Advanced Machine Learning : Project Description Self-Driving System

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1 Topic

This research project tackles the problem of a self-driving system in a 2D space containing obstacles. For concrete application, the system can be seen as a vacuum cleaner in a room with obstacles like furniture. This can also be seen as a generalization of the Wumpus problem in a continuous space.

2 Planned modeling

The considered state space for the agent are containing the coordinates of the agent (x,y) in the 2D space, the information of 3 sensors which return a value indicating the distance of the agent and the nearest obstacle. The 3 sensors are actually pointing toward 3 different directions.

The action space of the agent is quite simple. It can turn left (action=0), turn right (action=1) or doing nothing (action=2).

As we are considering a continuous state space, we are planning to use the same kind of modeling as in the mountain car exercise. So we will discretize our state space and represent it in a high dimension space, which is the features space. The question is how we will obtain this high dimensional space. We want to use the kind of representation in the mountain car exercise.

3 Planned RL algorithmic approach

For the Reinforcement Learning part, we want to try a classic Q-Learning, first with a linear approximation, then if this is not as good as we expect, we can try some non linear approximation like random forest etc .... Our comparison baseline will be the random agent.

4 Environment implementation

We did find an implemented environment here. We have to adapt it but the amount of work should not be so big. And therefore, we can use our time on the RL part.