Safer vehicles brake and steer out of harm's way

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Scientists at Chalmers University in Göteborg, Sweden, are working with a team at car manufacturer Volvo to develop a vehicle control system that can take over steering and breaking when it detects an imminent collision. Details of the computer algorithm on which the team is working that can make split-second decisions on behalf of the driver and so reduce the risk of serious road accidents is described in the International Journal of Vehicle Safety.

Many vehicles now have parking sensors, some can even spot a suitable parking space and automatically steer into the space, many have traction control that reduces the chances of the driver losing control when conditions are slippery or on rough terrain. Several companies are even developing autonomous cars. Mattias Brännström and Erik Coelingh of Volvo's Department of Safety Electronics and Functions are working with Chalmers' signals and systems expert Jonas Sjöberg on new safety technology for cars that would not replace the driver but could make driving safer.

Autonomic control of a vehicle's steering or braking systems based on the vehicle assessing the speed and direction of nearby vehicles could significantly reduce the number of often-fatal road accidents. Indeed, some cars already have active safety systems that work with either braking or steering to avoid collisions. However, Brännström and colleagues recognize that existing systems are often predefined to use either braking or steering to avoid accidents of a certain type, even though both types of actions may be applicable. This contribution

considers an algorithm which can be used in general traffic situations not only to decide if an intervention is necessary to avoid an accident, but also to select the most suitable type of intervention, steering or braking.

They suggest that a vehicle using a computer algorithm to select intervention type when a risk arises based on the car's sensor readings could make a much more appropriate decision to avoid an imminent collision. Braking or steering is then applied appropriately with very short response times.

The researchers have successfully tested their algorithm on four common accident types. First, rear-end accidents where the vehicle detects a lead vehicle and decides when automatic steering or braking should be applied to avoid a collision. Secondly, the single-target straight crossing path collisions where the decision depends on the speed of both vehicles as to whether braking or steering to avoid the collision would work best. Thirdly, collision scenarios with oncoming vehicles. Finally, situations where multiple obstacles need to be considered. The algorithm can also be adjusted for additional factors, that the vehicle be kept on the road regardless, which would be especially important when driving on bridges, mountainous terrain with precipices and cliffs or at the edge of a body of water.

There are inevitably limitations to the response of the algorithm in the event of an imminent collision, and certain accident types that the team has not yet incorporated into its programming. However, they conclude that the system could allow for the development of a general collision avoidance system that assists the driver in common collision types and makes use of the best available intervention type, whether braking or steering out of harm's way.

More information: Mattias Brännström; Erik Coelingh; Jonas Sjöberg. "Decision-making on when to brake and when to steer to avoid

a collision." in *Int. J. Vehicle Safety*, 2014, 7, 87-106. DOI: 10.1504/IJVS.2014.058243