Group 11 | Smart Hire

[Project status -- Refining the problem definition and current implementation]

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GOAL: MAXIMIZE THE REVENUE, MINIMIZE THE DELAY

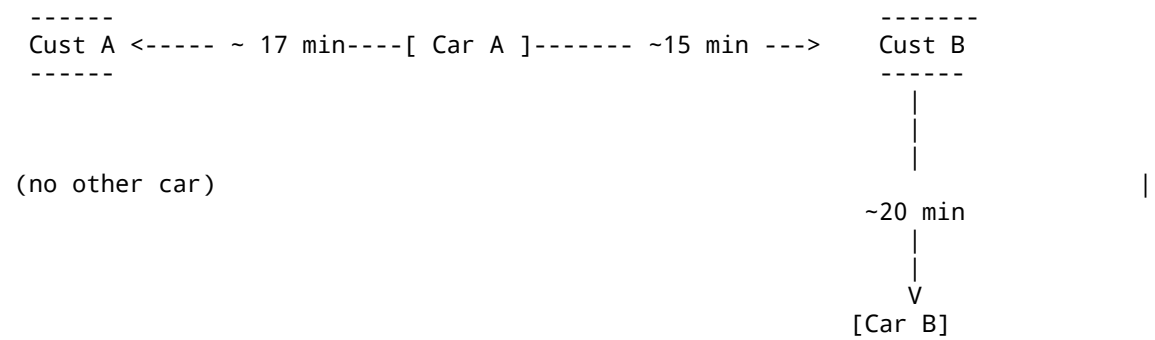
-- Revenue is generated when the car services the customer from his/her source to destination.

-- However, the distance travelled by the car to reach the customer to service the journey doesn't yield any revenue (also wastage in terms of battery). Naturally, we want to maximize the revenue-to-non-revenue ratio.

-- Each customer can have some stipulated waiting time before the he/she discards to use the car hire service. Another goal then is also to minimize the waiting time.

A scenario can happen when customer may have to wait in case a car at equal and lowest non-revenue distances from each source locally. However, to minimize non-revenue globally, starvation happens and a customer has to wait

(like customer A, in figure below)



CHALLENGES: CAR SELECTION IS LIMITED BY THE CHARGING LEVELS

-- The naive method one may think is to select the car nearest from the customer.

-- However we are limited by the amount of charge left in the car's battery and even if the car is close to the customer's source, it may not be able to complete the journey from source to destination.

-- Now, even if we do find a car that can fulfills the power level requirement, it may happenthat choosing a car may render it useless for further requests as the car may reach its depth of discharge. An unusable car would increase the waiting time for customers even more ultimately leading to loss of revenue.

CURRENT STATUS: IDENTIFY THE BARE MINIMUM

-- To be able to come up with a scheduling algorithm for car selection and to optimize both the metrics we decided to develop base cases where we only optimize 1 metric and ignore the other.

-- Simulations must be then performed to answer the following questions:

Given distribution of 'n' customers across the city geography and their arrival rate 'a', number of cars 'c',

A. What % of customers can be satisfied when we try to maximize the revenue-to-non-revenue ratio only. (c is fixed)

B. What % of customers can be satisfied when we solely minimize their waiting time.

C. Are two metrics even related to each other?

D. Usually, for a car hiring company it is critical to know what is minimum number of cars it needs to keep in the city running to satisfy its customer base. what is the number of cars should the company keep running?

CURRENT STATUS: IMPLEMENTATION DETAILS

-- The simualtion is an discrete-event simulation. Customer arrivals are considered as 'events' and so are their departures.

-- Arrivals are registered into a global event queue according to given arrival distribution function.

-- Customer departues events (when the car is now 'for hire') are then automatically registered according to departure time determined by our scheduling algorithm (as in when does customer finish its journey) while trying to achieve our goals mentioned above.

-- The system state is captured by a 'set' of cars. With each car we track the revenue, non-revenue, journey details. Each car has 3 states, HIRED, FOR HIRE, UNAVAILABLE.

-- To keep a realistic scenario, we consider placing our simulation to Mumbai city, considering only few close suburban areas (20 square miles)

example, x cars per mile palced equally distant from each other.

-- Placement of the cars initially is ofcourse a strategic decision, however, we dont deal with that problem and uniformly distribute the cars.

Note that the placement of cars will be same across all the simualtions.

-- We use on Google Maps API to aid in tracking the cars with each time event.

-- We are using Google Distance Matrix API for real time traffic updates and shortest routes from source to destination.

-- We have realised our models for CAR, CUSTOMER, JOURNEY and are implementing them to include into our simulator.

-- Since the simulator will require request to Google Mapping service, it is developing as web service application.