

Shape Design of Vehicle Frontal Area for Reducing Pedestrian Injuries

戴紹峰、鄧作樑、梁卓中

E-mail: 345426@mail.dyu.edu.tw

ABSTRACT

All efforts to improve safety devices focus on enhancing safety features for occupants. However, vehicle safety should not just focus on vehicle occupant safety. That is, protecting pedestrians is an important field in traffic safety. To assess the degree of pedestrian protection of a vehicle, it is necessary to develop an analysis model for vehicle-pedestrian collision. This study adopts the multi-body dynamics theory and constructs a vehicle-pedestrian collision model by using the MADYMO software. It also details the model used to analyze the impact behavior of the pedestrian model to the vehicle. To verify the accuracy of the proposed vehicle-pedestrian collision model, the current results are compared with those obtained from experimental tests and the results of other scholars' study. In general, appearance and performance was primarily considered on vehicle design. The pedestrian safety is not considered enough in appearance design of car. In the vehicle-pedestrian collision event, most of pedestrian injuries are attributed to impact of car fronts. The car appearance directly affects the impacted body part and severity of pedestrian injury. To protect and reduce pedestrian injuries, the front end of vehicle must be attached great importance during the development of vehicle design. Therefore, this study discusses the effect of front-end appearance of the car on the pedestrian injuries during impact event. The parameters of front end of the car include the length of hood, the height of the hood leading edge and the prominence level of bumper. Finally, the design guidelines of front end of the car are proposed based on the analysis results presented herein. And the friendliness of front end of the car is designed for reducing the pedestrian injuries. The multi-body models of car and pedestrian and design guidelines obtained in this study may serve as a useful reference for car manufactures and researchers with appearance design of car.

Keywords : Pedestrian、 Injury、 front end of the car、 multi-body、 MADYMO

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