Image Based Eye Saccadic Velocity Estimation

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Research Area: Embedded Signal and Image Processing Research Lab: Instrumentation & Signal Processing

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Research Abstract:

Alertness in human beings is an essential factor in many safety critical applications. The reduction in level of alertness of human operators may lead to accidents and catastrophes. Development of a system to detect the loss of alertness can be useful in giving feedback and preventing such conditions.

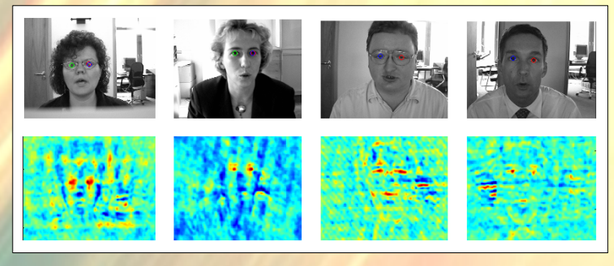

Fig. 1: Eye detection results in BioID database

The variations in alertness level is reflected in ocular parameters. Ocular parameters like percentage closure of eye (PERCLOS), blink frequency, eyelid movement, and saccadic velocity are related to the level of alertness. The Saccadic Ratio (SR), which is defined as the ratio of saccadic peak velocity to saccadic duration can be used an index for classification of alertness level.

Image based method is selected for the present study due to the noninvasive and non-contact nature. The eye velocity can be measured from a camera placed at a distance without causing any disturbance to the user.

Saccades usually occurs in small time durations, it has been estimated that a minimum temporal resolution of 300 Hz is required for the accurate estimation of saccadic parameters.

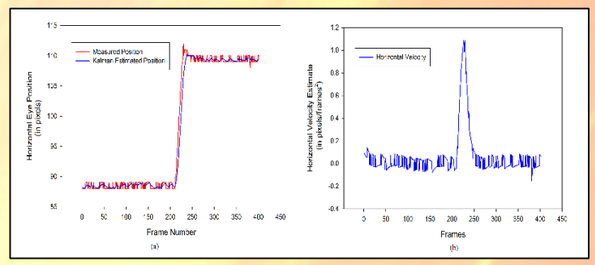

Fig. 2: Estimated eye position and saccadic velocity profiles

The accurate estimation of saccadic velocity in real-time requires high speed parallel platforms. Iris center is estimated accurately by the proposed two stage algorithm.

Publications and/or patents if any:

[1]A. Dasgupta**, A. George**, S. L. Happy, and A. Routray, "A Vision-Based System for Monitoring the Loss of Attention in Automotive Drivers," *IEEE Trans. Intell. Transp. Syst.*, pp. 1–14, 2013.

[2]A. Dasgupta**, A. George**, S. L. Happy, A. Routray, and T. Shanker, "An on-board vision based system for drowsiness detection in automotive drivers," *Int. J. Adv. Eng. Sci. Appl. Math.*, vol. 5, no. 2–3, pp. 94–103, Aug. 2013.

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