Steering and braking in-vehicle robots with CAN connectivity

Carmakers test their road vehicles intensively. This includes steering and braking tests. In order to achieve reproducible tests, it is necessary to use the same steering trajectories, for example. Human test drives could not do this with the same accuracy as automatic systems, especially if the car's suspension has been changed between tests or if two different types of vehicle are being compared. This is why the automotive industry is in favor of steering and braking in-vehicle robots.

OF COURSE, those robots need an optional connection to the CAN-based in-vehicle networks or to CAN-based measurement and data logger systems. “These CAN signals may simply be recorded by the robot, or they may be used for triggering purposes,” explained Dr. Steave Neads by Anthony Best Dynamics (ABD), one of the market-leading manufacturers of in-vehicle robots. The trigger is used to start robot actions (e.g. steering) or for vehicle control (e.g. increasing or decreasing speed). The CAN input enables external controllers to send commands to the robot (this is used by some researcher, who want to develop their own control algorithms to drive the vehicle); “In the future, the CAN output form the robot may be used to send commands to the vehicle’s own control system,” said Neads. “But this is not a typical use at the present time.”

A couple of years ago, ABD was faced with the task to develop a repeatable 'roll over' test demanded by US authorities. This imperative meant that ABD’s engineers designed a steering robot solution jointly with the motion control experts from Delta Tau. The robot is used to steer consistently through tests (including the roll over test) that determine a car’s stability and safety when avoiding a collision.

Recently, ABD introduced the SR15 steering robot. It is a lightweight geared steering actuator. The robot mounts on top of the standard vehicle steering wheel. The vehicle can still be driven normally with the SR15 robot installed. Whilst not as quiet as company’s direct drive steering robots (such as SR30, SR60, or SR60-Torus), the SR15 is suitable for durability and misuse applications.

Another manufacturer of steering robots is RMS Dynamic Test Systems. The FER 101 (for passenger cars) and 201 (for trucks) systems use the CAN inputs as external trigger to control motion sequences. With these robots it is possible to retrace steering movements up to 0,1°. CAN output data is used for recording of internal or external data (angle, velocity, torque, etc.). The CAN interfaces support data-rates up to 1 Mbit/s. The advantage of such steering robot systems is in the free definition of steering maneuvers by the user. Like that it is also possible to intensify the defaults for examinations of DIN/ISO or NHTSA (National Highway Traffic Safety Administration of USA) to check out the limits of the driving dynamics of the vehicle.

ABD also provides braking (BR1000) and other in-vehicle robots. The brake robot is designed to apply inputs to a vehicle's brake pedal for braking characterization and handling behavior measurement. It is typically used to apply step or ramped force or position inputs to the brake pedal. It can also be used to control vehicle deceleration when an accelerometer is used for feedback.

The AR series of accelerator pedal robots can be used either as a stand-alone product, or together with the steering robot and brake robot products. When it is used in conjunction with other robots it is possible to perform accurate and repeatable steering, braking and throttle control for vehicle dynamic testing.

In total, the company has installed more than 200 in-vehicle robots. In Germany, TJB Dynamische Messtechnik sells these robots. The company provides integration and application services as well as CAN data acquisition products such the QIC sensors from Caetec. Another offered product is the Varioview-7 touch-display with data-logger function. ABD has also representatives in America (USA, Mexico, and Brazil) as well as in Far East (China, India, Japan, Korea, etc.).