Abstract

Recent industry developments in automated vehicles have focused on ensuring that vehicles can drive autonomously in a variety of traffic conditions. It is expected however, that in certain scenarios vehicles will need to handover control to the (human) driver for a long period. In response, there has been increasing focus on managing transition areas, where multiple vehicles reach their functional limits and must perform a Transition of Control (handover vehicle control to the driver). In the absence of a traffic management system these transition areas can become hazardous with numerous vehicles performing transitions of control and in some cases minimum risk manoeuvres (where the vehicle comes to a stop).

This research explores two traffic management systems implemented to reduce the negative effects of transitions of control in cooperative autonomous vehicles entering transition areas. The transition areas being examined are the planned and unplanned blockages of an exit lane in a four arm intersection. To achieve this, an extensive literary review was conducted in which these two future transition areas were identified as having limited research done on them. Two road networks were created to replicate the traffic conditions at both planned and unplanned lane closures, and two management systems were developed to ensure that vehicles can traverse the networks smoothly. Finally the intersection was simulated at multiple vehicle penetrations and congestion levels.

This report evaluates the simulations conducted. For an unplanned closure, this report fails to identify a satisfactory traffic management system to increase safety and efficiency. The proposed system increased the time to collision (TTC) incident rate by 14% and decreased the mean trip duration by 10%. For a planned closure in the exit lane of an intersection, the proposed traffic management system does improve the performance of the intersection in terms of safety and efficiency, TTC incidents decreased by 11% and the mean trip duration decreased by 17%.