

1. Introduction

Background

Now is the era where a technology developing so fast, one of them is in the transportation field. Everyone wanted to do something instantly. Even people already supported by high technology, a chance for bad incident might still happen, because of human negligence factor. For example in driving a car. There is a lot of technology implemented in a car, but there are still many car accidents happened in this world.

Many experiments have been carried out by researches to solve the vehicle's accident problem. One of that experiment is Autonomous Driving, which is a car that can move without a driver in it. Not just moving, the car must be able to avoid the accident in the environment. This topic is interesting because even though there have been many experiments conducted by experts, there are still many things that can be developed.

Autonomous Driving Experiments in this Thesis will be developed using Deep Reinforcement Learning method. Deep Reinforcement Learning has advantages in exploration and exploitation features. Besides that, PPO algorithm is used to make the exploration and exploitation process more efficiently. PPO is effective in gradient optimization to get a better reward for the agent. being explored and developed at this time because reward and punishment features are quite efficient in the learning process. [1], [2]

Topics and Limitations

Autonomous Driving is one of the solutions that can prevent an accident. The vehicle is forced to know about their environment and move based on some rule and situations. In the Autonomous Driving research, there must be a dataset that shaped like a track and some vehicles model for the agent. In this experiment, we use a car model as the vehicle. We implement Deep Reinforcement Learning method in this experiment since there are several things that must be arranged first, like hyperparameter configuration, an action that can be used by the agent, reward and punishment configuration, etc. The result of Deep Reinforcement Learning for Autonomous Driving is the step of action used by the agent to get the reward as high as possible.[3]

In this experiment, there is a limitation created by the author. That was the purpose to simplify the problem and summarize the time, so this Thesis can be done in one semester. Besides that, the limitations help the author to do the analysis process and make this program more focused on the goal of this Thesis.

Below is a limitation that the author uses for this Thesis :

- Autonomous Driving implementation is a simulation that running in software named Unity Engine.
- The agent has a five sensor that can detect three types of wall, it is "wall", "initiate point", and "finish point"
- Agent action consists of the value of Accelerator, Break, and Steer.
- DataSet/Track was built based on some area in Bandar Lampung
- The number of agents used in these experiments is 1 until 10 agents.

Purpose

The purpose of this Thesis is building a machine learning model which can make a car move without a driver and not causing an accident. The agents is said to be succeed if he meets three condition, which are ⁽¹⁾agent must not hit the wall, ⁽²⁾the agent reaches the goal, and ⁽³⁾the agent reach the goal in a fastest way. Below is the explanation of the three condition.

- Agent must not hit the wall
Based on the step that given to the agent, the agent must stay in the track and did not allowed to touch the wall or the initial point.
- Agent reaches the goal
Based on the step that given to the agent, the agent have to reach the finish point successfully.
- The agent found the fastest way
Based on step given to the agent, the agent must reach the finish point and get a careward value as much as possible. Because a reward value takes effect in measuring distance or the number of steps that have been taken by the agent.