Evaluation of a Road Lane Detection Method Using Digital Environment and Deep Learning

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Currently, the research of autonomous driving is active all over the world. Among them is research on road lane detection. In this lane detection field, the accuracy of detection is being competed using public datasets of driving images that have actually been created by spending time and cost. If the detector trained with the driving image dataset does not work well, it is necessary to spend time and cost to create other driving image each time. In recent years, the traffic environment has been reproduced in digital space, and the verification of autonomous driving technology has been carried out. However, in the field of road lane detection, there are few researches using digital images taken in digital space.

In this research, we propose a framework to evaluate a road lane detection method using digital images created in the digital space and deep learning based on CNN (convolutional neural network). The trafiic environment in the digital space is produced with MATLAB/Simulink and UnrealEngine. Fig. 1 shows an overview of the evaluation framework for the road lane detection method. Precision, Recall, and F measure are used to evaluate the detection accuracy. In this research, five types of digital images are prepared for the evaluation by changing the weather (rain/fog) and time (day/night). Fig. 2 shows a typical example of the clear daytime case. The left figure shows overlaid label image and the right figure shows overlaid detector's result in Fig. 2. In order to confirm how well the detector trained on digital images works on real images, three images are tested. Fig. 3 shows a representative example of real image. Fig.3's images are same meaning Fig.2's images. Table 1 shows the evaluation result for the digital image of Fig. 2 and that for the real image of Fig. 3. From Table 1, we found that the proposed framework using digital space is effective to evaluate the detection method like CNN. However, the obtained accuracy with CNN is not enough. Some of the future work are modifying the label data, the training data and structure of the network in CNN, testing in the road lane detection benchmark.

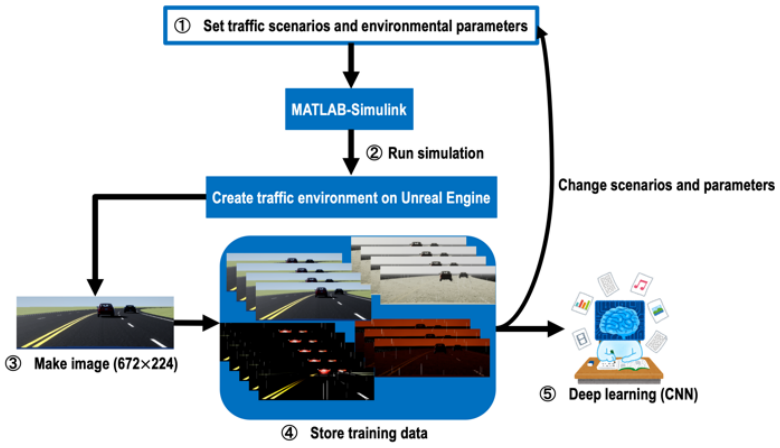

Fig. 1 Present framework for road lane detection method

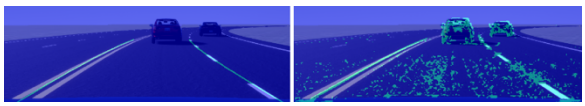

Fig. 2 Digital image

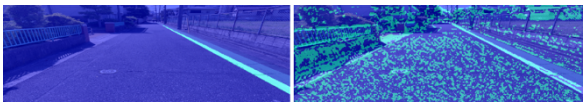

Fig. 3 Real image

Table 1 Evaluation results of CNN-based lane detection method

	Digital image	Real image
Precision	8.89	3.93
Recall	93.49	68.86
F measure	16.24	7.44