Abstract

Parking vehicles inside a parking lot is an intricately complex process. Firstly the vehicle needs to find empty slots and choose the most appropriate one from them. Next, after detecting the spot, the vehicle needs to plan a trajectory from its current position to the empty slot. After finalizing the path, it should maneuver safely without colliding with other parked(or moving) vehicles and pedestrians. On the other hand, the layout of the parking layout can vary a lot. For instance, a parking lot inside a building has constrained space as compared to an open parking lot. Additionally, the parking slot can be at different angles, for example, vertical, diagonal, or parallel. A vertical slot is the most common form of slot that we come across because of its efficiency to pack more cars in an area. While on the other hand diagonal slots promote one-way traffic and reduce the time it takes to park. Parallel parking is used places to save space width-wise.
In this paper, we evaluate the performance of SAC algorithm in a continual learning environment to park a vehicle in parking lots with different lane orientations. The evaluation shows that the agent is not able to incrementally learn to park over multiple phases ranging from simple to more complex layouts as the agent is susceptible to catastrophic forgetting. HER has no effect in mitigating the catastrophic forgetting when the learning is done in a phased manner. The agent can be seen to perform the best if it learns in a mix of environments with different variations. Additionally, if the variation in the lane orientation is large, it takes more episodes to train as compared to small variations. We simulate the car parking in an OpenGym-based environment with multiple scenarios and assess the performance for the same.

Keywords: Autonomous Cars Parking, Lifelong Reinforcement Learning, Deep Reinforcement Learning, OpenGym AI