

Team Mojavaton

Driverless Vehicle Relies on Galil for Precise Steering Control

Imagine a car running a 60-mile race full of intersections, traffic, turns, parking challenges and straight-aways and doing so without a driver or remote control. That was the task for Team Mojavaton, which finished as a semi-finalist in the DARPA Urban Challenge held late 2007 in Victorville, CA.

DARPA is the central R&D organization for the Department of Defense which initiated the 2004 Grand Challenge event that encouraged private development of unmanned and/or remotely controlled technology and vehicles for critical national security applications. Their new Urban Challenge presented even more twists and turns.

“Vehicles competing in the Urban Challenge have to think like human drivers and continually make split-second decisions to avoid moving vehicles,” explained Dr. Norman Whitaker, Urban Challenge Program Manager.

For this challenge, Team Mojavaton took its Nissan Xterra, the “The White Knight,” and modified the sensors and electronics. Team Leader Jim Crittenden, said the White Knight can identify and track other vehicles in motion while predicting their future path so that it can pass slow moving cars, understand traffic in intersections, and be able to weave through a maze of parked cars.

Handling the White Knight’s critical and throttle functions is Galil’s DMC-1416 single axis Ethernet motion controller. Crittenden relies on the Galil controller because of its superior precision and ability to respond instantly to multiple sensors and inputs.

With the White Knight, sensors deliver input gained from its GPS system, laser range finders, cameras and radar. All of these are reporting where the car is located on the earth and what’s ahead of it, so that the systems’ dual core microprocessor-based computer can digest all of the data in order to determine 1) how fast it should be going, and 2) what position should the steering wheel be in?

Since these decisions are made at ± 20 times/second, Crittenden says the Galil controller is ideal for the task. “What makes Galil great is 1) it communicates over Ethernet; and 2) it can report position to us *constantly*. Some other controllers can’t tell you where they are until they have made and finished the move. The Galil controller can tell you on the fly.”



Galil helps steer unmanned car in Defense Advanced Research Projects Agency Urban Challenge.

Crittenden also praised Galil’s position tracking mode: “With other controllers, once you say I want you to move to this position, it can’t accept anymore messages until that move is completed. If I said I want you to go to +10 degrees, and while it is making that move, I say let’s go to 12 degrees, Galil can make that move while it is still on the go from the first command. Other controllers will ignore that second message.”

“With Galil, I can send it as many positions as I want. I can stuff messages into it as fast as I can and as soon as it gets a new position from me (even though its not finished doing its previous move), it’ll say, he’s changed his mind again, he wants to go to 12 degrees, so it forgets about the prior message (even though it’s not done) and moves on to the newest move message.”

“Without this capability you would have to carefully manage those messages. For example, if there is a car in front of you and you’re turning into it, you have to wait until that move is completed before you send it another move to change direction in order to avoid the collision. With Galil, I don’t need to worry about that.”

To remain competitive, Team Mojavaton receives assistance from several sponsors in addition to Galil. “Galil is one of those that we would call on Day One and extend the invitation to. Their system is that good.” ■

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