Cues from facial expressions for emotional interfaces

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Abstract

Emotion detection provides a promising basis for designing future-oriented human centered Human-Machine Interfaces. Affective Computing can facilitate human-machine communication. Such adaptive advanced driver assistance systems (ADAS) which are dependent on the emotional state of the driver can be applied in cars. The following pilot study evaluated automatic recognition of emotions using facial expressions with $N = 1$ subjects. In contrast to the majority of earlier studies that only used complex and static recognition methods, a new non-complex dynamic approach for detecting emotions in facial expressions directly in a driving context is proposed. By analysing the changes within an area, defined by a number of dots that were arranged on participants' faces, variables were extracted to classify the participants' emotions. A special pattern-recognition algorithm detects the dots according to the Facial Action Coding System. The results of our novel way to categorize emotions lead to a discussion on additional applications and limitations that frames an attempted approach of emotion detection in cars. Implications for further research and applications are outlined.

Introduction

Drivers can be angered by other road users, can be nervous due to complex situations or just feel happy because all the traffic lights seem to be green. En route, several events can cause the driver to feel intense emotions. The effects of other influences such as alcohol, fatigue, smoking, and the use of mobile phones during driving have been shown in several studies, e.g., Crancer et al. (1969) and Weiler et al. (2000). The effect of emotions, however, has not been studied comprehensively. Accident reports usually do not contain information about a drivers' emotional state prior to an accident. Reports on the influence of emotions are mostly derived from newspaper articles or interviews and cannot be compared to empirical methods (Mesken, 2006). However, Mesken and her colleagues reported that participants who reported anger drove faster and exceeded the speed limit more often than participants who did not report anger (Mesken et al., 2007). Nesbit et al. (2007) indicate that anger is associated with aggressive driving.

This paper is about a pilot study which describes how a driver's facial expressions can be detected, and what kind of methods can be applied to extract emotions that