CADfix®

MIRA pioneers EMC technology with CADfix

Electromagnetic compatibility (EMC) is a growing issue for many manufacturers, particularly within the automotive industry. The problem stems from the increasing use of electronic components and communication devices within products. These emit frequencies that not only interfere with each other but also can be influenced by other devices. Analysing and reducing the effects of these frequencies for the automotive industry is the job of companies such as MIRA, which uses CADfix to help unravel the increasing amount of complex data involved.

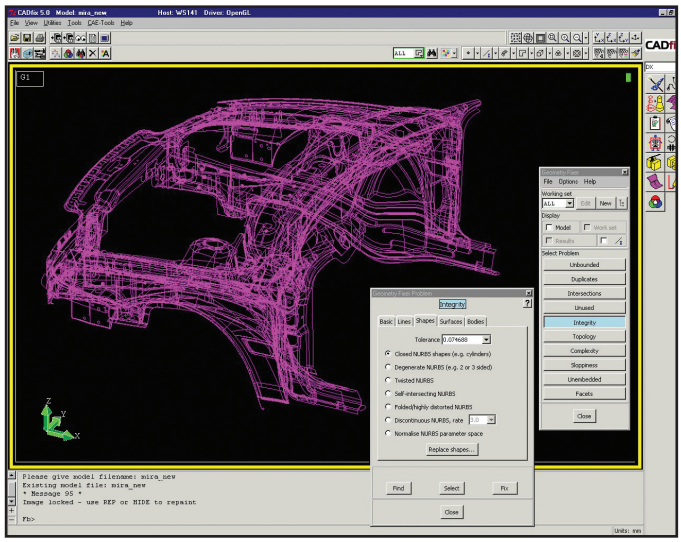
MIRA is a contract-engineering organisation that services the global automotive industry. The company specialises in product engineering and test services. There are some 35 major laboratories at MIRA's Nuneaton site including a wind tunnel, a proving ground and a test track.

Fewer prototypes – more predictions

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."

On the mechanical engineering side of things, 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). Modelling interior and exterior air flows in vehicles helps



CADfix is a central resource of geometric data at MIRA.

with the study of aerodynamic performance and heating performance. And then there's EMC, which helps predict how different EM systems will interact with each other and with the world around them.

"EMC is still very much a test-based discipline. But we've been active for about ten years in developing and applying computational techniques that could be used to predict the electromagnetic performance of vehicles," says Ward. "It is a new technology for the automotive industry but over the years we've noticed a very defined path in terms of how analysis techniques evolve. First of all the techniques are developed within universities and research institutes. Then they begin to be used on a small scale commercially and applied to real life problems. Computational performance and meshing issues are overcome and the tools eventually gain acceptance in mainstream industry."

EMC simulation

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 techniques. As the price performance ratio of big computers falls, computational performance is becoming less of a problem. To help tackle the issue of meshing,

MIRA turned to ITI TranscenData's, CADfix, a data interoperability tool developed as a central resource of geometric data.

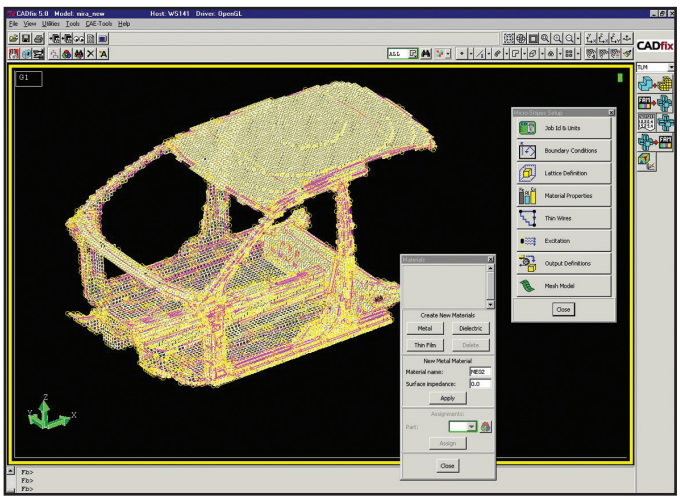
"We've been working with CADfix for about seven years," explains Ward. "We were at the point in about 1994 where we'd proved that the analysis tools that were available were potentially valuable to the automotive industry but we didn't have any way to extract the relevant data from the CAD models. MIRA ran a collaborative project with UK Government funding which involved ITI TranscenData as one of the partners and was very much about expanding the capabilities of CADfix so that it could deal with electromagnetic problems."

CADfix

MIRA's EMC team often uses real car geometry from various CAD systems, including CATIA and Unigraphics. 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 over 20 years experience of handling complex CAD geometry and converting it into finite element meshes.

"CADfix enables us to accept data from a wide range of sources," explains Ward. "Even when companies use the same CAD system they often use it in different ways, so we find the flexibility of CADfix very useful."

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.



Meshing requirements at MIRA are closer to those of CFD.

Meshing

"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."

CAD interop

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