CASE STUDY: Revolutionizing Automotive EMC Analysis - MIRA's Breakthrough with CADfix

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- David Ward, Manager, MIRA's Advanced Engineering Electrical Group

CADfix

CADfix removes barriers preventing the reuse of solid models. By providing an extensive set of geometry manipulation tools for importing, repairing and exporting data, CADfix maximizes the reuse of CAD data in downstream applications.

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ITI is the global leader providing reliable interoperability, validation, and migration solutions for product data and related systems. Our customers recognize the value in having a trusted solution partner that provides more than just software. ITI solves complex product data interoperability problems so that the world's leading manufacturers can focus on making great products. You need to keep your engineering initiatives moving forward.

Overview

Electromagnetic compatibility (EMC) is a growing issue for many manufacturers, particularly within the automotive industry. Companies such as MIRA, use CADfix to help unravel the increasing amount of complex data involved.

MIRA, a Horiba Company, is a contract-engineering organization servicing the global automotive industry and specializing in product engineering and test services. There are 35 major laboratories at MIRA's Nuneaton site.

Challenges

As automotive OEMs place more emphasis on developing new models based on common platforms and re-engineering, the product development time for new vehicles is decreasing rapidly. Manufacturers are becoming much more dependent on simulation and analysis techniques rather than building prototypes and seeing how they perform.

"These days the prototypes that companies build are pretty much representative of what they're going to go into production with," explains David Ward, manager of MIRA's Advanced Engineering Electrical Group. "There is less and less dependency on development prototypes where people are trying things out and looking to refine the attributes of a vehicle. There's more emphasis on analysis and simulation, and that is reflected in our work. Testing is still very important at MIRA but we need to have a wide range of design, analysis and simulation services available."

MIRA is very active in CAD and CAE, testing vehicles for crash worthiness and structural strength. There is also a lot of emphasis on computational fluid dynamics (CFD). Modeling interior and exterior airflows in vehicles helps with the study of aerodynamic performance and heating performance. And EMC helps predict how different EM systems will interact with each other and with the world around them.

Solution

Some of the techniques for mechanical simulation, like finite element analysis (FEA and CFD, have gone through that cycle and are now mature engineering disciplines. Electromagnetics is at the point where techniques have been developed but there are still issues with computational performance and meshing. As the price performance ratio of big computers falls, computational performance is becoming less of a problem. To help tackle meshing, MIRA turned to ITI's CADfix, a data interoperability tool developed as a central resource of geometric data.

"We were at the point where we'd proved that the analysis tools that were available were potentially valuable to the automotive industry, but we didn't have any way to extract the relevant data from the CAD models," explains Ward. "MIRA ran a collaborative project with UK Government funding which involved ITI as one of the partners and was very much about expanding the capabilities of CADfix so that it could deal with electromagnetic problems."

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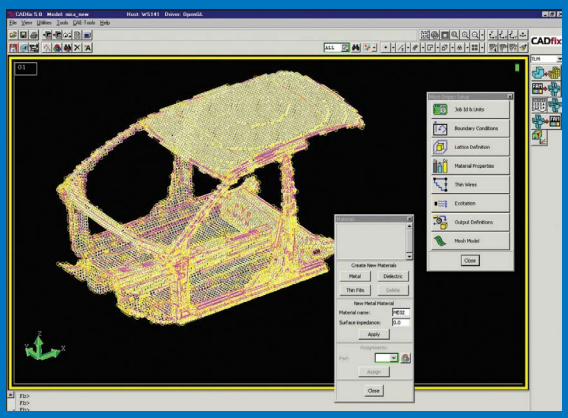
Result

MIRA's EMC team often uses real car geometry from various CAD systems, including CATIA and NX. When this geometry arrives, the relevant data is extracted from the CAD systems. CADfix is then used to manipulate and repair the geometry. CADfix has been designed specifically to address the problems that plague the efficient movement of data from one CAD/CAM/CAE system to another. Its suite of automated and manual healing and repair tools is based on more than 20 years' experience handling complex CAD geometry and converting it into finite element meshes.



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The geometry and meshing requirements of the EMC division are quite different from those of other disciplines at MIRA. The crash testing division, for example, needs to model the structure and major metal parts, but if they are working on a frontal crash model they might chop off the back of the car and replace it with a generic mass.

"In some ways the meshing requirements we have are closer to those of CFD," explains Ward. "But they tend to be more interested in different parts of the vehicle, generally the exterior surface. For EMC, we are interested in the whole of the interior space, which obviously affects our meshing needs. Another consideration is that the increasing frequencies that we are having to model require finer meshes for analysis."

As an engineering discipline, EMC is still in its infancy in terms of overall impact on car design. However, this is set to change as the use of electronics within vehicles continues to grow. "At the moment it is useful in terms of deciding where electronics are placed in a car and choosing the best location for an antenna. As the frequencies at play within cars become greater, the problems associated with them will naturally become more acute," says Ward. "This will eventually mean that our work will have a greater effect on the layout of a car's interior – but I suspect we'll always have the stylist looking over our shoulder."