

FYP-II Chapter 1

Group # 5

Routing Optimization System

Problem Statement

The delivery industry is growing massively as the new newly "online" trend has started due to the Covid. Most of the businesses have now shifted to "online" platforms. This increased the demand for the packages to be delivered. Therefore, finding an optimized route for delivering the packages has become more critical and harder than ever for delivery businesses.

An optimized route can create a valuable effect on cost and time taken by a package to be delivered or collected, thus minimizing the operational cost for the delivery company. Initially, route planning is not a very difficult task for a small business and, in some cases, can even be done manually. Still, it becomes harder as the volume of orders increases or the business grows. Companies also risk inflating their operational costs, often in the form of too many vehicles in their fleet and/or wasted fuel and wages due to longer than necessary routes. Delivery businesses face these types of problems every day.

An effective route optimization solution will help delivery businesses minimize wages, driving time, and fuel consumption by finding the most efficient route for the entire fleet in a matter of minutes. Thus, we will formulate an algorithm that would optimize the route for a delivery company in a multi-dimensional environment, hence minimizing the operational costs incurred by the company and the time taken to deliver a certain number of parcels.

Motivation and Challenges

It is observed by the people who order food online that the time taken by the delivery company often exceeds the expected time. The main causes behind this are often longer or incorrect routes, bad road conditions or sometimes due to the inexperience riders. These significant delays often bother people a lot.

The major challenging part here is the data collection. To carry out experiments on our formulated algorithm, we need some real-time data. Get this real-time data is very difficult as no company will be willing to provide its data due to data security reasons.

Our ultimate goal is to minimize the delivery time by minimizing the operational costs incurred in terms of travel time and fuel costs due to longer or ineffective routes or even due to an inexperience rider.

Project Objectives

- To collect data related to VRP i.e. Vehicle Routing Problem, that would contain the information regarding delivery and depot locations, the rider/delivery vehicle capacity and other customer related data.
- To apply different clustering techniques to divide the customers or the delivery locations according to their delivery needs or their locations or the like features.
- To minimize time by formulating an algorithm that would suggest the best possible route given the locations for delivery and the capacity of the delivery entity (i.e. the delivery van or the delivery boy).
- To develop a web API that would implement the designed algorithm so that the route data can be fetched when needed.
- To develop a demonstration app with maps implemented, that would visually display the routes suggested by the algorithm.

Structure of the Report

The rest of this report is laid out as follows. The literature review of related work is presented in Chapter 2. The system's basic model is presented in Chapter 3, along with the model's functional and non-functional requirements. On the other side, Chapter 4 discusses the system's detailed design, which can assist developers in implementing the system. The prototype and the development of the system are discussed in Chapters 5 and 6. This report comes to a close with Chapter 7.