Lane-swapping helps autonomous vehicles avoid collisions, study finds

January 28 2013

Autonomous, driverless vehicles look set to hit the streets in the near future and become increasingly common, so UK researchers have investigated algorithms that could help developers include escape manoeuvres to allow such vehicles to quickly and safely switch lanes to avoid collisions with other road users.

Writing in the aptly named *International Journal of Vehicle* Autonomous Systems, Matthew Best of the Department of Aeronautical and Automotive Engineering at Loughborough University, in Leicestershire, discusses the optimisation of a vehicle's standard brake, acceleration and steering control inputs in the context of avoiding collisions. He has devised a computer simulation that allows all those parameters to be optimised concurrently during a safety manoeuvre and to show how speed reduction and swapping lanes might be carried out by an autonomous vehicle.

The optimal rapid lane-change would inevitably be an aggressive, high "g" manoeuvre that would destabilise the vehicle, and additional computing power would be needed to act quickly to correct under steer and other issues that arise during and after such a vehicle movement. The high-speed lane switch would likely be rarely used in a real-world autonomous drive, but could, in exceptional circumstances, allow driverless or robot vehicles to be safer on roads that which they share with other such vehicles and vehicles with human drivers.

Best points out that simulations at 70 mph (the UK national speed limit

on motorways) reveal that braking alone would not lead to a safe outcome in many situations, so a lane swap would almost certainly be needed, assuming there were an empty lane for a vehicle to move into. A lane-change would in the best circumstances move the vehicle to safety in half the distance as braking at that speed.

The researchers concede that at present the limitations of on-board computing power in autonomous vehicles and the need for high-speed data streams measuring real tyre friction coefficients and more means that his algorithm is limited to the simulation at present. However, it paves the way for developing more powerful, safety aware driving systems for such vehicles.

More information: Optimisation of high-speed crash avoidance in autonomous vehicles, *Int. J. Vehicle Autonomous Systems*, vol 10, issue 4, pp 337-354.

Provided by Inderscience Publishers