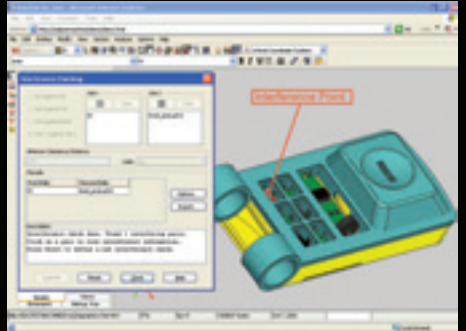


# Digital Mock-Up

David Chadwick explains how Version 18 of Cimmetry Systems' AutoVue combines MCAD and EDA files in a Digital Mock-Up to provide virtual assemblies on-the-fly



What's the next step now that collaboration on 3D digital models is well developed and available with most Visualisation and Collaboration solutions? There's a simple, and obvious, answer! Providing a tool that allows collaborators to combine the models they have been working on into a virtual assembly, so that they can continue the process of collaboration - and work out what will happen when they fit their components together!

Cimmetry Systems, leaders in visualisation and collaboration and pioneers in most of the features that are driving this particular sector of the industry forward, are breaking new ground again with AutoVue 18. The new release enables contractors and designers, for the first time, to create digital mock-ups - i.e., combine a number of digital models from disparate sources, developed using MCAD and EDA software, into a single assembly. The process has been called Digital Mock-Up, enabling designers to simulate assemblies in real-time, without having to create physical prototypes.

DMU allows users to bring in model files from external CAD and EDA packages and to manipulate and position them on the screen, combining them to form single digital models. Having been assembled, users can collaborate on a more complete structure, evaluating the relationship between components from different designers and eliminating manufacturing and assembly problems at an early stage in the design process.

A number of new tools have been added to the software to facilitate the creation of digital mock-ups, perhaps best described by using a typical example that combines

a couple of plastic structures with a small PCB. Mobile telephones are a reasonably recognisable commodity, with a fairly simple structure, and are ideal for this purpose. The base of the phone, providing its structural support, was developed using Unigraphics NX. The PCB (or circuit board) came from Cadence, and the cover, the aesthetical element, was designed using PTC's Pro/E.

A range of different formats can be imported into the system besides the above - Inventor, SolidWorks, CATIA, and others, in any reasonable quantity, to create the virtual assemblies - retaining all of the intelligence and attributes of the original files. Each file is loaded as a native file - there is no need to have the MCAD or EDA software installed on the system.

Having imported the second of two components and begun the digital mock-up, the user needs to set up the common boundaries, and the constraints, that will allow them to be combined. Two options then present themselves. For rapid object placement, the Manipulator tool surrounds the object with a series of coloured spheres, or grab handles, that can be used to drag the object around, rotate it and position it relative to the base of the phone. The scale of the object is defined in the native file/model - however the scale can be adjusted in AutoVue.

For greater precision, a more refined tool, Part Alignment, is found in the Analysis menu. Part Alignment allows the user to set up the different constraints that govern how the two objects are to be aligned - coincident, parallel, perpendicular or concentric. It also allows users to select the feature on each model that will be used to perform the connection, using

either a vertex, edge or face - assembly functions familiar to all 3D modellers. In this example, coincident constraints were used in conjunction with selected faces to align the body of each component, and concentric constraints located the edge of a hole on the PCB with the rim of a boss on the phone base - providing a perfect match between the components. The Part Alignment toolbox provides another useful tool - an anti-align feature that can be used to flip over objects, enabling them to be placed the right way up! As soon as each component is correctly lined up the assembly can be completed by clicking on Apply in the toolbox.

The Pro/E cover was loaded and combined up in the same way, complete with its geometric data and attributes - information relevant for subsequent manufacture of the component, but not necessarily required for view and mark-up. Hence another new tool - PMI Filtering - that allows such features to be turned on or off either in the Product tree or the viewing area.

Version 18 also uses a new render mode - shaded wire rendering - that gives higher clarity to model features such as edges and vertices than normal shaded models. In order to make it easier to align model features prior to linking them together, ZoomFit can be used to focus more closely on each component to establish the exact edges or vertices that will be used for the assembly.

## INTERFERENCE CHECKING

Whenever Digital Mock-ups are created, the possibility of clashes between the different models arises. Version 18 of AutoVue adds a further tool that allows users to run an interference check

between the different components in the DMU (Interference Checking - found in the Analysis menu).

Here, again, the user has a couple of different options. A complete check can be made between each component. Entire product trees of each component are copied into SET 1 and SET 2 in the tool-box to enable the geometry of each to be compared. Alternatively, individual groups of parts can be selected and placed in each of the two SET boxes for more focussed analysis. After running the interference check, a report displays all instances of virtual collisions between the two components. Selecting a particular violation from the report automatically jumps you to the interfering parts.

In the last version of AutoVue (17.1) a tool called Cross Probe was introduced to compare 3D layouts. This has now been taken a step further in Version 18, allowing Cross probe to be used between 3D and 2D layouts - in this particular incidence, it can be used with both the 3D layout and the schematic of the PCB.

Selecting Cross Probe and opening the PCB schematic file allows Interference checking between the PCB and the phone cover, highlighting, in turn, each

component on the PCB that clashes with the cover. This allows the collaborating EDA engineer to identify and replace the offending component with one that has a lower profile.

### MARK-UP AND COLLABORATION

Once interference points have been identified by combining the separate components into a Digital Mock-Up, they can be communicated to others using normal mark-up tools, such as cloud entities and sticky notes - used to mark the 'interference point' and accompany the mark-up with some textual explanation. Version 18 has enhanced this facility by retaining mark-up information with the Digital Mock-Up, so that it can be used at a later stage in the products development, and so that it can be used as an audit trail.

The software also enables users to create and save a series of user defined views which can highlight problem areas, providing collaborators with more explicit demonstrations of the problem. And, like the retention of mark-up data, they can also be used to record each stage of the process. Users can jump to particular stages in the process - to where the annotations were created - so that an

evaluation can be made of how the mock-up was created.

The process can also be used to generate assembly instructions, or can be saved in a mark-up file and exported to a PLM system using AutoVue's APIs. Saved Mark-up files contain all model information - a considerable amount of data that includes all imported part files, transformations, transparency of parts and models, rendering information, explosions of components and section views, user-defined views, such as the zoomed sections of files described above, user-defined co-ordinates and, of course, mark-up notes, text and measurements.

### OTHER NEW FEATURES

Although Version 18 concentrates on the introduction of Digital Mock-Up (as has this article) it also includes numerous enhancements to its EDA and ECAD features, and in its support for 2D/3D capabilities, particularly in the GD&T areas - Geometric Dimensioning and Tolerancing. The range of formats that the software can handle has also been considerably increased - with a complete range available on the Cimmetry website. **CU**  
[www.cimmetry.com](http://www.cimmetry.com)