. KTM Komuter uses three-car electric units (EMUs) from three different suppliers-Jenbacher Transportation Systems, Marubeni Corporation and

The contents of the thesis is for internal user only

Chapter 5

CONCLUSION

Transportation problem such as LRT station finding can be viusalized as state space solution. Routes can be transformed into tree solution which can be manipulated by searching strategies. This study showed a searching tree solution for finding paths. In this study, we have compared and used two blind searching techniques to solve LRT problem in Kuala Lumpur.. The best paths are always obtained by breadth first search a compared to depth first search. The result can be used to assist sudents and actual users in understanding tree path solution and searching techniques using PROLOG.

Future work for this study is to use actual heuristic values such as distance or cost in the calculation in order to find the best path at minimum cost. We plan to incorporate Best First Search and A* Search heuristic search methods for a conclusive and comprehensive searching system.

In addition, we also hope to do the study in Kuala Lumpur itself by taking actual distance between stations involved, time travel, and cost of travel. The absence of data has significantly reduced our study to only simulation data which might not reflect current situation. We need to represent the problem as a whole so that the system that we develop can be used for actual users of the system.

REFERENCES

Ambite J., Kapoor, D., 2000, *Automatic Generation of Data Processing Workflows for Transportation Modeling,* The Proceedings of the 8th Annual International Digital Government Research Conference, pp.82-91.

Assis Francisco, 2000, Weight *Structure of Binary Codes and the Performance of Blind Search Algorithms.*

Bapna S., 1991, De Suranjan, *An Intelligent Search Strategy for Solving the Symmetric Traveling Salesman Problem.* IEEE International Conference on Decision aiding for Complex System.

Beck C.J., Perron L., 2000, *Discrepancy-Bounded Depth First Search,* ILOG SA.

Bratko I., 2001, PROLOG Programming Artificial Intelligence, 3rd Edition,.

Buisson J., Garel A., 2003, *Balancing meals using fuzzy arithmetic and heuristic search algorithms*, IEEE Transactions on Fuzzy System, Volume 11, Issue 1, pg. 68-78

Change N., Liu Mingyan, 2004, Revisiting the TTL based Controlled Flooding Search: Optimality and Randomization, MobiCom'04, Sept. 26Oct.1, 2004, pp.85 – pp99.

Hamzeh A., Rahmani A., 2005, Intelligent Exploration Method for XCS, IWLCS 2005.

Hilmi Mohamad, 2003, *Railway Transportation in Kuala Lumpur*, Japan Railway and Transport Review 35, July 2003, pg.21-27.

Hoar R., Penner J., 2003, *The Application of Artificial Intelligence to Transportation System Design*, 05-09_9.3_Xrds_Artifl_Intelli, pg. 5-9.

Horowitz,E. and Sahni S . 1978. Fundamentals of Computer Algorithms, Computer Science Press.

Khan M.B., Zhang D., Jun M.S, Li Z.J., 2006, An Intelligent Search Technique to Train Scheduling Problem Based on Genetic Algorithm, IEEE—ICET 2006, 2nd International Conference on Emerging Technologies.

Lanin V., Lyadova L.,2007, *Intelligent Search and Automation Document Classification and Cataloging Based on Ontology Approach*, International Journal "Information Theories & Applications" Vol.14 / 2007

Li T, Han T., 2005, An Intelligent Searching Model Based on Data Integration and Its Query Algorithms, Proceeding ofNLP-KE'O5, pp.324-330.

Likachev M., Koenig S., 2002, *Incremental Replanning for Mapping*, Proceedings of the 2002 IEEE/RSJ Intl. Conference on Intelligent Robots and Systems, pg. 667-672.

Luger G., 2002, Artificial Intelligence Structures and Strategies for Complex Problem Solving 2nd edition.

Michlmayr E., 2006, Self-Organization for Search in Peer-to-Peer Networks: The Exploitation-Exploration Dilemma, Research by Austrian Federal Ministry for Education, Science, and Culture (bm:bwk), and the European Social Fund (ESF) under grant 31.963/46-VII/9/2002.

Patra S., Mitra J., Earla R., 2006, *A New Intelligent Search Method for Composite System Reliability Analysis*, Transmission and Distribution Conference and Exhibition,2005/2006 IEEE PES, pp803-pp807.

Russell, S. J. & Norvig, P. 2003, Artificial Intelligence: A Modern Approach (2nd ed.), Prentice Hall, pp. 94 and 95

Schaefer, L.,Mackulak G., Cochran J.,Cherilla J. 1998, *Application of a General Particle Model to Movement of Pedestrians and Vehicles,* Proceedings of the 1998 winter Simulation Conference. pg. 1155-1160.

Shen X., Xu Y., Yu J., Zhang K., 2007, *Intelligent Search Engine Based on Formal Concept Analysis*, 2007 IEEE International Conference on Granular Computing, pp.669-674.

Singapore Transit System http://www.sbstransit.com.sg/transport/trpt_overview.aspx,

Thesen A., Grant H., Kelton D., 1987, Using Expert System to Select Software for Traffic Analysis, Proceedings of the 1967 Winter Simulation Conference, pp. 828-837.

Vishnevsky V., Safonov A., Yakimov M., 2006, *Tag Routing for Efficient Blind Search in Peer-to-Peer Networks,* Proceedings of the 11th IEEE Symposium on Computers and Communications (ISCC'06)

Weyns D., Lefever T, 2005, *Decentralized Control of EGV Transportation System.* AAMAS '05, pg 67~74.

Wikipedia Free encyclopedia http://en.wikipedia.org/wiki/Best-first_search

Wikipedia Free encyclopedia http://en.wikipedia.org/wiki/Branch_and_bound

Wu B., Kshemkalyani A.D., 2006, *Analysis Models for Blind Search in Unstructured Overlays,* Fifth IEEE International Symposium on Network Computing and Applications (NCA'06).

Zonnan M., Podgorelec V., Kokol P., 1998, Quest €or the Information: Using Intelligent Search €or Finding Telemedical Sites, pp. 4086- 4091.

Zonnan M., Podgorelec V., 1998 , Quest €or the Information: Using Intelligent Search €or Finding Telemedical Sites.