Predicting driver intent by means of pattern recognition based on gaze behaviour

Firas Lethaus, Martin R.K. Baumann, Frank Köster, & Karsten Lemmer
German Aerospace Center (DLR)
Braunschweig, Germany

Abstract

Advanced Driver Assistance Systems (ADAS) should correctly infer the intentions of the driver from what is implied by the incoming data available to it. Gaze behaviour has been found to be an indicator of information gathering, and therefore could be used to derive information about the driver's next planned objective in order to identify intended manoeuvres without relying solely on car data. Previous work has shown that significantly distinct gaze patterns precede each of the driving manoeuvres analysed indicating that eye movement data might be used as input to ADAS supplementing sensors, such as CAN-Bus, laser, or radar in order to recognise intended driving manoeuvres. Drivers' gaze behaviour was measured prior to and during the execution of different driving manoeuvres performed in a dynamic driving simulator. The efficacy of Artificial Neural Network models in learning to predict the occurrence of certain driving manoeuvres using both car and gaze data was investigated, which could successfully be demonstrated with real traffic data (Lethaus, 2009). Issues considered included the amount of data prior to the manoeuvre to use, the relative difficulty of predicting different manoeuvres, and the accuracy of the models at different pre-manoeuvre times.

Introduction

Human error is the main cause of more than 90% of traffic accidents (German Federal Statistical Office, 2007), which presents an opportunity to the automotive industry to tackle this problem via exploiting Advanced Driver Assistance Systems (ADAS). In general, ADAS should adapt to different situations and manoeuvres thereby increasing its reliability. The use of manoeuvre recognition can help to avoid mismatches between the driver's intention and the system's reaction. In a situation where a driver intends to change lanes in order to overtake the lead car an incipient collision warning may confuse and irritate the driver as this would be a false alarm. The extent to which the driver perceives this confusion or action intrusion is strongly linked to the way the false warning is being presented. Haptic warnings in the form of short duration brake have been demonstrated to be more effective than acoustic warnings (Dingus, Hulse, & Barfield, 1998; Suzuki & Jansson, 2003). However, false haptic warnings distract the driver and can lead to additional driving errors, thus, negating the benefit of such systems. Therefore, a Collision Warning

In D. de Waard, N. Gérard, L. Onnasch, R. Wiczorek, and D. Manzey (Eds.) (2011). *Human Centred Automation* (pp. 35 - 47). Maastricht, the Netherlands: Shaker Publishing.