Abstract

Health and Safety is the main concern for car companies in the modern world as they ensure to keep the passengers comfortable and safe while driving or during a collision by maintaining standards and requirements. A study conducted in 2012 reveals that fatal road traffic occurs every 50 seconds on average and there are 1.35 million deaths caused every year due to road accidents according to the WHO. The inability of drivers to control a vehicle at its friction limits is the main cause of accidents. As a result, this study aims to maintain a safe distance between two vehicles contributing to traffic safety, traffic capacity, and efficiency.

The main objective of this research is to design, implement and evaluate Machine Learning based Adaptive Cruise Control (ACC) for collision avoidance of autonomous vehicles. The research aims to develop a scalable solution for Adaptive Cruise Control using Deep Reinforcement Learning in Traffic simulation. With the recent development of Autonomous vehicles, extensive research are made in Adaptive Cruise Control (ACC) technology. Autonomous Vehicles (AV) is an interesting topic that plays a lead role in future transportation and has potential benefits to society by reducing traffic congestion and reducing the number of fatalities. With Reinforcement Learning techniques traffic optimizations are done by learning optimal policy in order to solve decision-making problems without any human interactions. Deep Reinforcement learning has been used to optimize vehicle speed control and avoid collisions. Therefore, this thesis is focused on using the Deep Reinforcement Learning method with Double Deep Q Learning (DDQN) by training two agents with different scenarios. The CARLA traffic simulator is used for these simulations where key metrics such as environment, number of agents, number of collisions, etc are initialized and detected. Throughout the simulation, three sets of actions are analyzed and tested. Double Deep Q Learning (DDQN) Method is implemented to