

PS5.3 - Taxi Fleet



Problem description

Millions of people commute by car every day; for example, to school or to their workplace.

Self-driving vehicles are an exciting development for transportation. They aim to make traveling by car safer and more available while also saving commuters time.

In this problem, we'll be looking at how a fleet of self-driving vehicles can efficiently get commuters to their destinations in a simulated city.



Your job

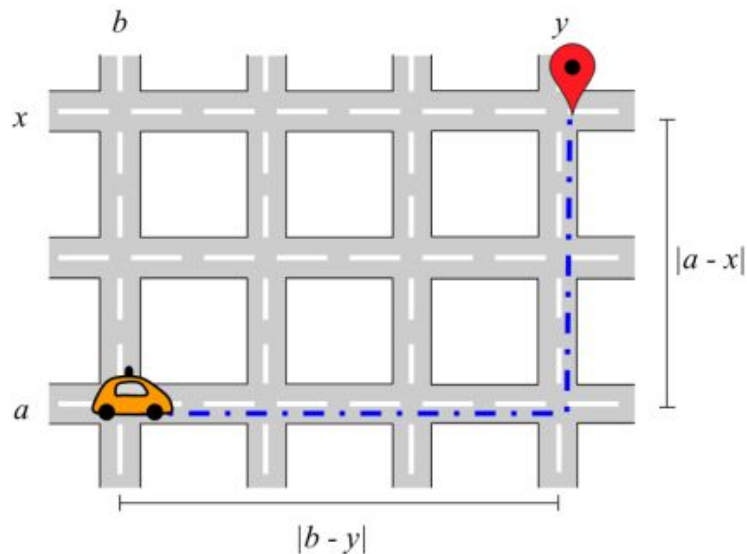
Given a list of pre-booked rides in a city and a fleet of self-driving vehicles, assign the rides to vehicles, so that riders get to their destinations on time.

Optimize your assignment to get the best score!



Problem simulation:

The parameters



You are in a $\langle \text{rows} \rangle \times \langle \text{columns} \rangle$ square city



You have $\langle \text{nb_vehicle} \rangle$ vehicles



Starting in 0/0



You have $\langle \text{nb_ride} \rangle$ rides



Starting in $[\langle \text{fromX} \rangle, \langle \text{fromY} \rangle]$



Starting in $[\langle \text{toX} \rangle, \langle \text{toY} \rangle]$



Starting after $\langle \text{earliest_start} \rangle$



Finishing after $\langle \text{latest_finish} \rangle$



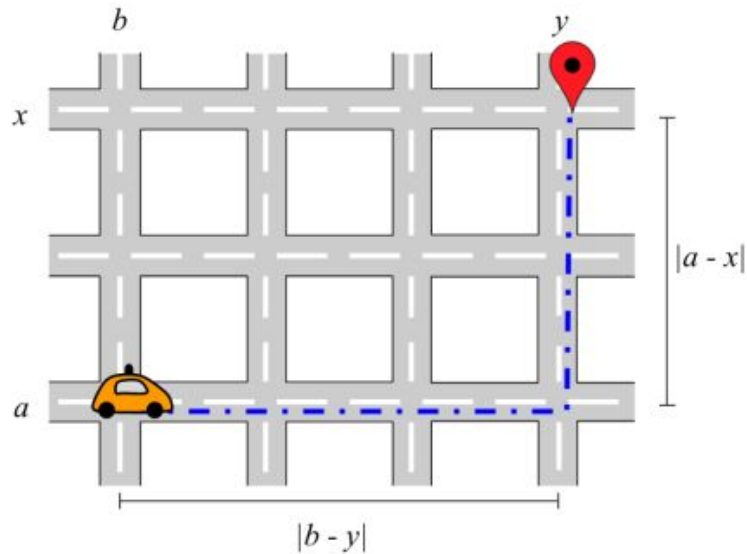
You are given a $\langle \text{on_time_bonus} \rangle$, a $\langle \text{fixed_fee} \rangle$, and a $\langle \text{distance_fee} \rangle$



The simulation is $\langle \text{nb_steps} \rangle$ long

Problem simulation:

Vehicle itinerary



For each assigned ride:

1. The vehicle goes from its current position to the start intersection of the ride
2. If it is on position before $\langle \text{earliest_start} \rangle$, it waits until $\langle \text{earliest_start} \rangle$
3. The vehicle does the ride

Moving duration:

It takes 1 step for each bloc driven.

Example:

If a vehicle starts in $[1,2]$ and finish in $[4,3]$, the move will last 4 steps ($|1 - 4| + |2 - 3| = 4$ steps).

Problem simulation:

The input file

First line:

```
<rows> <columns> <nb_vehicles>  
<nb_rides> <on_time_bonus> <fixed_fee>  
<distance_fee> <nb_steps>
```

<nb_rides> next lines:

```
<fromX> <fromY> <toX> <fromY>  
<earliest_start> <latest_finish>
```



You are in a <rows> x <columns> square city



You have <nb_vehicle> vehicles



Starting in 0/0



You have <nb_ride> rides



Starting in [<fromX>,<fromY>]



Starting in [<toX>,<toY>]



Starting after <earliest_start>



Finishing after <latest_finish>



You are given a <on_time_bonus>, a <fixed_fee>, and a <distance_fee>



The simulation is <nb_steps> long

Problem simulation:

The output file

First line:

<calculated_score>

<nb_vehicles> next lines:

<nb_assigned_rides> <1st_ride_id>
<2nd_ride_id> ...



You have to calculate your <calculated_score>



The simulation is <nb_steps> long



For each vehicle



Provide the <nb_assigned_rides>



And the assigned rides <nth_ride_id>

Problem simulation:

Score calculation

The **total score** is the **sum** of the score of **each** rides **done**.

The score for a ride is:

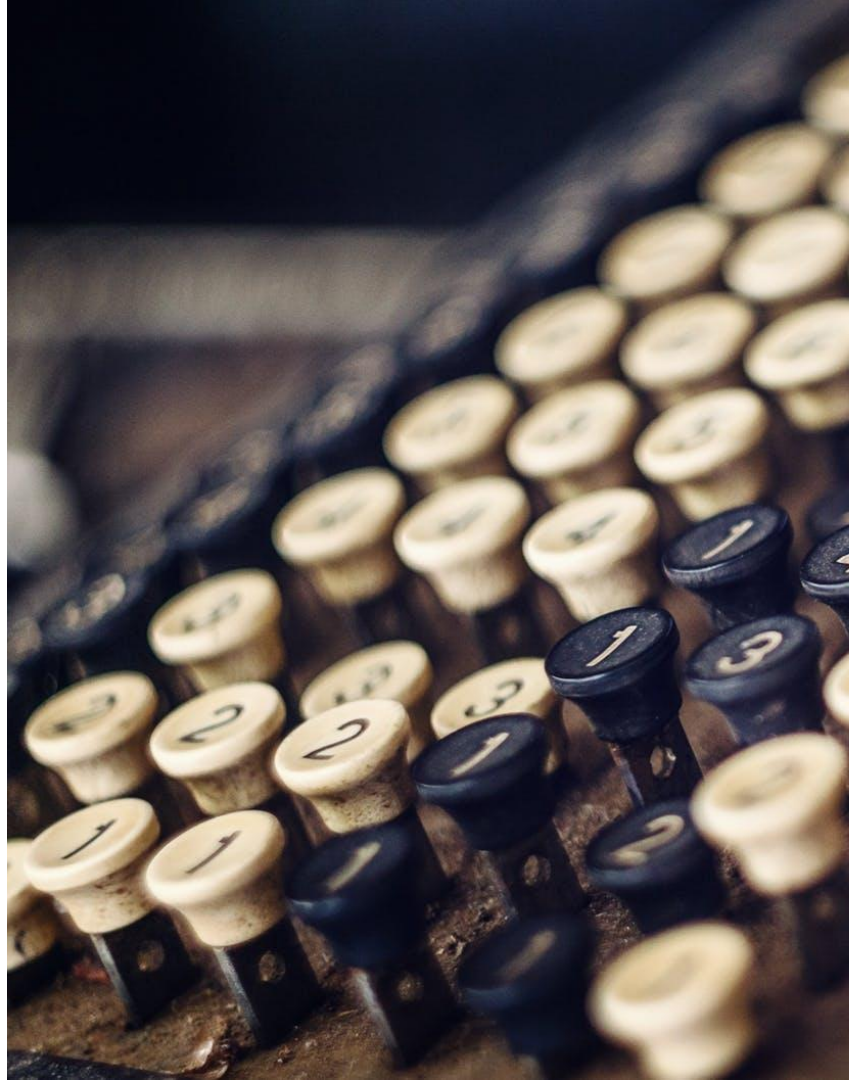
$$\text{\$ } <fixed_fee> + <ride_distance> \times <distance_fee>$$

If the ride start on time, an additional $<on_time_bonus>$ is added to the ride score.

Example:

For a 10 blocks long ride started on time, the score is:

$$<on_time_bonus> + <fixed_fee> + 10 \times <distance_fee>$$



Benchmarking:

Measure your solution's efficiency

Run your code multiple times to estimate its running time **empirically**.

Objective: obtain an **average** measure of your code's execution time

Tools used:

- JMH: benchmarking
- a visualization of the results of your choice



**ANY
QUESTIONS ?**



Project execution

WEEK 3: Design
WEEK 4: Design
WEEK 5: Design
WEEK 6: Dev
WEEK 7: Dev



Timeline

Every day:

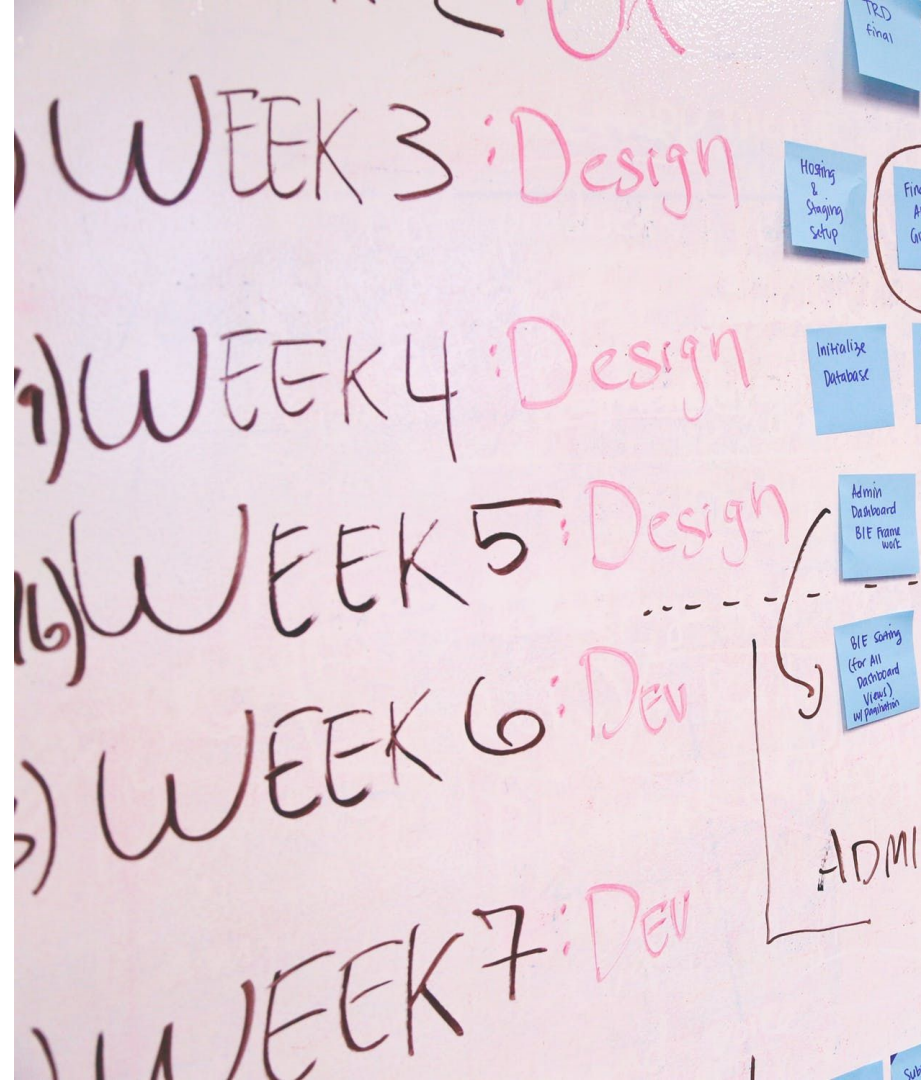
- facilitation
- automated delivery

Tuesday morning: Q&A session

Thursday: demonstrations

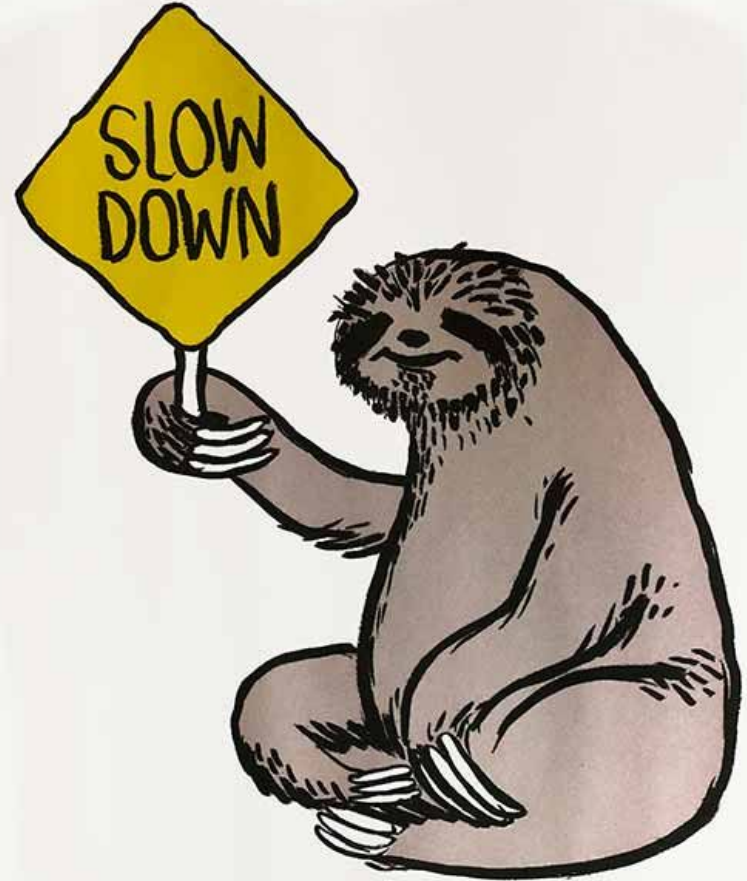
Saturday: code delivery

Sunday: report delivery



Before diving into the project

- 10:00 AM: All teams declared properly in GitHub Classroom
- Read the subject carefully!
(link will be on Slack)
- Use Slack and #si3-ps5 channel to ask questions, they may be useful to others!



Daily delivery

Monday - 8PM (tag REL1)

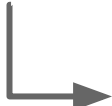
Tuesday- 4PM (tag REL2)

Wednesday - 4PM (tag REL3)

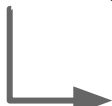
Friday - 12AM (tag REL4)

Saturday - 6PM (tag FINAL)

git clone



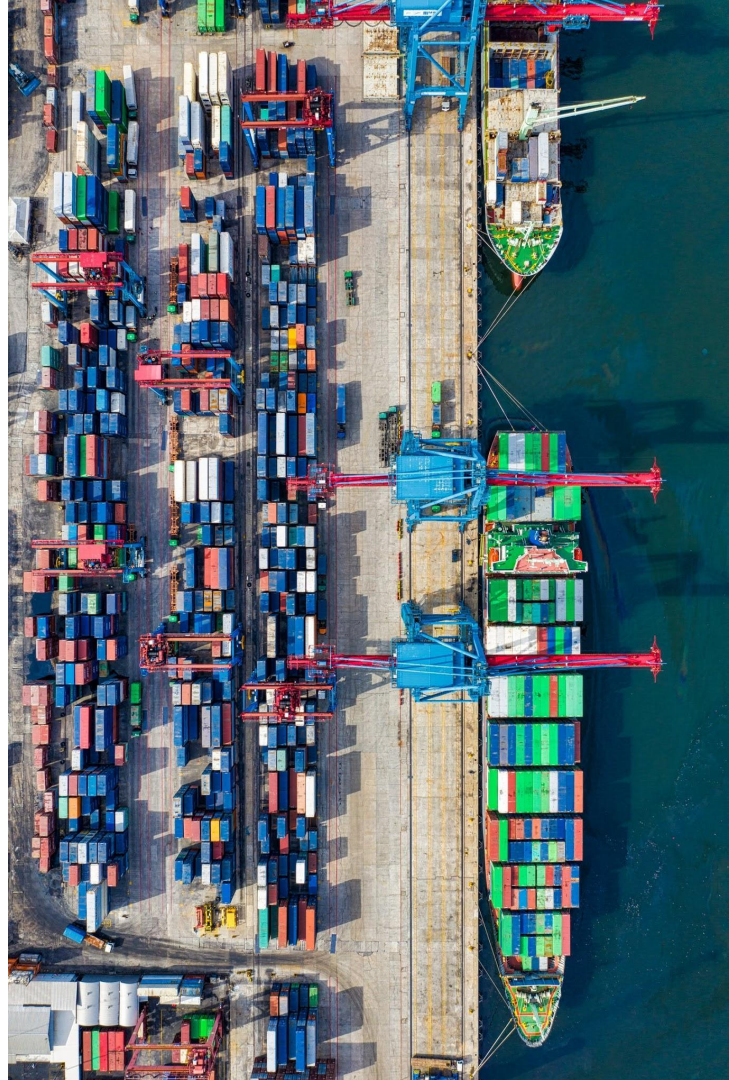
git checkout <tagname>



mvn clean package



mvn exec:java@run





3... 2... 1... Start!