Chapter I

Introduction

1.1 Background of the Problem

Everyday, people produce lots of garbage from their activities. garbage are any substance which is discarded after primary use, or it is worthless, defective and of no use. These garbage are produced everyday in every region in the world. The government is responsible to manage garbage made by the residents. Garbage can cause negative impact for the people. For that reason, garbage should be accumulated and thrown away as fast as possible to minimize the negative impact to residential area. Garbage truck drivers in major cities usually pick the shortest route and drive through high populated area, which can cause discomfort for the citizen. This issue happens because there is no certain route for the truck driver to deliver the garbage, which makes the driver just pick the shortest route, even though that route is a high population area.

By selecting routes only from the shortest path, the garbage truck drivers can drive past the high populated areas and make them uncomfortable. The smell of the garbage in the garbage truck is very bad and the water that the garbage produce can make people uncomfortable. Other than that, garbage can cause some problem like health issues and pollution. Therefore, the government needs recommendation of garbage transportation path so that garbage truck drivers can choose shortest path without passing area with high population. To create comfortable living place for the people, the government and the residents have to deal with garbage issue, especially the route selection of the garbage truck carrying the garbage, so the truck will not cause nuisance in people's daily activity.

Tegal is one of the cities that has problems in the field of garbage processing, especially garbage transportation system [7]. Garbage is transported from each TPST spread over several points . However, this situation is not supported by the transportation system that takes into account the large number of people in the area passed. With limited fuel garbage trucks should be able to cover all the TPST in Tegal . In Tegal , there is 600 m^3 of trash pile that must be delivered daily from 12 TPST to TPA with 10 litres fuel every day.

In the process, each truck transports garbage from two to five TPST every day. The garbage truck operational equipment starts to operate on average at 05.30-12.00 for the morning shift and 13.00 - 18.00 for the afternoon shift.[7] Therefore this emphasize there are many waste-carrying activities from TPST to TPA so choosing the shortest path is important.

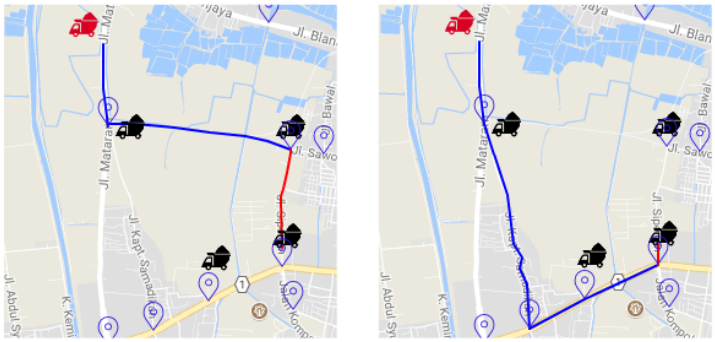

Figure 1.1: Difference of safe path with existing path

But finding a shortest path is not enough for the garbage truck driver. Figure 1.1(a) show existing path. Blue line is the path in low population area and red line is the path in high population area. With the available fuel actually can choose the shorter red path than exiting path like figure 1.1(b). Figure 1.1(b) shows the shortest path by minimize passing the red path. Population density score choosed to determine whether the path is in area with high population or not. Area with high population scores mean there are many settlements, offices, schools or shopping centers [16]. The score can be combined with the finding shortest path algorithm so that the path obtained in not only the shortest path but can minimize through the path with high population density.

In computer science, There are many algorithms can be used to find the shortest path From TPST to TPA. Some of them are dijkstra, floyd-warshall's and A* algorithm. based on reference [4] A* has the least computational complexity than dijkstra and floyd-warshall's algorithms. This is because the A* algorithm performs a search operation using the heuristic value of the destination node, so not all nodes are checked [4]. A* algorithm only check the node that approaches the destination node. Although the neighbor node of the current node has a shorter distance than the other neighbor node, if the node is away from the destination node the node will not be checked by this algorithm. [18]

This final project presents A* algorithm combined with a population density score for choose the safe path in Tegal. System will determine shortest path with avoid or minimize passing through the path in high population area. So can give recommendation path from TPST to TPA for government .

1.2 Research Question

This is the research question that the problem need :

1. How to determine the shortest path and avoid the path with too much civilians activity?
2. How to know the A* algorithm with population density score can produce the shortest path by not passing the area that has high population density?

1.3 Purpose of The Study

1. Implementing the A * algorithm on the weighted graph on the issue of transporting waste from TPST to TPA In Tegal city.
2. Compare the Path generated A* Algorithm with population density score and A* without population density score.

1.4 Limitation Of Problem

1. The system collection the garbage that be selected is collection system indirectly.
2. Optimizing calculated in this study is the optimization / minimize distance and also choose the route with a path that has a low population level of activity during garbage trucks hauling garbage from TPST headed to TPA.
3. Calculations for the shortest route and the route selection to avoid paths that have too many civilian activity is only for the area in Tegal city.
4. This study only focuses on finding the save path and shortest path, not finding for the fastest path.
5. Population density scale is used to represent population density level.
6. The road that the author choose is the arterial roads for the biggest road and the roads with width of 4 meters and road side 50 cm for the smallest street.[14]