Talab App Research Problem Report

ABSTRACT

Food lovers might be loving a lot of restaurants but craving certain dishes on one day. It is a satisfying feeling to imagine a dish in your head and have it delivered at your doorstep without worrying about which restaurant to bring it from. I am creating an app where people can select their favorite restaurants and at order time, they only select a dish and we take care of making the order and delivering it.

PROBLEM STATEMENT

Talab is a Food application that is concerned with delivering food to the customers with the minimum amount of cost. The application is concerned with the interaction between customers and restaurants through the ordering system in which it assigns the food delivery to a courier (if available) for it to be delivered to the customer. This project tackles the problem of order allocation and delivery cost optimization. The process includes a various processed after the customer settles on a specific food:- a) allocating the food order to one of its favourite available restaurants b)allocating the order delivery to one of the available couriers for the order to be delivered to the customer. The problem primarily is broken down to the order allocation stage(order-restaurant) and delivery allocation(restaurant-delivery). In the order allocation stage, it is mainly about the prospective of the availability of restaurants and the availability of delivery guys nearby where the total cost of the delivery process is minimal while maintaining the preference of the customers' food. The customer decides which type of food it craves and the ordering system will carry out the process of choosing the restaurant with the best fit and delivers the order successfully to the customer's doorstep. The ultimate goal of the application is to maximize the matching of orders and minimize the delivery cost. This problem has some assumptions:

- Each delivery guy has a carrying limit but for the sake of simplicity. each courier is responsible for delivering a single order per time.
- Each restaurant has a maximum number of order per time
- Delivery men uses different kind of vehicles and also each vehicle has a different cost per distance(cpd)
- Each courier has a maximum route length to tackle per order delivery.

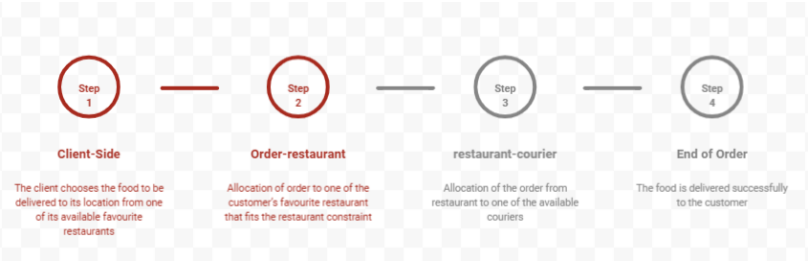

Figure 1: The processes of Order-Delivery

Figure.1 shows the steps of order - delivery allocation process till the food is delivered successfully to the customer.

MODELLING DISCUSSION

The problem of order-delivery allocation has been tackled before in terms of research and there is a couple of research that fits the scope of our problem. Sun et al. (2020) discusses take-out route delivery problem (TRDP) with order allocation and unilateral soft time window constraints. The TRDP considers the order allocation and delivery route optimization in the delivery service process. The mathematical modelling including in this paper is relevant to the model we are targeting. The objective function of this model is to minimize the total cost of delivery(travel cost+time cost). Our objective will mainly focus on maximizing the number of delivered orders and minimizing the travel cost so the number of orders will be a soft constrained which will be the main difference between our target model and their model, and also the time penalty cost will not be part of our model. Steever et al. (2019) proposes the framework for a more flexible business model in which multiple restaurants may be included in a single customer's order. The formulation included in this paper is somewhat a network where there are different types of nodes: a)initial courier locations b)customer locations c)pickup points (customer/restaurant pairs) d)final courier locations. The set of active customers will change upon the arrival of new orders or the completion of a delivery. This model tackles a part of our formulation where each of customers, pickup points(restaurants) and courier location points are given a static locations. The main difference between our approach and this paper is that each courier is required to return to its designated point after delivering the order and each courier can only serve one customer at a time. Xue et al. (2021) tackles a different angle of order delivery which scheduling the riders. The problem lies that some riders may be idle in several periods in regions, while, in contrast, there may be a shortage of riders in other situations. They introduced a two-stage model that adopts the method of mixed-integer programming (MIP), characterize relevant aspects of the scenario, and propose an optimization algorithm for scheduling riders. We also divide the delivery service region and time into smaller parts in terms of granularity. This method has proven to have reduced overall cost of the delivery. This issue is not

part of our main target goal at the moment but it is close to some issue we might encounter as a system in which there might be overhead over a certain restaurant and other restaurant do not get that many orders so this model may help for future purposes but somehow our model is constrained with satisfying the customer order with one of his/her favourite restaurants that they hand-picked.

REFERENCES

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