



Latest research achieves “zero simulator-induced latency” on a driving simulator

Study using automotive OEM and Formula 3 driving simulators shows how prediction algorithms can be applied to synchronize and minimize latency, leading to a more accurate driving experience.

PARIS – Cruden has shared details of its latest breakthrough research on how to minimize latency when using a driving simulator, together with Audi AG and the University of Stuttgart, at the Driving Simulation Conference (DSC) in Paris (September 7-9, 2016). Cruden’s researchers achieved “zero simulator-induced latency” through the use of predictive algorithms that synchronize and reduce latency. This new approach will allow car manufacturers and motorsport teams to use validated car models directly on the simulator without having to make modifications to compensate for simulator hardware and software delays.

“Latency has always been a challenge in the design of driving simulators when trying to replicate exactly the handling characteristics and driving experience of a real car caused primarily by sampling delays, processing time and data transfer,” explains Maarten van Donselaar, Cruden CEO. “This latency means that additional time elapses between the model output and the resulting feedback from the simulator when compared to the real vehicle. Minimizing latency is something of a holy grail in driving simulation and this research is the culmination of years of work to identify, measure and eliminate latency, to finally be able to put numbers behind the claims.”

To reduce perceived simulator-induced latency even further, Cruden predicts the visuals from the output of the vehicle model in order to synchronize them with the simulator’s motion platform and other feedback channels. The second step involves applying additional prediction algorithms to all system channels based instead on inputs using the available information about steering wheel position and velocity. This prediction can compensate for all delays that are not a result of the dynamics of the vehicle model, to effectively reach a state of zero simulator-induced latency.

This methodology was tested on two 6-DOF simulators: an automotive simulator with an off-board projection screen used for chassis development at Audi AG and a motorsport simulator with three screens mounted on the top platform and a Formula 3 car model.

“Cruden is a designer of the complete simulator architecture, with in-house experts not only for the hardware of the motion base, top platform and integration of vehicle mock-ups, but also the various software packages, including not only the rendering engine or pipe-line but also the operator and engineering GUI, motion cueing and its integration with third party engineering software and vehicle dynamics capabilities. This puts Cruden in an ideal position to lead latency research. The importance of the integration of all the complex simulator elements, in the design, manufacturing and commissioning phases, is often underestimated,” says van Donselaar.

For a fuller explanation of the approach, please follow [this link](#) to a longer web article. To request the technical paper, Implementing prediction algorithms to synchronize and minimize latency on a driving simulator" by van Doornik, Jelle, Brems, Willibald, de Vries, Edwin and Wiedemann, Jochen, please contact c.dumbreck@cruden.com.

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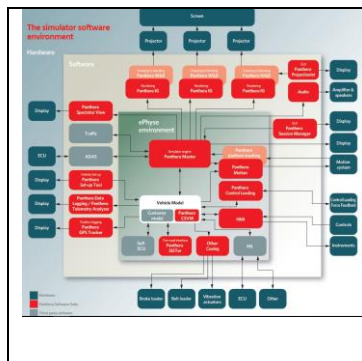
About Cruden

Cruden is the world's leading designer and manufacturer of professional, open architecture HIL/DIL driving simulators, simulator components and software. Originating from Fokker Aircraft Company in the late 1990s, Cruden was formed in 2006 and today serves the automotive, motorsport and marine industries. The company's complete simulator packages interface with SIMULINK-based customer vehicle models and include on- and off-board projection systems. Cruden also produces vehicle, road/track and tire models in-house. The company launched its open architecture Panthera software suite in 2015. www.cruden.com

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Images



An overview of the driving simulator system showing the complex network of input and output signals that can contribute to delays.