Affordable CFD simulation software for SMEs in the transportation industry

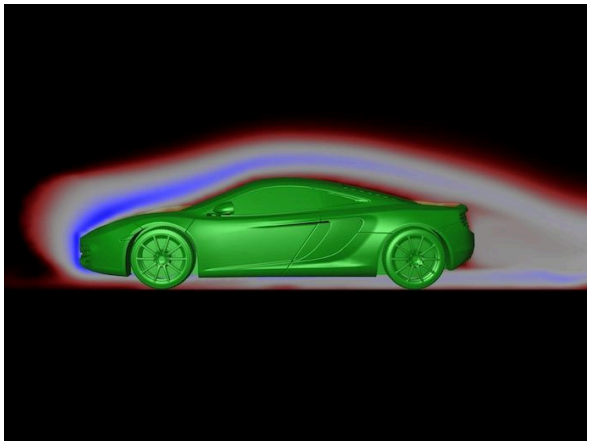
Results in Brief

Democratising the use of computational fluid dynamics

By developing an affordable, user-friendly computational fluid dynamics software programme, one Austrian-based engineering company is ensuring more automotive companies can benefit from this powerful technology.

DIGITAL ECONOMY

TRANSPORT AND MOBILITY



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In the automotive industry, computational fluid dynamics (CFD) simulation tools are king. Using numerical analysis and data structures to analyse and solve fluidity-related problems, CFD leads to faster development times, decreased costs, higher added value and increased innovation. Unfortunately, CFD's complexity and high licensing costs put it out of reach for many small and medium-sized enterprises (SMEs).

With the support of EU funding, Austrian-based Engineering Software Steyr (ESS) set out to answer this demand for affordable, user-friendly CFD software. The result is SENSE, an innovative modular CFD solution.

"Our goal was nothing less than the democratisation of CFD within the automotive industry," says Martin Schifko, ESS CEO and SENSE project coordinator. "To do this, we created a system that reduces – if not eliminates – the obstacles that have traditionally prohibited the large-scale uptake of CFD software."

Simplifying simulation

To achieve this goal, project researchers had to create numerical models so simple that automotive planners and designers could also be CFD users. This meant completely redesigning how CFD software works. For example, instead of running on a complex – and expensive – central processing unit (CPU), SENSE uses a cost-effective graphics processing unit (GPU). It also uses the smoothed-particle hydrodynamics (SPH) method, a computational method for simulating the mechanics of, for instance, solid mechanics and fluid flows.

According to Schifko, this combined use of SPH and GPU, along with the system's intuitive graphical user interface (GUI), simplifies the process compared to the Finite Element Method and Finite Volume Method used by most CFD tools. It also eliminates time-consuming pre- and post-processing and reduces total simulation time by a factor of 10.

"SENSE stands out as the first modular CFD solution on the market," says Schifko. "Instead of having to buy complex, predefined toolboxes full of features that will never be used, SENSE provides easy-to-use modules targeted at the one application the user requires, optimised for their needs, and with pre-set boundary conditions."

The SENSE toolbox currently includes numerical models for a variety of applications, including powertrain, drainage, flooding, PVC sealing, waxing, solid body interactions, injection moulding, and cooling systems.

A disruptive result

Because SENSE reduces CFD simulation costs from EUR 400 000 to just EUR 40 000, it has already attracted the attention of several major players. For example, the Audi Group recently began using SENSE to simulate cavity preservation.

"Realising that SMEs could only integrate a fully developed product into their processes, we had to change our focus to the large OEMs who could already utilise SENSE's individual applications," explains Schifko. "But now that SENSE is available as a complete product, we are again turning our attention to SMEs."

Although SENSE is currently available as software, ESS is preparing to launch a cloud-based version – a development that will ensure even faster service and make the solution available to even more users. The company is also investigating new use cases for SENSE technology in other industries.

"Our goal at ESS is to disrupt the automotive market by providing SMEs with access to much-needed simulation software," adds Schifko. "With SENSE, we accomplish

this, giving SMEs the ability to become more cost- and time-efficient, more innovative and more competitive.”

Keywords

SENSE | Engineering Software Steyr | automotive industry | computational fluid dynamics | CFD | SMEs | graphics processing unit | GPU | smoothed-particle hydrodynamics | Finite Element Method | Finite Volume Method

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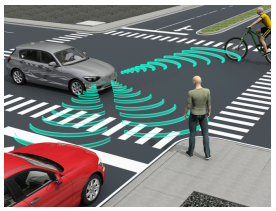

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