



**Faculty of Information and Communication Technology**

**AN INTEGRATION OF AHP-ACO TECHNIQUE FOR SOCIAL  
INTERACTION AND TRAVEL PLANNING**

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**Master of Science in Information and Communication Technology**

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**AN INTEGRATION OF AHP-ACO TECHNIQUE FOR SOCIAL INTERACTION  
AND TRAVEL PLANNING**

**PERLY PEH THAI EE**

**A thesis submitted  
in fulfillment of the requirements for the degree of Master of Science  
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**2016**

## DECLARATION

I declare that this thesis entitled “An integration of AHP-ACO technique for social interaction and travel planning” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : .....

Date : .....

## APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality as a partial fulfillment of Master of Science in Information and Communication Technology.

Signature : .....

Supervisor Name : .....

Date : .....

## **DEDICATION**

To my beloved parents, Mr. Peh Hock Beng and Mrs. Tan Sok Ooi, for their expression  
of love and fully support...

To my supervisor, Associate Professor Dr. Choo Yun Huoy, and co-supervisor,  
Associate Professor Dr. Burhanuddin Mohd Aboobaidar for making it all worthwhile...

## ABSTRACT

The current web and mobile computing technologies have encouraged all sorts of applications mushroom in the market. However, most of the application that available does not integrate the place recommendation and route planning. Besides that, improving the processing speed of the algorithm is also another challenge of this research. Thus, the objectives of this research is to integrate the place recommendation based on profile preference using Analytic Hierarchy Process (AHP) method and route planning using ACO method. The second objective of this research is to enhance the processing speed of the proposed AHP-ACO technique in generating the optimum route plan. This study presents the integration methods of AHP algorithm for point of interest decision-making and ACO and rule-based algorithms for route optimization. AHP interest scores based on user preferences, business information and community reviews are used to model decision making. ACO and rule-based algorithms are used to arrange the itinerary of the place of interest that either has been chosen by the user or recommended by the system. The integration AHP-ACO method has been enhanced to reduce the execution time from 5 minutes to 30 seconds for 7 days trip planning. Object Oriented Software Engineering (OOSE) methodology has been used to build the mobile recommender system prototype and web application prototype. Questionnaires have been distributed to collect user feedback. The results show that the integration method is promising for helping the user in making decisions and itinerary arrangements.

## ABSTRAK

*Teknologi web dan telefon terkini telah menggalakkan perkembangan pelbagai aplikasi dengan pesat di pasaran. Akan tetapi, kebanyakan aplikasi tidak mempunyai cadangan tempat dan perancangan laluan dalam aplikasi yang sama. Selain itu, meningkatkan kelajuan algorithm juga merupakan satu cabaran dalam pengajian ini. Oleh itu, objektif kajian ini adalah untuk mengintegrasikan kaedah Analytic Hierarchy Process (AHP) yang digunakan untuk memilih tempat melancong dan kaedah Ant Colony Optimization (ACO) serta rule-based algorithm yang digunakan untuk pengoptimum laluan. Objektif yang kedua adalah untuk meningkatkan kelajuan pemprosesan teknik AHP-ACO yang menghasilkan laluan optimum. Kajian ini membentangkan kaedah integrasi AHP dan ACO. Skor AHP berdasarkan pilihan pengguna, maklumat perniagaan dan ulasan masyarakat digunakan untuk membuat keputusan memilih tempat pelancongan. ACO dan rule-based algorithm digunakan untuk menyusun jadual perjalanan bagi lokasi pilihan yang sama ada telah dipilih oleh pengguna atau disyorkan oleh sistem. Kaedah integrasi AHP-ACO telah diubahsuai untuk mengurangkan masa pelaksanaan dari 5 minit ke 30 saat untuk 7 hari perancangan perjalanan. Object Oriented Software Engineering (OOSE) metodologi telah digunakan untuk membina sistem prototaip dan aplikasi web prototaip. Borang soal selidik telah diedarkan untuk mengumpul maklum balas pengguna. Hasil kajian menunjukkan bahawa kaedah integrasi ini membantu pengguna dalam membuat keputusan dan mengatur jadual perjalanan.*

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## LIST OF ABBREVIATIONS

|      |   |  |
|------|---|--|
| ACO  | - | Ant Colony Optimization                |
| ACS  | - | Ant Colony System                      |
| AHP  | - | Analytic Hierarchy Process             |
| AIDL | - | Android Interface Definition Language  |
| AS   | - | Ant System                             |
| API  | - | Application Program Interface          |
| BAO  | - | Bee Algorithm Optimization             |
| CBRS | - | Content-based recommender system       |
| CI   | - | Consistency index                      |
| CRS  | - | Collaborative-based recommender system |
| CR   | - | Consistency ratio                      |
| DRS  | - | Demographic recommender system         |
| HRS  | - | Hybrid recommender system              |
| HTML | - | Hypertext Markup Language              |
| HTTP | - | Hypertext Transfer Protocol            |
| IC   | - | Identity Card                          |
| ICT  | - | Information Communication Technologies |
| ID   | - | Identity                               |
| IDE  | - | Integrated Development Environment     |
| iOS  | - | iPhone Operating System                |
| ERD  | - | Entity Relationship Diagram            |
| GA   | - | Genetic Algorithm                      |
| GMM  | - | Geometric Mean Method                  |
| GPS  | - | Global Positioning System              |
| JSON | - | JavaScript Object Notation             |
| JSP  | - | Java Server Pages                      |

|      |   |                                      |
|------|---|--------------------------------------|
| KBRS | - | Knowledge based recommender system   |
| MMAS | - | MAX-MIN Ant System                   |
| OAT  | - | Operational Acceptance Testing       |
| OOP  | - | Object-oriented programming          |
| OOSE | - | Object-Oriented Software Engineering |
| OS   | - | Operating System                     |
| POI  | - | Point of interest                    |
| PSO  | - | Particle Swarm Optimization          |
| SA   | - | Simulated Annealing                  |
| SDK  | - | Software Development Kit             |
| SIT  | - | System Integration Testing           |
| SP   | - | Service Pack                         |
| SQL  | - | Structured Query Language            |
| TSP  | - | Travelling Salesman Problem          |
| UAT  | - | User Acceptance Testing              |
| UBRS | - | Utility based recommender system     |
| UI   | - | User interface                       |
| UML  | - | Unified Modeling Language            |
| VM   | - | Virtual Machine                      |
| WSM  | - | Weighted Sum Model                   |
| XML  | - | Extensible Markup Language           |

## LIST OF PUBLICATIONS

Peh P. T. E., Choo, Y.H. and Burhanuddin, M.A., 2011. The Intelligent Vacation Planner System Using Ant Colony Optimization. *Procedia Engineering*.

Peh P.T.E., Choo, Y. H., Burhanuddin M.A., 2013. Cloud-Mobi Framework using Hybrid AHP-ACO Method for Social Interaction and Travel Planning. *2013 International Conference on Intelligent Systems Design and Applications (ISDA)*, Universiti Putra Malaysia (UPM), Selangor, Malaysia, 8 - 12 December 2013. IEEE.