Road surface marking image generation for automotive camera recognition system verification

Takeshi Chibahara[1]   Sho Fujiwara[1]   Mari Kawabata[2]   Killian Hutchinson[2]

1) Honda Motor Co., Ltd.(4630 Shimotakanezawa, Haga-machi, Haga-gun, Tochigi, 321-3393 Japan)

2) Ansys Japan K.K Nittochi Nishishinjuku Bldg. 18F 6-10-1 Nishishinjuku Shinjuku-ku, Tokyo，160-0023 Japan

KEY WORDS: electronics and control, image recognition system, image processing, simulation (E1)

We focused on a system that uses a white line to estimate the position of the vehicle used in the Advanced Driving Assistant System (ADAS), and we worked on evaluating a simulator that would allow this system to be verified virtually. We found that the main challenge in using a simulator to evaluate a camera recognition system was to ensure the correlation with images obtained with the real camera on actual roads.

Figure 1 introduces the basic simulation pipeline of the simulator to used in this study. In order to obtain the luminance value using simulation, light distribution, spectrum, reflection properties of surfaces and materials are calculated based on physical equations.

To evaluate the correlation between the luminance values of white road marks obtained from the simulator proposed in this study and the actual measurement values,

the luminance values were measured in the actual test course and compared with those of the test course reproduce virtually in the simulator. Table 1 shows the comparison between measured values and simulated values, as well as the luminance relative error （%）. The relative error was within 30%.
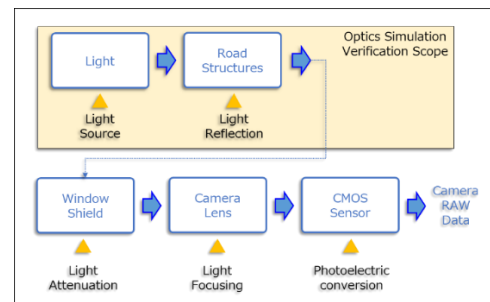

Fig.1 Block diagram for calculating the optical trajectory of a camera simulation

Table1 Results of Luminance Values Obtained from Actual Measurements and Simulator

Measurement points	Test scene	Test dates	Pictures	Average illuminance values lx		Average luminance values cd/m²		Signed relative error between measured and simulated luminance values
				Simulation	Measured	Simulation	Measured	
Sample A Stop line	White line, Day time Clear sky	2021/2/10 10:43		66,800	68,300	8,000	8,900	-10%
	White line, Day time, Cloud	2021/7/29 10:11		36,878	37,200	6,705	7,309	-8%
Sample B Cross walk	Very damaged line	2021/6/10 17:00		58,429	59,200	2,287	2,496	-8%
Sample C Parcel line	Damaged white line	2021/7/29 11:12		39,938	39,800	6,947	6,382	9%
Sample D Parcel line	White line with shadow	2021/7/29 11:12		39,938	39,800	6,542	5,034	30%