講演番号	096

文献番号	20226096

Development of the Testing Device which Can Evaluate the Perception Performance of a Vehicle Running in a Rain Environment

Toru Kojima [1)] Tetsuya Niikuni [1)] Terunao Kawai[1)] Hiroshi Kawazoe[2)] Yoshinori Kondo[3)]

1) National Agency for Automobile and Land Transport Technology National Traffic Safety and Environment Laboratory
7-42-27 Jindaiji-Higashi-Machi Chofu-shi Tokyo 182-0012, Japan
2)HORIBA, Ltd.
2 Miyanohigashi-cho, Kisshoin, Minami-ku, Kyoto, 601-8510, Japan
3)HORIBA, Ltd.
Kanda Awaji-cho, Chiyoda-ku, Tokyo, 101-0063, Japan

KEY WORDS: **safety, active safety,** perception performance, rain environment, four-wheel constant speed bench apparatus (C2)

In order to evaluate the perception performance of an automated driving vehicle or a vehicle which has the functions of advanced driver assistance system under a rain condition in limited outdoor space, the portable type testing device in which the artificial rain device and the compact four-wheel constant speed bench apparatus were combined was developed. In this paper, the abstract of the device is introduced.

The preconditions for development of the testing device were set as follows.

1)It can make rain fall equally in the area of two lanes of lateral direction and 30m of longitudinal direction.

2)Rainfall is adjustable from little rain to heavy rain.

3)It can make rain fall continuously for five to ten minutes.

4)The test bench can make the four wheels of the test vehicle rotate with equal speed, and also higher speed range (maximum 130km/h) is possible.

5)Operation of the steering wheel within +/- 45degree is possible during the test vehicle running on the bench.

6)It doesn't need a dedicated building, and it can be installed in limited outdoor space, and portable.

The testing device is mainly constructed with the following elements. Fig.1 shows the layout of the equipment, and actual installation scene at the test facility of National Traffic Safety and Embironment Laboratory.

1. Electric Power Generator
2. Artificial rain device : Rain / Mist stands, Pump, Water strage tank, Control box
3. Four-wheel constant speed bench apparatus : Assembly of servo motors, CVJ shaft, Control box

Outline of the specification of Rain / Mist stands are as follows.

i) Artificial rain device
> Rain nozzles type 2010, the number of nozzles = 58pieces / unit
type 3020, the number of nozzles = 18pieces / unit
> Pump 4kW, 0.43Mpa, discharge approximately 500L
> Compressor for the rainfall switching valve drive

ii) Mist device
> 20 pieces / unit
> High pressure pump 1.5kW, 7Mpa

iii) Water tank 2000L (2 tanks)

iv) Controller Main power supply, PLC, Inverter (1 unit)

Rain / Mist stands have the structure of rise and fall system, and total six stands were located in three right side and left side in order to make rain fall equally in the area of two lanes of lateral direction and 30m of longitudinal direction.

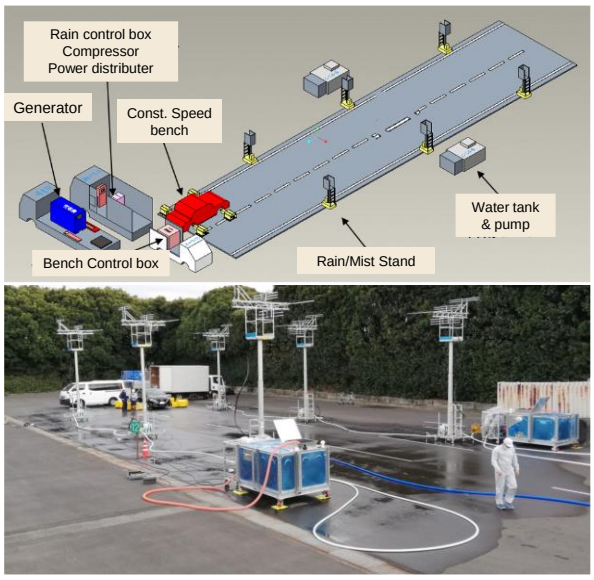

Fig.1 Layout of the equipment and scene at the test facility

Four-wheel constant speed bench makes the four wheels of the test vehicle rotate with equal speed in order to activate ACC (Adaptive Cruise Control) and LKAS (Lane Keeping Assist System) on the bench. The device has the structure which makes the hubs of the vehicle rotate directly, and it can keep the normal height of the vehicle in order not to influence the perception performance of the vehicle. And the device and the hubs are connected via CVJ shaft in order to steer the front wheels during LKAS operation.

Control of four-wheel constant speed (actually, constant speed between front and rear wheels) are performed by the servo motor system. The speed of the non-driven wheels are controlled by servo control in order to follow the speed of the driven wheels. And electric inertia force (1 to 7kgm^2) is appliedto the driven wheels in order to stabilize the wheel speed during acceleration and deceleration of ACC.