THE VIRTUAL PROTOTYPE OF THE GUIDING – SUSPENSION SYSTEM OF A PASSENGER CAR

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In this paper, using the MBS (Multi-Body Systems) environment ADAMS/Car, we developed and analyzed the virtual prototype of a passenger car. The model includes the front wheel suspension (double-wishbone mechanism), the rear axle suspension (quad-link mechanism), the steering subsystem (parallel-link mechanism), and the car body subsystem. The front/rear tires model consists of wheel parts that are connected to the spindle mount parts, which have outputs in the front/rear suspension subsystems. The dynamic model is characterized as a constrained, multibody, spatial mechanical system, in which rigid bodies are connected through geometric constraints, compliant joints (bushings), and force elements (springs, dampers, bumpers & rebound elements, anti-roll bars). The virtual prototype has 98 degrees of freedom, including 15 active mobilities (vertical displacements of the wheels - 4, steering rotation of the front wheels - 1, car body's oscillations - 6, rotations of the wheels around the wheel spindles - 4).

The virtual prototype is analyzed in passing over bumps regime, simulating the experimental test on stand (vehicle simulator, fig. 1). The wheels are moved through linear actuators, which execute vertical motion relative to the fixed structure (attached to ground), the inputs applied to the actuator pistons (which move the sustaining plates of the wheels) simulating the road profile. The analysis results (ex. fig. 2) allow evaluating the dynamic behaviour of the vehicle in a fraction of both the time and cost required with traditional build-and-test approaches using physical (hardware) prototypes.

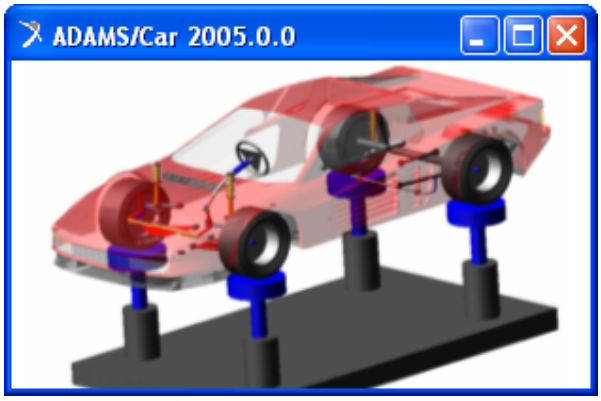

Fig. 1. Virtual prototype of the vehicle

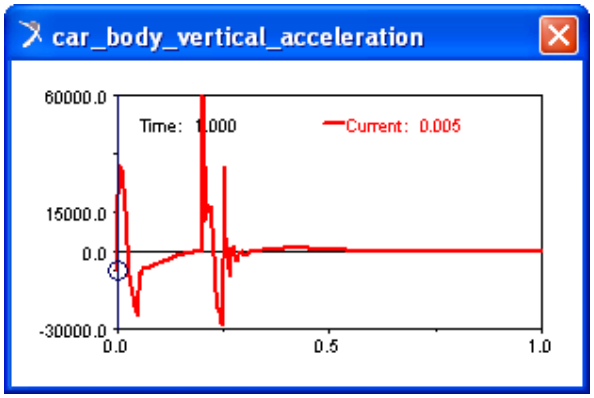

Fig. 2. Result of the dynamic analysis

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