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The effect of change-Lane prediction algorithms on the safety of the adaptive cruise control system model in MATLAB/ Simulink

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Introduction. The adaptive cruise control system is considered the first level of driving automation, aiming to maintain the vehicle in its lane while adjusting its velocity based on the leading vehicle in the same lane to ensure a safe following distance [1]. However, prior discussions have not addressed the impact of other vehicles in the driving environment on the system's performance. For instance, a motorbike or bicycle in an adjacent lane might change lanes when the vehicle matches its velocity with a preceding vehicle in its own lane. In such a scenario, the vehicle might be delayed in recognizing the motorbike or bicycle as a potential obstacle. Consequently, without driver intervention and attention, accidents may not be avoided. Therefore, one potential solution to enhance the system's safety is to develop a more advanced change-lane prediction algorithm and integrate it into the system."

Main Part. With the assistance of machine learning classification algorithms, MATLAB, and Simulink, we can accomplish the following tasks:

1. Develop various driving scenarios involving lane-changing vehicles using the Driving Scenario app in MATLAB.
2. Collect data for training by extracting information from sensor detections in Simulink.
3. Implement the Maneuver Classification Method based on Sensor Data, as outlined in an article by ITMO students [2]. This method utilizes RandomForest criteria for training the data.
4. Employ Hidden Markov Chains [3] to further train the collected data.
5. Utilize the Classification Learner app in MATLAB for additional training.
6. Compare and analyze the performance of the previously mentioned methods.
7. Trying to find actual data and train the networks on it and apply it to the model.

Conclusion. The lane change prediction algorithms, coupled with a novel target declaration function, have demonstrated impressive results in preventing collisions across various scenarios. However, their effectiveness diminishes in certain situations, primarily attributed to the minimum acceleration criterion [1].

List of used references:

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