
RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

REMACS 5.0



CS240 - BACHELOR OF INFORMATION TECHNOLOGY [HONS.]
CS248 - BACHELOR OF SCIENCES [HONS.]
MANAGEMENT IN MATHEMATICS
CS251 - BACHELOR OF COMPUTER SCIENCE [HONS]
NETCENTRIC COMPUTING
CS255 - BACHELOR OF COMPUTER SCIENCE [HONS]
DATA COMMUNICATION & NETWORKING

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Universiti Teknologi MARA Perlis Branch

**Research Exhibition in Mathematics and Computer Sciences
(REMACS 5.0)**

Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)

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Preface

It is with great pleasure that we present this extended abstract book, titled "The 5th Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)". This book is a collection of research work in the fields of Computer Science and Mathematics, contributed by the final year students from Universiti Teknologi MARA, Perlis Branch. The aim of this book is to showcase the diversity and depth of research in these two interrelated fields.

Mathematics and Computer Science are two fields that have seen tremendous growth and advancement in recent years. With the rise of new technologies and the increasing demand for data-driven solutions, researchers in these fields have been working hard to develop new theories, algorithms, and models that can help solve some of the most pressing problems of our time. This book is a testament to their hard work and dedication.

The abstracts in this book cover a wide range of topics, including algebra, analysis, logic, computer architecture, algorithms, artificial intelligence, machine learning, computer network, netcentric computing and many more. The work presented here is both theoretical and practical, and has the potential to impact many areas of society, from finance and healthcare to education and security.

We hope that this book will serve as a valuable resource for future students in the fields of Mathematics and Computer Science. We also hope that it will inspire more students to pursue innovative and groundbreaking research in these two fields. Finally, we would like to express our gratitude to all the contributors for their hard work and dedication, without which this book would not have been possible.



RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES
REMACS 5.0

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EVENT SCHEDULE

8:00 – 8:30 am

- Registration

8:00 am – 12:00 pm

- FYP Project Presentation

12:00 - 2:00pm

- Lunch Break

2:15 – 2:35 pm

- National & Wawasan Setia Anthems
- Doa Recitation

2:35 – 2:45 pm

- Welcoming Address by Director of REMACS 5.0

2:45 – 2:55 pm

- Officiating & Closing Remarks from Rector of UiTM Perlis

2:55 – 3:00 pm

- REMACS 5.0 Montage

3:00 – 4:00 pm

- Awarding of Winners:
 - Best Poster
 - Best Project Award

- Photo Session

- End of Ceremony

Dress Code: Formal / Corporate

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EXTENDED ABSTRACTS

RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES
REMACS 5.0

TOURIST TRIP DESIGN PROBLEM WITH USER PREFERENCE AND POPULARITY: A CASE STUDY OF LANGKAWI ISLAND

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Abstract

Langkawi Island received more than 1.8 million tourists in 2022 after the Malaysian Government introduced Langkawi Travel Bubble. This study aims to resolve the Tourist Trip Design Problem (TTDP) given user preference and popularity of Points of Interest (POIs). TTDP formulation falls under Orienteering Problem, which adopts the Integer Programming Formulation (Benjamin et al., 2019; Ruiz-Meza & Montoya-Torres, 2022). This study proposed enhancement in the greedy algorithm approach (Benjamin et al., 2019). A greedy algorithm solves a problem that selects the most appropriate option based on the current situation. Clarke Wright Saving Algorithm has been embedded in a greedy algorithm to find the shortest route between POIs selected by the algorithm, and it will create a sequence of POIs. The algorithm will choose POIs based on categories selected by the users. Users will choose three categories out of the six categories listed. The categories are; Forests, Island Adventure, Beaches and Waterfall, History and Culture, Shopping, and Fun. Then the algorithm will select POI if the cost of POI does not exceed the allocated budget. The algorithm also considers the popularity of POIs, operating hour, and touring time of POI. The carbon footprint is calculated for the best itinerary found.

Keywords: orienteering problem, tourist trip design problem, point of interest

1. Introduction

According to the Ministry of Tourism & Culture of Malaysia (2021), Langkawi Island has been identified as the world's leading country on the tourism board since it receives a significant number of foreign and domestic visitors annually. Langkawi had more than 1.8 million visitors in 2022 after the launch of the Langkawi Tourism Bubble. This study aims to solve the Tourist Trip Design Problem (TTDP), which considers user preference and the popularity ranking of the Points of Interest (POIs). This study considered 36 POIs, which fall under six categories; Forest, Island Adventure, Beaches and Waterfall, History and Culture, Shopping, and Fun. The algorithm also considers the popularity of POIs, operating hours, touring time, travel time, and adult entrance fees.

2. Methodology

The TTDP formulation is viewed as Orienteering Problem in which the Integer Programming Formulation was adopted (Ruiz-Meza & Montoya-Torres, 2022). This study proposed enhancement for the greedy algorithm (Benjamin et al., 2019) for the problem. A greedy algorithm is an approach that solves the problem by selecting the best POIs available at one time without considering the future. A savings algorithm is embedded in the Greedy algorithm as an enhancement to find the best distance. The algorithm embeds user preferences based on the categories selected (out of 6) and then finds the best sequences of POIs to be visited such that the user budget is not exceeded.

3. Results and Discussion

The enhanced greedy algorithm was coded in Matlab and run several times with different categories selected. A maximum of three categories can be selected at one time, while there is no limit to the budget that can be input. The starting node is fixed at the Jetty Point, and the duration time starts as early as 9.30 am based on the opening hours of POIs and ends at 10 pm. Although the earliest POIs are at 8 am (for example, Mardi Agropark and Galeria Perdana), this study considered these POIs can be

visited at 9.30 am due to their closed time in the evening. For a one-day visiting duration, if the user chooses categories Island adventure, shopping, and fun. The best sequences found include visiting Day Cruise if the budget is not exceeded because the adult entrance fee is quite expensive at RM 200 on average. It is observed that a maximum of 6 POIs can be visited in a one-day trip.

4. Novelty of Research / Product

This study contributes to the body of knowledge by proposing an enhanced greedy algorithm that considered user preferences. The enhancement is done by finding the best sequences of POIs to be visited in the shortest distance. A savings algorithm is embedded in the greedy algorithm to obtain the shortest distance. Existing studies considered maximizing POIs to be visited, POIs popularity, and minimizing the cost, while this study add the distance between POIs criteria. In addition, this study considered 36 POIs with the addition of 3 recently opened POIs. Therefore, this study is to research finding the best sequences while considering POIs' popularity and user preferences and at the same time, minimize the routes of the best sequences. Alternatives routes for visiting POIs were also found.

5. Conclusion

This study develops an enhanced greedy algorithm for solving the tourist trip design problem (TTDP). The algorithm considered 6 categories of user preferences and popularity. The enhanced algorithm greedily decides the options given at once, the budget, the allocated time, and the opening hours. The enhanced algorithm is embedded with Savings Algorithm for route improvement. Finally, the algorithm will calculate the carbon footprints for the best itinerary found.

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