COUPLING OF SIMULATION TOOLS FOR SIMULATION OF MULTIPHYSICAL SYSTEMS

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The role of Computer Aided Engineering in research as well as product development has been significantly increased during two last decades. The growing demands on the simulation address not only monodisciplinary phenomena but also phenomena from different engineering branches. The current state-of-the-art simulation tools allow two basic approaches for meeting the demands, either coupling of various specialised simulation codes or application of multiphysical simulation tools.

This paper focuses on the simulation approaches for the multidisciplinary tasks and particularly on the connection of specialised simulation tools by interfaces. It classifies the interfaces between specialised software packages in general and gives some case studies using the coupling of specialised simulation tools. Finally, the development stages of an interface between civil and mechanical systems are presented.

Key words: *multiphysical system, simulation tool, CAE*

1. Introduction

The level of current state-of-the-art in modelling and simulation technology offers the modelling of technical systems with many targets, from different points of view, in several levels of complexity and using various Computer Aided Engineering (CAE) tools ranging from tools based on universal spreadsheets to very complex specialised tools solving dynamic behaviour of systems. Many simulation tasks are targeted to the multidisciplinary simulation. Furthermore, during the last years the needs for shorter development times and cost reduction resulted in multidisciplinary model based design approach. This paper focuses on multibody systems and their interaction with other phenomena, such as control or elasticity.

Two basic strategies for modelling the complex multidisciplinary dynamic systems can be distinguished. On one hand, the multidisciplinary systems can be modelled in one multidisciplinary environment often based on block oriented modelling or bond graphs. It means that all model components are implemented in a single environment. Typical examples of a multidisciplinary environment are general block-oriented simulation tools such as MATLAB/Simulink with its Physical Modelling extensions and the object-oriented modelling languages such as the open language Modelica implemented e.g. in Dymola environment. Modelica offers libraries from many engineering branches such as mechanics, hydraulics, pneumatics, thermomechanics, state-automata, electrical engineering, etc. Such

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