



# UNIVERSITY OF MALAYA

WIA1002: Data Structure

## **Group Assignment Managerial Report**

### **Always On Time Delivery**

**Prepared by**

sadcat.com

Occurrence 7

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## Summary

### Goals and Objectives

1. To explore various searching algorithms for solving the vehicle routing problem.
2. To find the best tour with lowest cost, taking into consideration the number of vehicles used.

### Team Formation

We have been asked to form a group of not more than four members. A Padlet platform has been provided to communicate with classmates and form groups. Four members were selected and Muhammad Waiz Wafiq was elected as the group leader. Our group members identified ‘*sadcat.com*’ as the name of our group. Once group details were submitted through google form, the project was assigned to our group. Table 1 shows the details of our group members.

No.	Name	Matrics Number
1	Muhammad Waiz Wafiq bin Mohamad Jafri	17203410
2	Zulfathi Imran bin Hanafi	17203746
3	Zeqry Danial Muzamil bin Zuraidy	17204986
4	Sarah Atiqah binti Amram	U2005346

Table 1

## Members Roles

Each member played their roles in the project. The group leader delegated the task into several parts, ensuring each member has their own responsibility to complete the project. We compiled all our tasks into an overall project via GitHub. Table 2 shows the distribution of tasks of the team members.

Name	Assigned task
Muhammad Waiz Wafiq bin Mohamad Jafri	<ul style="list-style-type: none"> <li>• Map and map components representation</li> <li>• Blind DFS implementation</li> <li>• Implementation of heterogeneous vehicles and parallelism in Command Line Interface (CLI)</li> </ul>
Zulfathi Imran bin Hanafi	<ul style="list-style-type: none"> <li>• Revised DFS implementation</li> <li>• MCTS algorithm implementation</li> <li>• Graphic User Interface (GUI) implementation</li> </ul>
Zeqry Danial Muzamil bin Zuraidy	<ul style="list-style-type: none"> <li>• A* search algorithm implementation</li> <li>• Best-first search algorithm implementation</li> <li>• Technical report preparation implementation</li> </ul>
Sarah Atiqah binti Amram	<ul style="list-style-type: none"> <li>• Best path algorithm implementation</li> <li>• Dijkstra's algorithm implementation</li> <li>• Managerial report preparation</li> </ul>

Table 2

## Project Timeline

The project was implemented from 8 May to 14 June 2021. We conducted frequent discussions via WhatsApp and Google Meet. As a result, the project was completed successfully before the submission date. Figure 1 and Table 3 show the timeline of our project.

Activities	May				June			
	Weeks							
	1	2	3	4	1	2	3	4
Formation of group members								
Appointment of group leader and group name								
Received project titled ‘Always on Time’ Delivery from lecturer								
Review and brainstorm project plan, objectives and requirements								
Meeting conducted via Google Meet to discuss the implementation approach and proposed possible algorithms								
Ongoing discussion and problem-solving sessions held via WhatsApp								
Ongoing work on the project by each member								
Codes from each member compiled								
Exploring and integrating GUI into the project								
Debugging and final adjustments to the reports and source code conducted								
Submission of project								
Presentation of project								

Figure 1

Date	Activities
7 May 2021	Formation of group members. Appointment of group leader and group name.
8 May 2021	Received project titled 'Always on Time' Delivery from lecturer and a meeting time was set between the group members to discuss the project.
9-13 May 2021	Each group member review and understand the objectives and requirements of the project assigned and brainstorm ideas to develop solutions.
14 May 2021	Meeting was held with group members via Google Meet to discuss the implementation approach and proposed possible algorithms. Each member was assigned to work on few areas of the project.
15-21 May 2021	Ongoing discussion and problem-solving sessions were held with group members via WhatsApp.
22 May-4 June 2021	Ongoing work on the project by each member. The codes from each member are compiled.
5-11 June 2021	Exploring and integrating GUI into the project.
12-13 June 2021	Debugging and final adjustments to the reports and source code conducted.
14 June 2021	Submission of project.
17 June 2021	Presentation of project.

Table 3

## Problems, Complications and Solutions

Several problems were encountered while finishing the project. However, through teamwork, we managed to overcome all the problems as we worked together in providing ideas and suggestions to complete the project. Table 4 shows the issues faced while accomplishing this project and our solutions.

Issues	Solutions
In basic requirements, every vehicle shared the same capacity even though the customers' demand exceeded the vehicle's capacity. This will increase the distance travelled by the vehicles and the tour cost.	Implemented the Heterogeneous Vehicle Capacity feature by adding lorries to the vehicles. Lorries have double the capacity compared to basic vehicles, allowing for longer routes, more orders to be fulfilled and minimize the tour cost.
NRPA-MCTS algorithm took a long time since it had to compare for every possibility that can be considered in finding the best tour.	Applied parallel programming by parallelising the process of route searching to get a better result with a shorter time for large N.
Lacked detailed information on the vehicle movement between locations during the parcel delivery process, which took more time to understand.	Developed a GUI for the program. This GUI will allow for a better understanding of each vehicle movement, as the nodes of each ID will change colour once it is traversed through.

Table 4