TEST OF A NEW DROWSINESS MONITORING SYSTEM BASED ON IMAGES OF THE EYE

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Abstract Text:

The involvement of drowsiness in a large number of accidents, whether in private or professional activities, makes its detection a major societal issue to improve public health and safety.

Drowsiness is the intermediate state between wakefulness and sleep. It is characterized by impairments of performance, e.g. slow reaction time, loss of vigilance, and deficits in information processing; which can be very dangerous, especially in the case of driving. Moreover, all persons are affected by drowsiness but some people have a higher propensity than normal to drowsiness. Indeed, 6 to 11% of the population suffer from excessive daytime sleepiness. There is thus an obvious need for a device able to detect drowsiness in an objective way, and to avoid tragic accidents.

We have thus developed a new, automatic, real-time drowsiness monitoring system based on the physiological state of a subject. This system uses ocular parameters extracted from images of an eye to determine a level of drowsiness on a numerical scale. Oculography is indeed recognized as one of the most significant and practical technique to characterize drowsiness. In order to “validate” our system, we compared, for a number of subjects, the level of drowsiness determined by our system to two references: (1) the level of drowsiness obtained by analyzing polysomnographic signals, and (2) the performance of these subjects in the accomplishment of a task. We thus realized an experiment in which 25 subjects were asked to perform several reaction time tests in different sleep-deprivation conditions. Results show that our system is well correlated with both references. Moreover, it has the advantage of being non-invasive, usable in any condition, and of requiring no intervention from the subject. It has thus significant potential for reliably quantifying the level of drowsiness of subjects accomplishing a task and ultimately for preventing drowsiness-related accidents.