

Steven Mulski, INTEC GmbH
Rainer Keppler, INTEC GmbH

Code Export Excel Plug-In

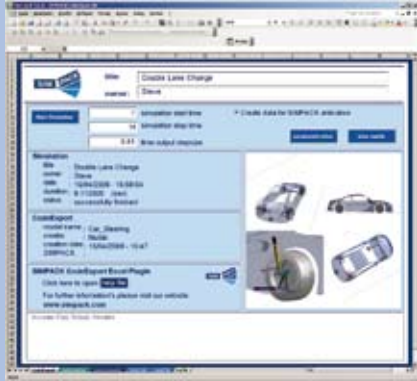


Fig. 1: Title Page to Carry out Simulations

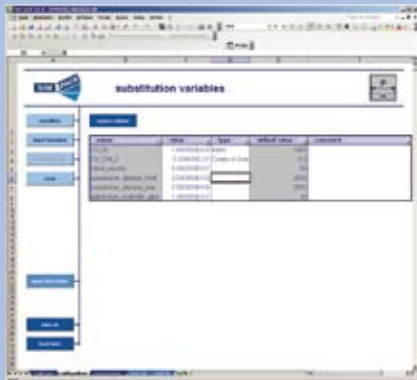


Fig. 2: Parametrisation of Substitution Variables

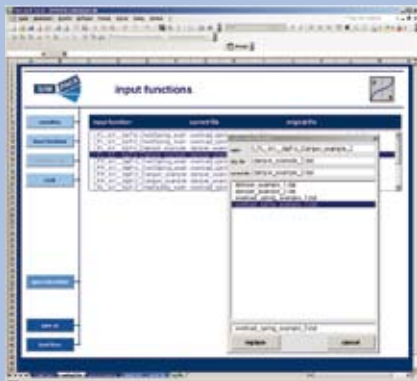


Fig. 3: Parametrisation of Input Functions

SIMPACK Code Export has been extended with the ability to automatically generate model specific user interfaces for Microsoft Excel. Users can now configure models, run simulations and postprocess results all within the Excel environment. With this functionality, SIMPACK has now opened the door for non-multi-body experts to work with complex SIMPACK models.

The computer on which the exported model is executed does not require an entire SIMPACK installation but only the directory structure generated by the export process. In addition, only the code execution and SIMPACK solver licenses are required during runtime. Simulation results can be plotted directly within the Excel Plug-In. For animations, if required, the free-of-charge SIMPACK Viewer may be used. Additionally the SIMPACK PostProcessor can be used for full postprocessing capabilities. Users of the Excel Plug-In only have access to parameters and files specifically made available by the SIMPACK user who originally exported the model, thus ensuring model integrity.

The Excel Plug-In capability is shipped and licensed as part of the standard SIMPACK Code Export.

WHAT PROMPTED THIS NEW DEVELOPMENT?

For years now SIMPACK has been leading technology in the field of code export. User created SIMPACK models can be exported as either C or Fortran code for use within external environments. Up until now exported models have been primarily used as SIMULINK plug-ins for use in Software-in-the-Loop (SIL) or Hardware-in-the-Loop (HIL) applications. Currently customer real-time models have around 140 degrees of freedom with frequency content of up to 20 Hz (sampling rate 1 ms).

Several years ago a SIMPACK user who needs to simulate a vast amount

of vehicle variations with many standard manoeuvres realized that SIMPACK Code Export could also be used in combination with model specific user interfaces (MAN Nutzfahrzeuge AG, "The Easy-to-use Steering Design Tool SimuLENK as an Application of SIMPACK Code Export", www.simpack.com, software/publications/User Meeting 2006). With this functionality in Excel, trained and proficient SIMPACK users are no longer required for running and analyzing this vast amount of variations. Human resources can be more efficiently utilised.

INTEC quickly realized the potential of this functionality and has therefore created a simple and automated method suitable for all SIMPACK users, the Code Export Excel Plug-In.

WHY EXCEL?

Microsoft Office products, especially Microsoft Excel, have become more or less standards within the worldwide engineering community. Because of Microsoft Excel's widespread use and ability to modify parameters, carry out calculations, plot results and set cell protection, Microsoft Excel was the obvious choice for model specific graphical user interfaces.

THE USER INTERFACE CODE EXPORT TITLE PAGE

From the title page (Fig. 1) a user may edit the simulation parameter (e.g. time and output stepsize) and run simulations. During simulations the progress and status of the solver run is shown on screen.

The page also contains information concerning the creator of the Excel Plug-In, creation date and SIMPACK version used to export the model. Full documentation on the Plug-In may also be accessed. An editable comment field for the user is also available at the bottom of the page.

PREPROCESSING

A configuration page (Fig. 2) offers the possibility to modify values of substitution variables, exchange Input Functions, Function Arrays and Track files from local database.

The Substitution Variables, which were selected to be available in the exported code, are listed in a table. From here the values may be changed and the corresponding parameter type (e.g. mass, length, etc.) and additional comments entered. All columns of the table can be filtered by Excel standard features for column operations. Parameter configurations, together with simulation results, can be saved and later selected. Furthermore, an information folder can be accessed on the configuration page, where additional information such as model contents, pictures, documentation files, etc. can be stored.

All Input Functions and Function Arrays used in the model are listed in a table containing the SIMPACK name of the function element, the corresponding file name and the original file (Fig. 3).

A double click on an Input Function opens a dialog window of all available Input Functions, from the local database, from which any may be selected. A similar table is used for selecting track files (Fig. 4).

POSTPROCESSING

All output results, defined y-output vectors in original SIMPACK model, may be viewed as Excel plots within the postprocessing page (Fig. 5). The page is accessed either by selecting the "view results" button on the title page or through the page tabs on the bottom of all pages. Results and plotting configurations can also be saved and selected. The "get current results" button reloads the latest results. With "create diagram sheet" a new page is opened containing the plot of the

selected curve and enables the usage of all features of Excel's plot functionality.

If necessary, the animations may also be viewed using the SIMPACK Viewer (Fig. 6). If more detailed postprocessing is required, and the corresponding SIMPACK license is available, the SIMPACK PostProcessor may also be used.

EXCEL PLUG-IN USAGE

By no means is the Excel Plug-In limited to only automotive applications. The functionality may also be applied to almost any SIMPACK model, regardless of the engineering discipline (e.g. wind turbines, general machinery, etc.).

The Excel Plug-In may also be used as a tool in academia to help students get a better understanding of the principles of mechanical vibration.

We are all enthusiastically looking forward to seeing not only the number of users of the Excel Plug-In over the next few years but also the wide range of applications to which the Excel Plug-In is applied.

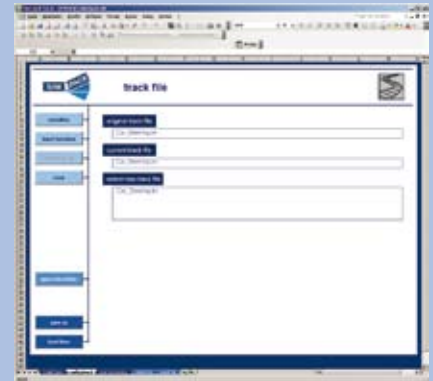


Fig. 4: Parametrisation of Track Files



Fig. 5: Postprocessing, Plot Contents of Y-Output Vector

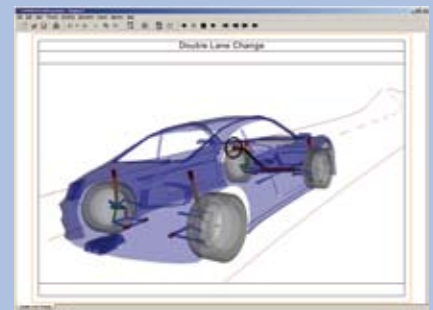


Fig. 6: Postprocessing, Animate Results with SIMPACK Viewer