

# The role of advanced numerical simulation in vehicle safety research and development

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As computer technology continues to get more advanced while the predictive quality of the calculations is growing steadily, numerical simulation has then established itself as an essential tool in the development of motor vehicles. The existing of high performance computing allows for simulations to be increasingly used in the field of vehicle safety ranging from component impact tests to whole vehicle crash tests. Virtual prototyping and testing have become generally accepted in automotive industry. Safety assessment of sub-systems or whole vehicles require a full-scaled anthropometric device or a crash test dummy which is employed to predict human responses in a vehicle crash. The crash test dummy can be modelled using multibody dynamics technique or finite element technique. However, a crash test dummy cannot provide detailed injury such as brain/lung contusion, bone fracture, liver rupture or whiplash injury. An advanced finite element human body model has then been developed to address this issue and the ethic issue of cadaveric tests. The human body model is more biofidelity than the dummy model and can provide better understanding of injury mechanisms of occupants and pedestrians in various crash scenarios.

The talk will start with introduction of the two widely used numerical modelling techniques for simulating vehicle crash scenario which are multibody dynamics and finite element method. Case studies of crash reconstruction and virtual testing for type approval will be presented. The highlight will also be on the development of advanced finite element human body model together with related research projects at the Automotive Safety and Assessment Engineering research centre, KMUTNB.