Virtual Reality (VR) is a technology that is both attractive and more and more affordable for design reviews. Complex products can be visualised and assessed in excellent quality quickly and easily. However, a wide use of VR is still hindered by the great efforts necessary to make available the required data and lack of integration into the running development process. An integrated working environment, in which VR and CAD are used simultaneously and thus design processes may be carried out very efficiently, was created by the Department of Design Methodology/CAD. The solution was recently brought into operation by the machine manufacturer TRUMPF Werkzeugmaschinen GmbH + Co. KG in Ditzingen.

Every designing engineer should be capable of using CAD and VR without being confronted with problems resulting from questions of how to do data conditioning, how to generate VR scenarios or how actual the models are. As a prerequisite, consistent management of the product structure, native CAD files or exchange data formats should be available for all VR data in a PLM system. During implementation, we referred to the integration platform J2x-PLM by the Dresden company xPLM.

The platform was extended by a VR connector, which controls the VR system out of the CAD system. The VR connector makes possible direct communication between the VR- and CAD system. The application scenario assumes that one VR system functions as the review platform for a number of CAD stations in the vicinity. The possible VR hardware ranges from PowerWalls to multi-sided projections. A VR session is initiated from a CAD system, but it can be extended to several workstations with different CAD systems simultaneously. The actual solution combines the VR system ICI-DO© with Catia® or SolidWorks®. The software mySAP/PLM© is used as the PDM system.

It is possible to very quickly update (in a matter of seconds) components changed under CAD while the VR session is running. When building up the VR model, only structural information for the product in the PLM system are used. Thus, even product configurations that are not available as CAD assemblies can be loaded in the VR system. This is advantageous, for instance, for large assemblies whose components were modelled in different CAD systems or whose components are only provided by the sup-
plier in exchange formats like JT or VRML. It is also possible to visualise product configurations in which all components are completely designed, but not every imaginable combination of these components is modelled in the CAD system. In addition to the consistent administration of the components of the CAD- and the VR model, the advantages outlined above come from the direct exchange of user interactions between the two systems. So it is possible to work in both systems in parallel, and to make use of the corresponding system-immanent advantages. Thus, for example, the VR connector makes it possible to load and edit components that were selected in the VR system into the CAD system. Contrary structures and load in VR System that are changed actually in CAD.

One may intentionally change component properties, e.g. the transparency of housings, to make inside parts more visible, whereas in the CAD system the changes are carried out only on this housing. To further increase the significance of the VR model, it is possible to additionally visualise meta information from the PLM system. Thus, VR components can be coloured as a function of their release state, different structural membership functions can be marked and various alterations can be visualised.

For particularly large-sized assemblies, it is helpful that higher-ranking building structures of the current CAD model can also be loaded in the VR system. When doing this, multiple use is considered, and resolution into a structural layer that can be freely chosen is supported. It is very easy to carry out installation analyses in various applications.

A well-known problem for VR systems is that computational simulations done under CAD cannot be visualised offhand, since the assembly constraints are only valid under CAD. To overcome this obstacle, the designed VR connector allows immediately use of the movement data calculated in the CAD system, if the same assemblies are loaded in both systems.

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