Experiment on a Collision of Bicycle with a Vehicle

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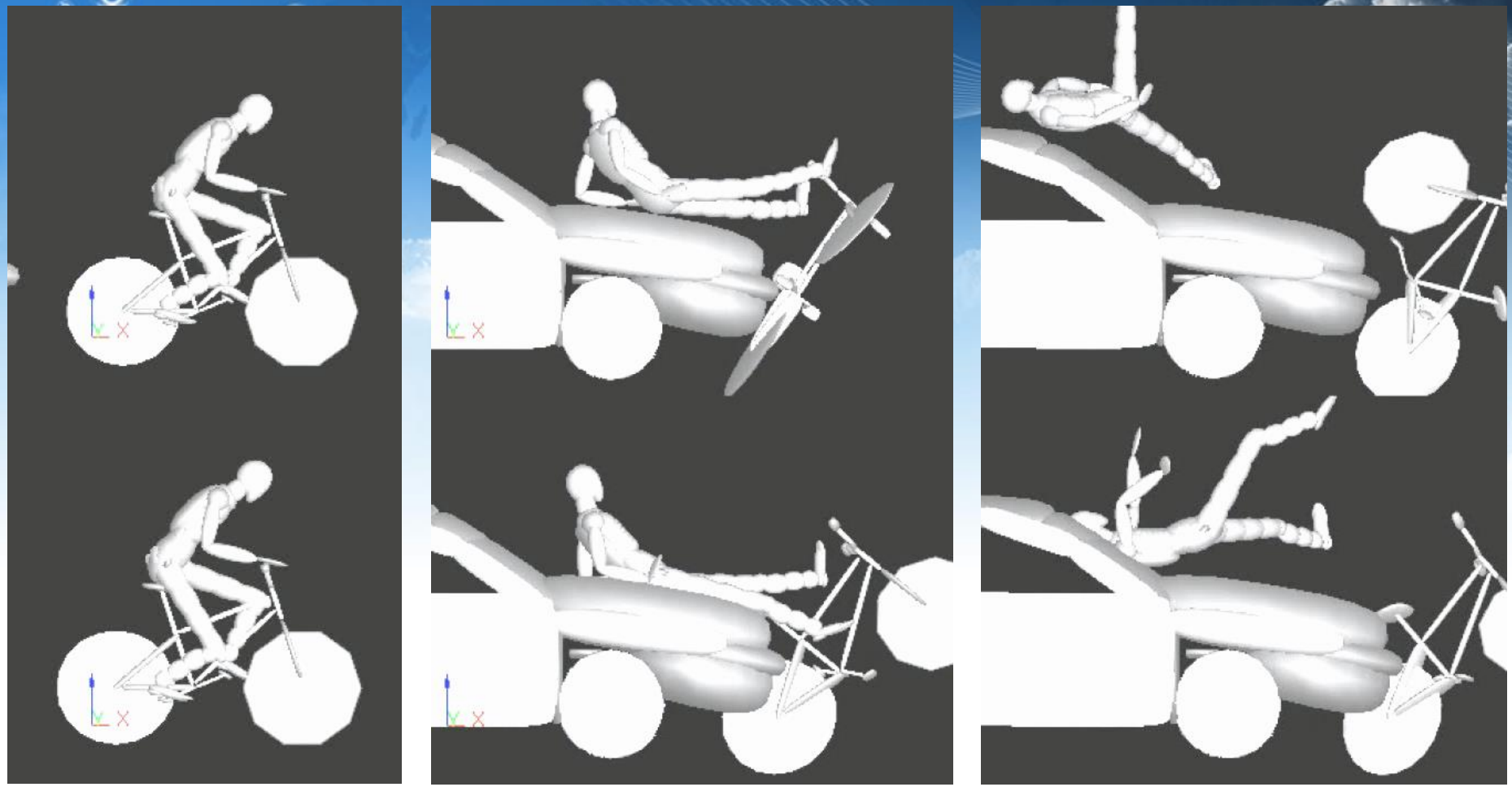


Inaccurate simulation (Top) and good simulation (Bottom)

For performing accurate simulations, actual experimental data is required.

1 Research Objectives

- In order to increase reliability of the test for the vehicle-to-bicycle collision accident, actual impact test data that recorded vehicle speed, and collision spot, etc., are required.

2 Research Content

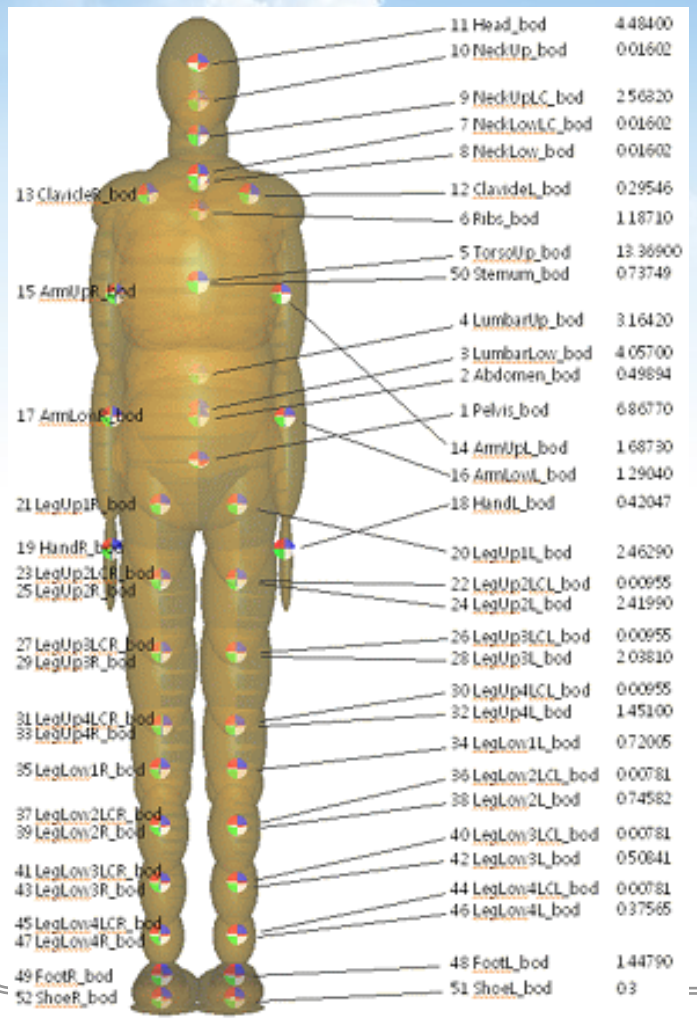
- Vehicle vs. bicycle collision test

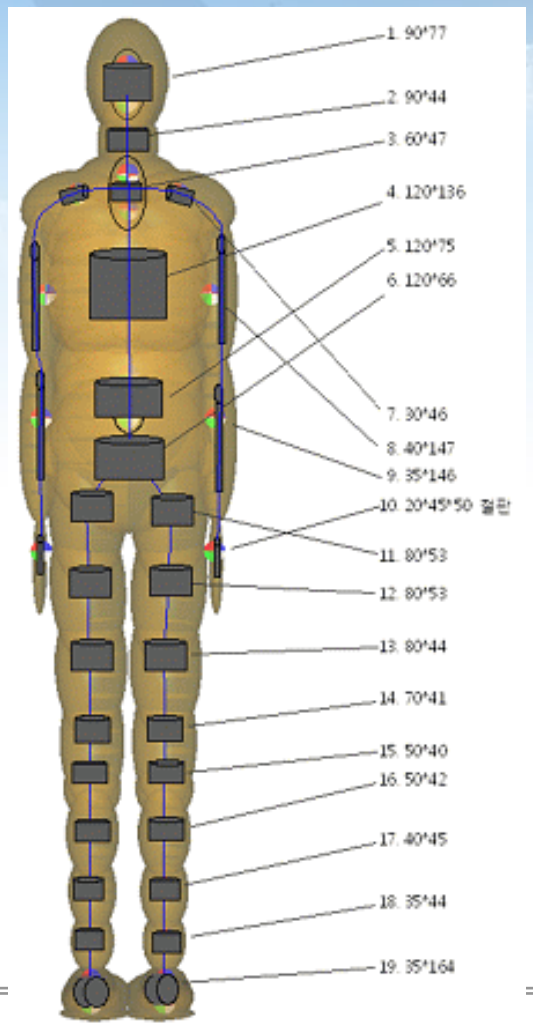
- The vehicle running at a speed of 40 km/h was set to hit the left side, rear side, and left rear of the bicycle on which the dummy rode, respectively one time.
- Dummy : Soft mannequin
- Vehicle : Hyundai EF Sonata (new version)

- Reproduction through a simulation

- The scene was reproduced in MADYMO simulation with the vehicle observed in the actual test

3 Dummy production





180 cm, 63 kg.

Specifications of the dummy

1) Weight for each part should be matched to that of a human body.
2) The parts should not be separated when an impact is given.
3) Each part should operate smoothly.

Dummy production

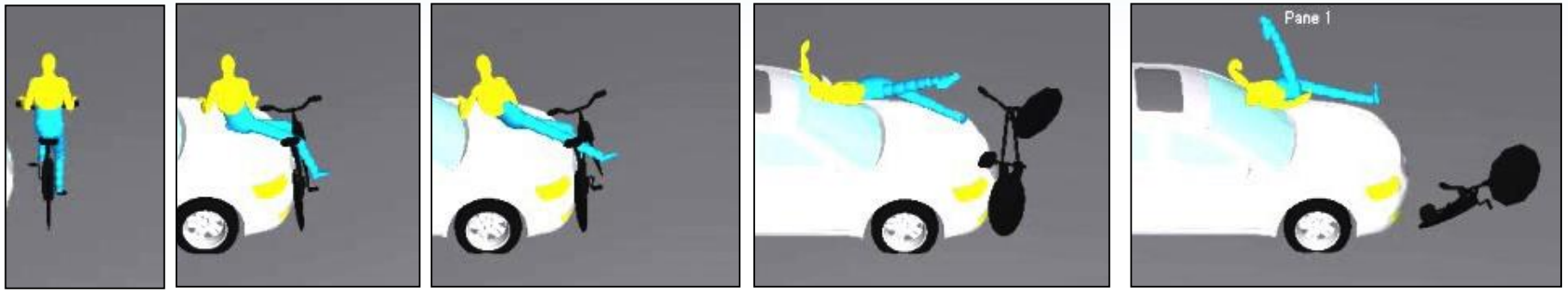
1) Used a soft mannequin.
2) Round iron bars are inserted into the mannequin according to the MYDAMO dummy's weight and location.
3) Round iron bars are connected with wires.

4 Test Results and Simulation

Dummy manupicrured and used in the test

1st test : The vehicle was driven at the speed of 40 km/h, and hit the left side of the bicycle.

Scenes taken by a high-speed camera



Reproduced scenes through MADYMO simulation

Migration distances after impact test

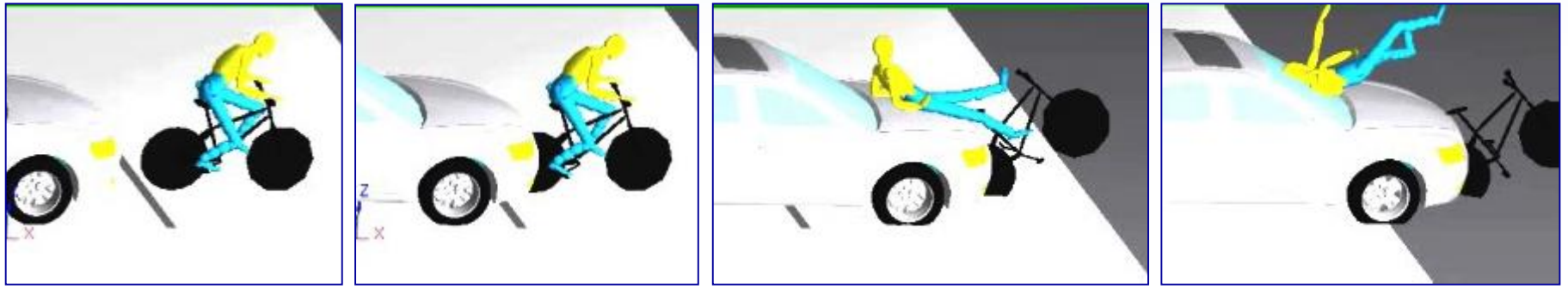
Vehicle 11.1 m bicycle 16.4 m dummy 14.2m

The vehicle and the bicycle after Impact Test

1. The front windshield is broken in radiating pattern.
2. A spoke of the rear wheel of the bicycle is distorted by about 3.5 cm.

2nd test : The vehicle was driven at the speed of 40 km/h, and hit the rear part of the bicycle.

Scenes taken by a high-speed camera



Reproduced scenes through MADYMO simulation

Migration distances after impact test

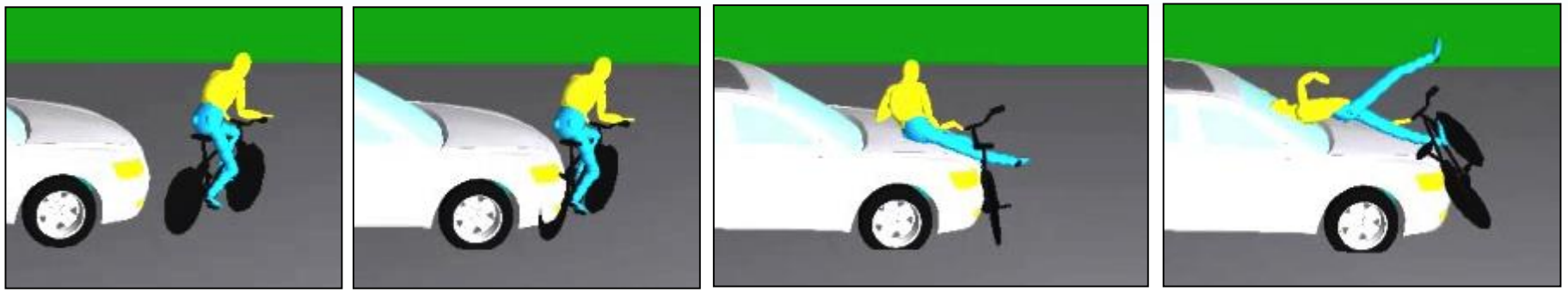
Vehicle 14.9 m bicycle 15.8 m dummy 18.0m

The vehicle and the bicycle after Impact Test

1. The front windshield is broken in radiating pattern.
2. The rim of the rear wheel of the bicycle is damaged.

3rd test : The vehicle was driven at the speed of 40 km/h, and hit the left rear part of the bicycle.

Scenes taken by a high-speed camera



Reproduced scenes through MADYMO simulation

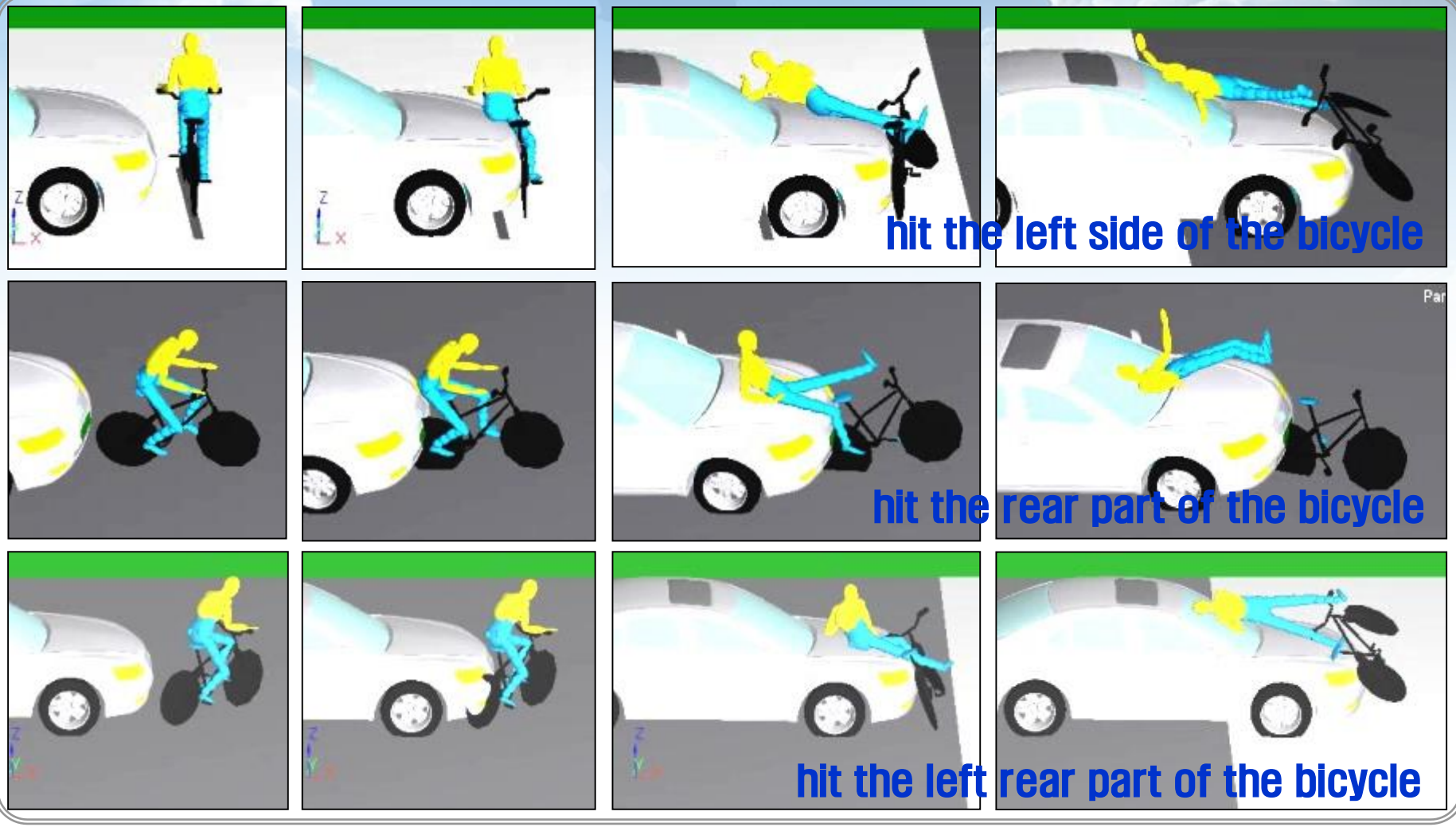
Migration distances after impact test

Vehicle 17.6 m bicycle 17.5 m dummy 27.1m

The vehicle and the bicycle after Impact Test

1. The front windshield is broken in radiating pattern.
2. The spoke of the rear wheel of the bicycle was slightly bent and has be transferred onto the bumper paint of the vehicle.

5 Simulation where the vehicle driven at the speed of 30 km/h hit the bicycle



Migration distances of the dummy, vehicle and the bicycle after the impact test

Migration distance(m) / Impact parts of the bicycle	Vehicle	Bicycle	Dummy	Left shoe	Right shoe	Cap	Sun-glasses
Left side	11.1	16.4	14.2	9.0	16.5	-0.4	2.1
Rear part	14.9	15.8	18.0	9.6	8.5	9.4	-3.4
Left rear part	27.6	17.5	27.1	17.5	18.7	24.8	-1.4
The overturn distance reported in the thesis(m)		Bicycle	Dummy				
Impact by the rear part of the bicycle		20					
Vehicle vs. passenger			15~20				

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6 Research Performance and Utilization

- The research result may be used in an evaluation that assumes the speed of the vehicle, impact, and position at the time of collision, etc., in case of a traffic accident based on the damages, distorted shape, overturn distance of the bicycle as well as the overturn distance of the dummy obtained in the vehicle-to-bicycle collision test.

- In the simulation, the test results may be used in the actual application by setting F-D curve, damping coefficients, and friction confidents and changing speed and impact position, etc.

Thank you !

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