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MOGESSA/Pro: Integration of ADAMS Suspension Analysis in Pro/Engineer

by

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1. Introduction

Kinematic and eleastokinematic suspension analysis has a long tradition at Volkswagen. For the last 12 years we used a self written program called MOGESSA (Modulares Gesamtfahrzeug Simulationssystem in ADAMS). This program allows kinematic and elastokinematic suspension analysis for several load cases such as wheel travel, steering, force input and the calculation of wheel envelopes. MOGESSA is based on the DMP pre-processor for ADAMS and provides an user friendly surface, so that a wide acceptance inside the construction departments could be achieved.
But the main disadvantage of this program is that geometric data input has to be done twice, first for the CAD construction and then for analysis within MOGESSA.
So the idea of analyzing suspension systems within the CAD environment was born. Since the decision of using Pro/Engineer for suspension construction was made up, the parametric basis of this CAD system could be used for our project. A hardpoint structure similar to that of ADAMS/Car could be realized by the skeleton-part technique. On this base MDI Italy developed the new MOGESSA/Pro as a Pro/Toolkit application.

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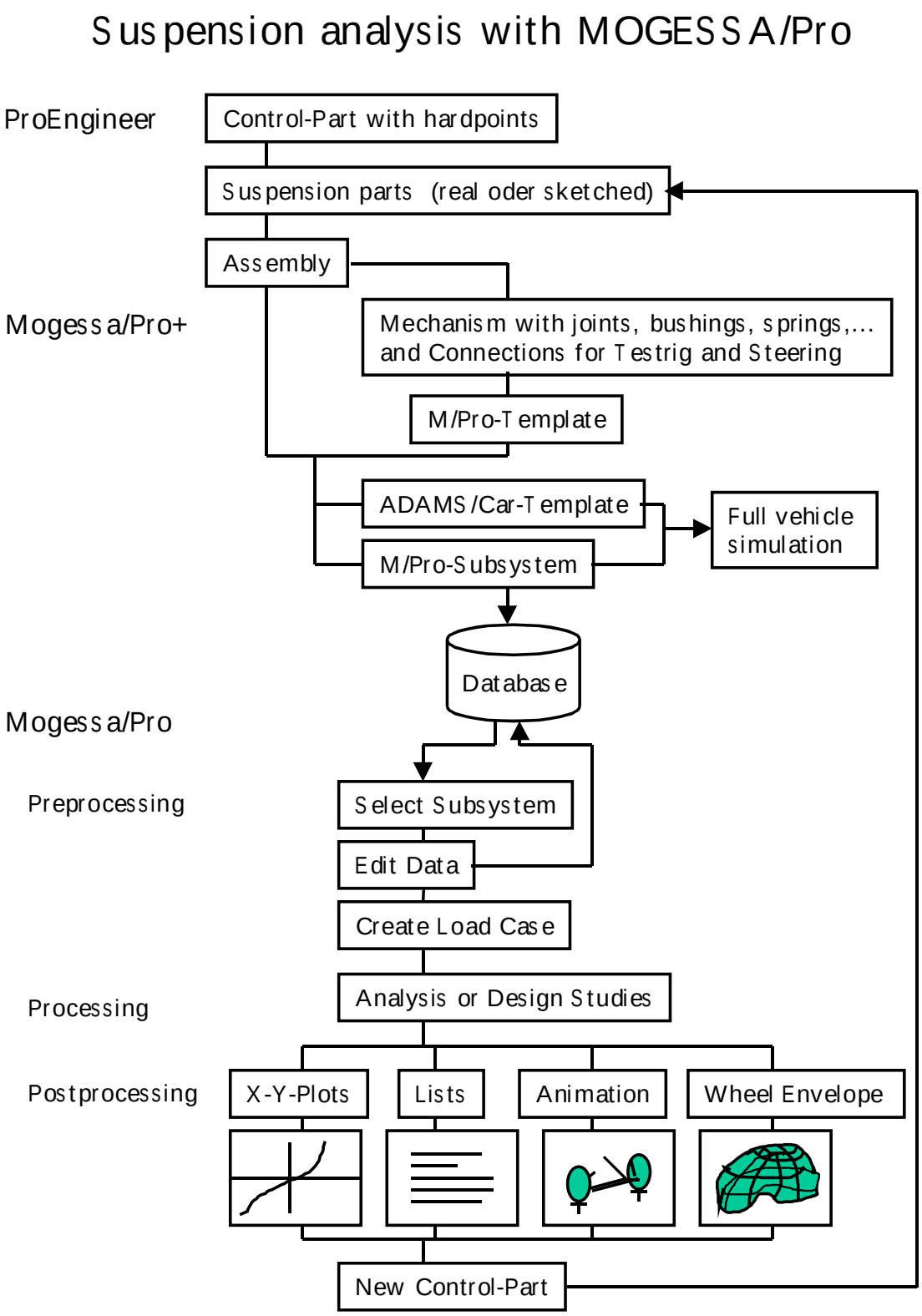

Fig. 1: Concept of MOGESSA/Pro

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2. Program description

The MOGESSA/Pro concept contains 2 different program sections. The first is MOGESSA/Pro+, where the mechanism is defined, the second is MOGESSA/Pro for suspension analyzing and results. The functionality of the program is shown by the flowchart (Fig. 1).

2.1 MOGESSA/Pro+

MOGESSA/Pro+ is the expert user part of the program. First the control-part for the construction has to be established and then the complete suspension assembly can be created related to the control-part. The assembly may contain real parts or simplified parts like pipes which may be useful in an early state of the construction process. To start the MOGESSA/Pro+ functionality it is simply necessary to press the corresponding button in Pro/Engineer. The menu structure of MOGESSA/Pro appears as the users are accustomed to.
Now the mechanism can be established, that means parts have to be defined and joints can be created. (Fig. 2) Having done that, it is possible to insert linear or nonlinear bushings, springs and bumpstops and even linear or nonlinear beams. Special connections to testrig, steering and antirollbar must be created so that they can be integrated for later analyzing. The mechanism is saved as a MOGESSA/Pro-template.
With a special interface a MOGESSA/Pro-subsystem can be created which is identical to ADAMS/Car–subsystems and is used for further analyzing in MOGESSA/Pro or in ADAMS/Car. Also an ADAMS/Car-template can be generated, so that the same model can be used for full vehicle simulation within ADAMS/Car.

2.2 MOGESSA/Pro

MOGESSA/Pro is the standard user part of the program. The user only has to select a MOGESSA/Pro-subsystem from the database. Then the Pro/E-assembly and the MOGESSA/Pro-mechanism is loaded automatically. For suspension analysis a testrig-subsystem is needed. Steering- and antirollbar-subsystems can also be loaded. Now geometric data, bushing- and spring properties can be edited (Fig. 3). A loadcase has to be defined, realized up to now is wheel travel, steering, force input and combined load for wheel envelope calculation for front and rear suspensions.
Single analysis and design studies with the ADAMS solver are available in the processing section of the program.

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For post-processing standard X-Y-plots and printed results as listings are available. The animation is done in Pro/Engineer where it is possible to look for collision and interference, which is important for our users.
The calculation of wheel envelopes is done within an existing procedure which is connected to MOGESSA/Pro. A VDA-file is generated and can be loaded directly into the CAD-model of the suspension to describe the needed space of the wheel.

3. Conclusion

With the new MOGESSA/Pro the users in the construction departments of Volkswagen get a tool for kinematic and elastokinematic suspension analysis without leaving their habitual CAD-system-environment. The models for analysis can be built up by certain users without any knowledge of ADAMS. The data transfer to ADAMS can be done automatically, so that the specialists for full vehicle simulation can take over the ADAMS-models.
Collision and interference problems between suspension components and vehicle parts can be solved on the base of analysis results more efficiently and faster by this new program.

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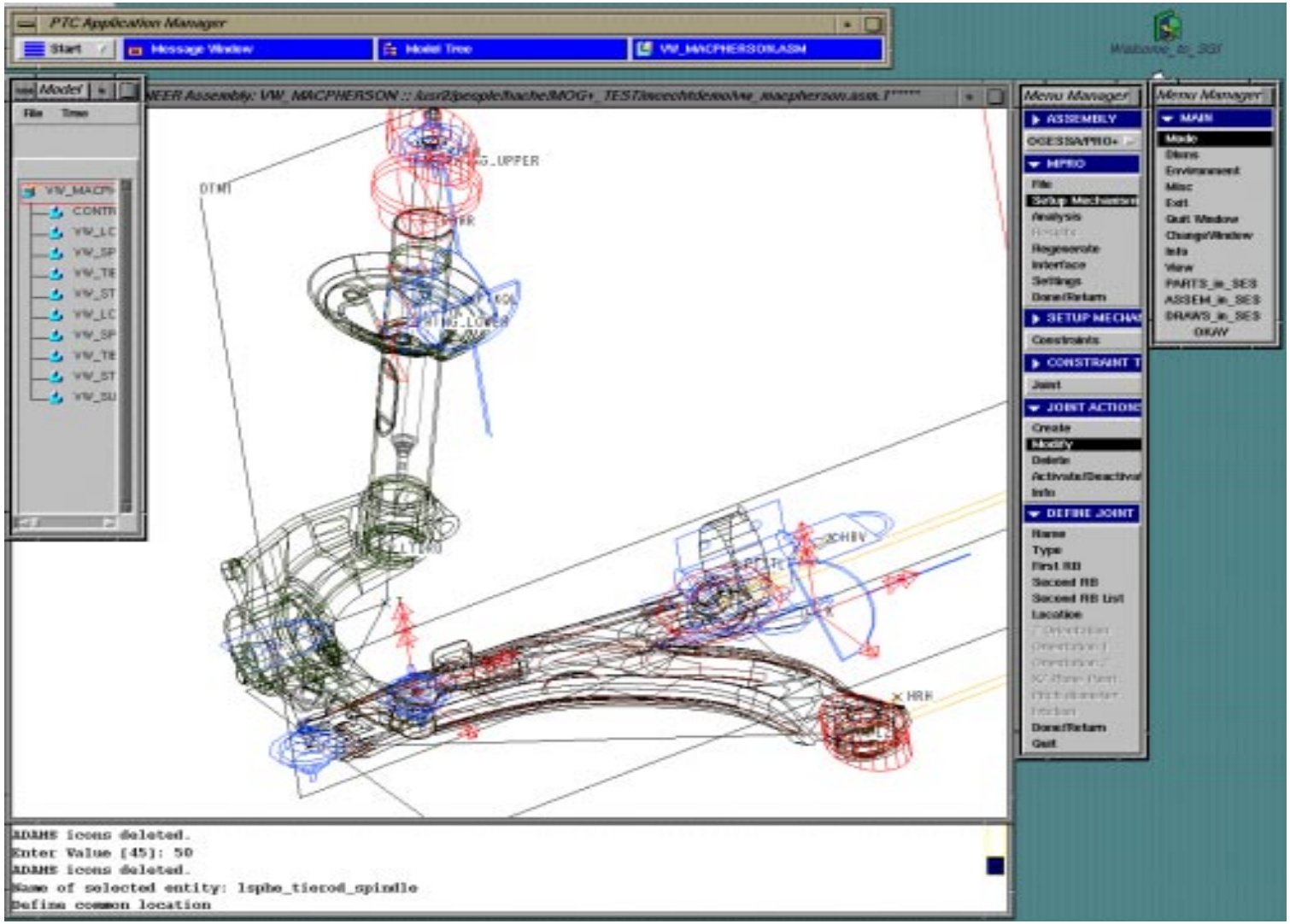

Fig.2: Modifying joints in MOGESSA/Pro+

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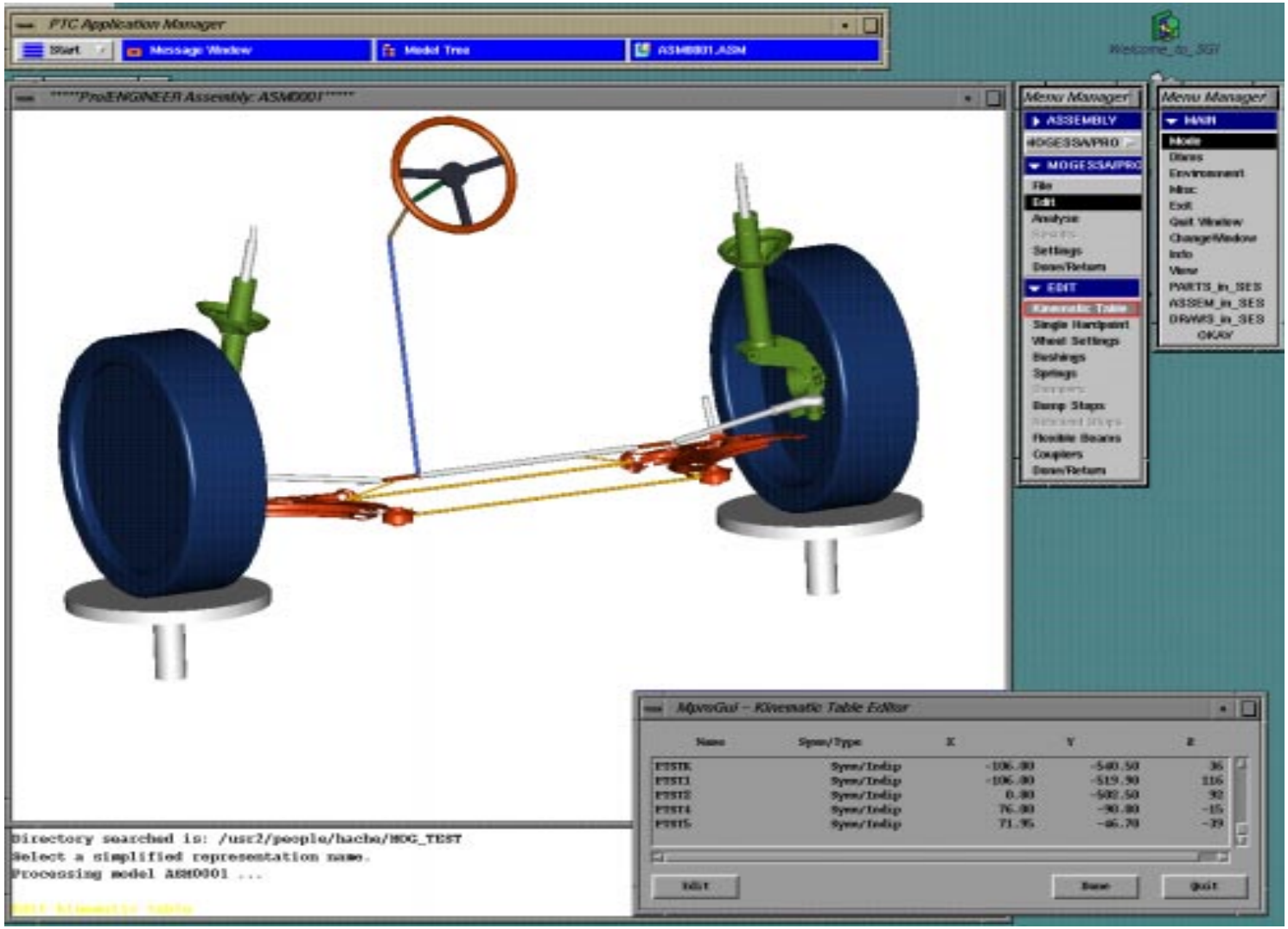

Fig.3: Editing geometric data in MOGESSA/Pro

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