Env: Traffic Lights Simulation

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1 Description

This environment tries to simulate a network of streets, vehicles and intersections with traffic lights. The agent is responsible for handling the traffic lights at the intersections in a way that the achieved traffic flow is maximized. Furthermore all vehicles have to reach its goal in a given time. The traffic flow will be calculated by the amount of vehicles moving.
Each vehicle follows a given path and from a starting position and tries to reach its destination. The path is precomputed with a simple search-algorithm and vehicles are not allowed to touch/crash into each other.
First, a simple simulation based on discrete values will be implemented. This environment can be extended further to increase the complexity:

- by using continuous values for vehicle positions
- by using continuous values for the street network
- by improving vehicle ai (e.g. lane switching, acceleration, rerouting based on traffic, etc.)

The number of vehicles in front of a traffic light can be used as observation-space. This might be interpreted as a camera in the real world, which can identify and count waiting vehicles.
In a more complex network with two or more intersections it has to be considered whether each intersection is handled by a different agent or whether one agent handles all traffic lights.

2 Frameworks

Python 3.8.6 will be used for this project, as this version of Python was already used for all the exercises. It is currently not planed to use any framework for the environment besides OpenAI-Gym and maybe numpy. For the agents it is planned to use recommended agents provided by hill-a/stable-baselines.

3 Computing Resources

For training the agent I can use a Laptop with an Nvidia GeForce 940MX. It will be checked whether I need to use Google Collab.

4 Timeline

These are the milestones planned for this project. All dates are given for the year 2021.

08/02 Working simple environment (e.g. a single plusshaped crossing with traffic lights)
29/02 More complex environment with at least one working agent
10/03 Comparison of different agents solving environments with different difficulty levels
Start working on presentation slides
17/03 Deadline for submission