FRONT STRUCTURE DESIGN PROCEDURE FOR OPTIMAL PEDESTRIAN LEG IMPACT PERFORMANCE

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In the European Union more than 7000 pedestrians and 2000 cyclists are killed each year in accidents with vehicles while hundreds of thousands are injured. In the USA in the year 2000 there were over 4700 deaths and 78,000 injuries of pedestrians and 690 deaths and 51,000 injuries to cyclists, while in Japan there are 3000 annual deaths. The European Union has made proposals for vehicle tests and regulations concerning vehicle-pedestrian safety issues. These proposed regulations involve the impact of four different projectiles representing different parts of the human body into the front of a resting vehicle, as shown in Figure 1.

This presentation focuses on the leg impact portion of the EU proposed regulations, and methods to optimize vehicle performance in simulations of this test. In it we propose a method to optimize the front structure of the vehicle for pedestrian leg impact performance using a multiple simulation model approach. The three models include 1) a detailed finite element model of both the leg impactor and vehicle front structure; 2) a detailed finite element model of the leg impactor coupled with a simplified, parametric finite element model of the vehicle front structure (see Figure 2.); 3) a response surface model generated with the results of simulations of model #2. In this approach the detailed model is used to calibrate the behavior of the simplified FE model, and then the simplified FE model and response surfaces are used to perform the optimization. Details of the work described in this presentation can be found in [1].

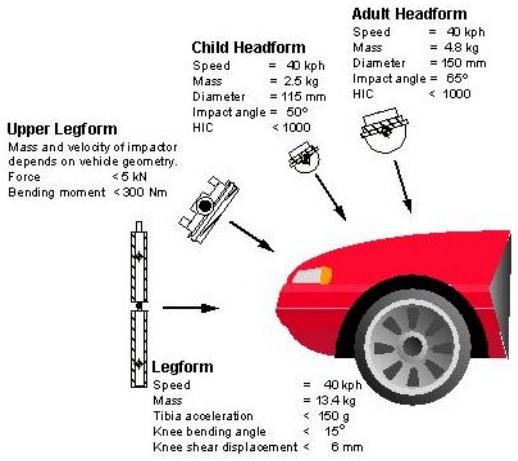
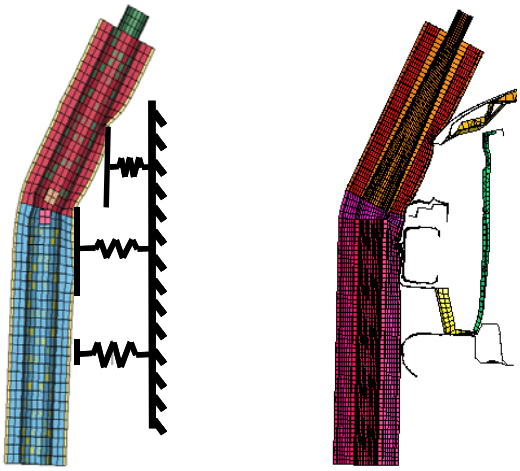


Figure 1. Proposed EEVC pedestrian impact safety tests.



(a) Simplified model (b) Detailed model

Figure 2. Modeling approach for pedestrian leg impact with vehicle.

References

[1] M. O. Neal "Front Structure Design Procedure for Optimal Pedestrian Leg Impact Performance," to appear in Proceedings of 12th ASME Symposium on Crashworthiness, Occupant Protection, and Biomechanics in Transportation, paper # IMECE2003-44094.