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Abstract

Autonomous systems, including autonomous cars, have become a prominent research topic in recent years due to their potentials for improving safety for users and the potential commercial success for automotive industries. The increase in studying autonomous vehicles is recently motivated by the advancements in machine learning. One of the most challenging tasks of autonomous vehicles is self-navigation, which dynamically makes decisions for movement based on the learned surrounding environment. Although many efforts have been denoted to improving the self-navigation, most of the efforts focus on solely using deep neural networks (DNN) to analyze the environmental images captured by the video sensors on the vehicles. This, along with best practices of gathering data and labelling the data for training, have led to high prediction accuracy. There, however, exists many undiscovered ways to optimize performance of nontrivial tasks that must navigate dynamic environments. In this paper, a hybrid deep learning network model composed of both convolutional layers and Long Short-Term Memory (LSTM) has been proposed to learn an environment in images by exploiting the time-series imaging data and accordingly make navigation predictions. This leads to a significant improvement in accuracy in comparison to models that do not exploit temporal information in the environmental imaging data.

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