CHAPTER IV

ANALYSIS AND DESIGN

4.1 Analysis

4.1.1 Use Case Diagram

![Diagram showing the use case flow]

**Figure 4.1 Use Case Diagrams**

User opens the application and starts with select each city in the maps. When user already select the city and press the calculate button, this application will automatically calculate for the optimization route. Beside the optimization route, user will get the direction by Google direction.
4.2 Design

4.2.1 Class Diagram

![Class Diagram](image)

**Figure 4.2 Full Class Diagram**

Two class JavaScript for the algorithm and maps. One index html for the main page for user. The purpose of query is to make it much easier to use JavaScript on this application. Cascading Style Sheets, define how to display HTML elements.
4.2.2 Flowchart

Start

Implement parameter optimization through Taguchi method in order to identify values of α, β, ρ, and iteration numbers (Q) and identify the best parameters. Equalize the number of ants to number of cities. Put the initial pheromone τ_{ij} on each edge

Read the initialization parameters

Locate ants randomly in cities across the grid and store the current city in a tabu list

Determine probabilistically which city to visit next

Move to next city and place this city in the tabu list

Have all cities been visited

NO

YES

Record the length of tour and clear tabu list

Determine the shortest tour until now and update pheromone

Have the maximum iterations been performed

NO

YES

Show the best solution

End

Figure 4.3 Flowchart