

Harald Meyer-Tuve,  
TU München

## Research on the Open Road at the TU München

A number of questions concerning the interaction of components on the vehicle dynamics are often left unanswered during a degree course. The hands-on side where students are able to examine a mass-produced vehicle is often missing. The Experimental Handling Vehicle (EHV) is a research vehicle within the automotive engineering module at the TU München which provides this hands-on experience. The students simulate the vehicle components and the overall vehicle dynamics before applying these results to the EHV.

### INSIGHT IN THE EXPERIMENTAL DESIGN VEHICLE

The first design of the suspension uses a conventional double wishbone suspension which can be viewed from the driver's seat. The vertical forces are directed into a longitudinal spring-damper system via pushrods. This makes them more easily visible and allows a modular design. The vehicle frame was designed with a torsional stiffness of more than  $10 \text{ kNm}^\circ$  which allows each wheel, regardless of the applied forces, to be mounted on separate suspensions. The first suspension that was developed during the course is extremely flexible. There are over 15 different ways in which the position of each wheel can be adjusted allowing countless possibilities and almost all kinematic variants to be created. These variants can then be used for either training or research purposes.

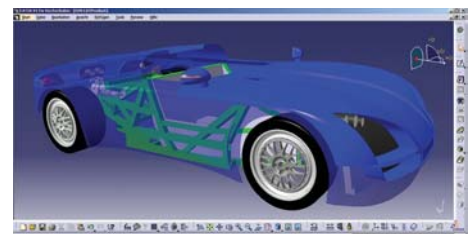
### THE EHV PROJEKT IS A COOPERATION

The EHV project, in cooperation with a number of partners, improves the students' technical understanding. In addition, a contact forum has been formed which provides a relaxed atmosphere in which the partners can get to know and assess the students as potential future employees. The partner INTEC GmbH e.g. supports the project with the software SIMPACK. The EHV driving dynamics, the vehicle controller, the eigenfrequencies of the front and rear axes and the kinematic design were all

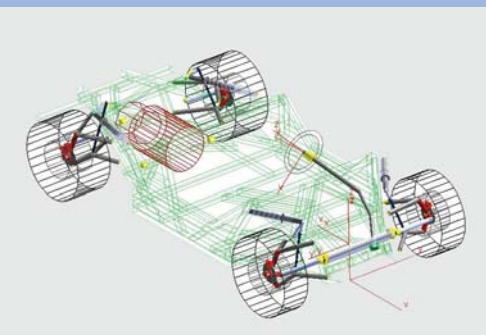
simulated in SIMPACK. In addition the applied load cases were calculated in a finite element simulation.

The individual components of the vehicle have been fitted with the help of a number of German vehicle manufacturers. Audi AG has helped with the drivetrain, BMW provided, among other things, chassis components and DaimlerChrysler has provided technical support along the way. Automotive suppliers have also helped out, e.g. Hirschmann with uniball universal joints and Robert Bosch GmbH with the fuel injection systems. The visual design of the vehicle was created in collaboration with the design house Pollmann. The vehicle in its first setup should be up and running within the course of 2006. Future components of e.g. suspensions are planned to be added in cooperation with ZF Sachs, ZF Friedrichshafen, and ZF Lemförder Fahrwerktechnik. The stage at which the project is currently at, is presented at regular intervals. This provides a constructive discussion platform between the cooperation partners, students, faculty and those interested in the project. The points raised, the ideas collected and the direction in which the project is to go, all which have been discussed during the meeting, are then brought together. These changes are first tried out in the virtual prototype model and advice is also taken from the cooperation partner TÜV Süddeutschland before these changes are implemented in the vehicle.

It is not just at these meetings when the focus is placed on the handling and driving dynamics. INTEC have supported the students of the automotive engineering module offering industrial placements using SIMPACK and therefore giving them valuable experience in a commercial MBS tool.



Professor HeiBing, TU München,  
and the Team Working on the EHV



The Experimental Handling Vehicle  
in SIMPACK



The Experimental Handling Vehicle  
in Reality