

Analysis of head pose as an indicator of drivers' visual attention

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Abstract

Estimating the direction of visual attention is very important to predict driver's distraction, assess his/her situational awareness, and improve in-vehicle dialog systems. Tracking eye movement can be an accurate measure to identify the exact location of the gaze of the driver. However, robustly measuring gaze in a driving environment is challenging due to changes in illuminations in the vehicle, and changes in head poses from the drivers. This level of accuracy in gaze detection does not need to be perfect to understand the visual attention of the driver. Head pose provides a coarse estimate of the gaze direction, which might be helpful in determining the visual attention of the drivers for most applications. In fact, many related studies have used head pose to infer where the driver is looking. To what extent can the head pose be a useful indicator of visual attention? This paper analyzes the relation between head pose and visual attention by asking drivers to look at predefined locations in the windshield. We are interested in understanding how much the head pose deviates from the actual gaze of the driver and how much the head pose varies for a given gaze direction. We observe that the deviation is much higher in the vertical direction compared to the horizontal direction, making it more difficult to estimate vertical gaze. We observed that as the direction of attention is skewed further away from the frontal direction, the deviation between gaze direction and head pose increases. We estimate the variation in the bias as function of windshield's location, which will provide useful information about head movement of the driver to guide future in-vehicle safety system.

Keywords

In-vehicle speech technology, visual attention, active safety