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Continuous Integration and Agile Engineering

Processes, Methods, Tools and Applications
A disruptive change in vehicle development

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Driving sound simulator as enabler for virtual prototyping

The trend towards fewer and fewer prototypes leads to disruptive changes in the vehicle development process. NVH engineers would like to judge as early as possible the sound of a new vehicle because late changes are very expensive. But how can you experience the sound properly without a prototype? The answer is a driving sound simulator. Testing and simulation are combined to build a virtual prototype of the acoustic performance. It speeds up the development process and allows agile engineering. What-if-scenarios can be made audible immediately using updated simulation data without building another prototype.

This tool also enables to evaluate the sound of the future. Are passengers more sensitive to noise while they relax during automated driving? How sensitive are they to unknown strange noise caused by auxiliary components if they are not in control? Such studies could be performed in a driving sound simulator.

Another aspect is active sound design. Artificial engine sounds are played back in electric and hybrid vehicles using cabin loudspeakers to set emotions or give acoustic feedback. It is also used for downsized combustion engines to make them sound more powerful or to mask cylinder deactivation. A hardware-in-the-loop approach is proposed so that the sound generating device can be tuned in the driving sound simulator considering the masking noise by wind and tire-road noise.

In this presentation the concept and applications of a driving sound simulator are shown which allows a flexible development process.