

Racing simulator with dynamic real-time Motion Control platform

The Real-Motion® driving simulator promises the feeling of undiluted motor racing. Not only because the driver takes their seat in an exciting vehicle, but also because the driving experience is simulated with such realism that the feeling of a real racing circuit is undeniable. The developer and manufacturer of Real-Motion® is Steel Construction and Robotic Machinery (S.Co.R.E). The company with headquarters in Amchit, Lebanon, specialises in dynamic motion simulators for various areas of application. The racing simulator is controlled by a PC- and EtherCAT-based control platform from Beckhoff. The implementation of the project was supported by Industrial Technologies S.A.L. (ITEC), the exclusive Beckhoff partner in Lebanon.

“Up until 2010 all driving simulators from S.Co.R.E were equipped with conventional PLC systems. However, with Real-Motion® we hit the technical limits”, explains Gaby Mike, Managing Director of Real-Motion. The greatest challenge of this project was to create a precisely synchronised Motion Control platform that reacts in real-time to the data from the external racing engine. Further requirements were the mathematical calculation of the customer-specific motion curves as well as the possibility to change the target points during operation of the simulator.

Higher data throughput over Ethernet

“The decisive criteria for choosing Beckhoff were the openness of the PC-based Control platform and the high data throughput”, says Jad Wehbe, Managing Director of Industrial Technologies. “The Beckhoff C6915 Control cabinet Industrial PC, which functions as the controller here, has an integrated Dual-Ethernet adapter. The synchronisation of several simulators on a server takes place over Ethernet. Only with fast Ethernet can we achieve data throughputs of up to 200 packets per second”, adds Gaby Mike. Thanks to the use of Ethernet and UDP packets, longer data cables and an unlimited number of network nodes can also be used.

The movement of the racing simulator is based on the interpolation between separate axes. Hence, each delay in their synchronisation causes an unwanted movement in various directions. EtherCAT, the real-time Ethernet bus system from Beckhoff, provides here with its Distributed Clocks function the conditions required for the highly precise synchronisation of the various drives.

The racing simulator from Real-Motion® promises exhilarating fun: it perfectly simulates the handling of a real race car.



Black line: demanded target points, green line: speed curve,
Red line: actual position

Adjustment of the servomotors to the customer-specific movement curves

In a vehicle simulator the target points of the movement must, on account of the actions of the operator, be driven to very quickly by the servomotors. The conventional setpoint generators in the TwinCAT NC PTP automation software have therefore been extended by the external setpoint generation which is a component of the NC PTP package. The calculations for the external setpoint generation were programmed in the standard PLC with the aid of structured text. Hence, it was simple to combine the complicated calculations of the customer-specific movements (optimised 7 segments) with the standard algorithms of the NC PTP. In this way it was simple to solve the very dynamic change of the target points. Due to the high-performance of the PC-based platform, the complicated mathematical algorithms for the new setpoint values can be computed in real-time.

Improved safety functions with TwinSAFE

Safety is an important aspect for motion simulators. If the emergency button is pressed, the simulator must stop immediately, taking into account the jerk and deceleration limits. “Thanks to the TwinSAFE modules EL6900 and EL1904 we are able to guarantee fail-safe functionality of the emergency stop button”, said the Managing Director of Real-Motion.

Further Information:

www.real-motion.com

www.iteclb.com