

Long Short-Time Memory Neural Networks for Human Driving Behavior Modelling

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Abstract : In this paper, a long short-term memory (LSTM) neural network model is proposed to replicate simultaneously car-following and lane-changing behaviors in road networks. By combining two kinds of LSTM layers and three input designs of the neural network, six variants of the LSTM model have been created. These models were trained and tested on the NGSIM 101 dataset, and the results were evaluated in terms of longitudinal speed and lateral position, respectively. Then, we compared the LSTM model with a classical car-following model (the intelligent driving model (IDM)) in the part of speed decision. In addition, the LSTM model is compared with a model using classical neural networks. After the comparison, the LSTM model demonstrates higher accuracy than the physical model IDM in terms of car-following behavior and displays better performance with regard to both car-following and lane-changing behavior compared to the classical neural network model.

Keywords : traffic modeling, neural networks, LSTM, car-following, lane-change

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