

Feedback from supervisor

on the bachelor's thesis of the student of mathematics and mechanical department Dmitry Igorevich Zaitsev

Detecting collision with a stationary vehicle at parking

The work of Dmitry Igorevich Zaitsev is devoted to the problem of using convolutional neural networks for detecting a moving vehicle relative to a standing vehicle using video from an outdoor camera attached to the vehicle and determining the distance to it. The task is relevant as one of the auxiliary tasks in driver assistance systems and autonomous vehicles control. Work in this direction is carried out by leading automotive manufacturers and suppliers of driving automation systems.

The aim of the work was to study the possibility of determining the distance to the vehicle and hitting the video based on a machine learning algorithm. The work achieved the following results:

- a number of vides from video recorders on which a collision with a stationary vehicle occurs have been found;
- a synthetic video with a collision with a stationary vehicle has been generated using the CARLA autonomous vehicle simulator;
- a comparison of several pre-trained CNNs for vehicle detection has been performed;
- a method of blind calibration of external and internal camera parameters based on video based on OpenCV has been implemented;
- a mathematical model has been built to determine the distance to the car based on the results of the CNN operation, which includes a kinematic model of vehicle movement, and a nonlinear optical model of a wide-angle camera;
- Experiments have been carried out to determine the distance to the vehicle on real and synthetic videos.

The job has some disadvantages:

- An insufficient number of experiments does not allow judging the accuracy of the proposed method;
- Investigation of the method operation at close range and directly at the moment of vehicle collision has not been carried out.

We can conclude that the task is basically completed. The results are of high practical value. Despite the shortcomings, given the complexity of the task, the independence and the amount of work done, I believe that the bachelor's work of Dmitry Igorevich Zaitsev deserves an assessment - "EXCELLENT".

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