It's Break Time: An Iris-Based Eye Fatigue Monitor

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Nowadays people, especially the young, spend more and more screen time browsing web pages, playing games, or chatting with friends on smart phones. The intensive eye usage is causing visual fatigue or eyestrain, which may lead to headaches, allergies and even partial loss of vision and cancer. The main objective of this project is to build a visual fatigue estimation and alert system for smart phone users based on eye status monitoring. First, it was found that the pupil size, which is the inner diameter of the iris, is the best indicator for visual fatigue caused by the excessive use of smart phones. This is different from many other driving fatigue detection systems where eyelid size and eye blink rate are best indicators. In order to acquire this fatigure indicator, an eye localization framework combining Haar-based AdaBoost and correlation filter-based tracking was build. Then pupil and iris can be precisely measured in the detected eyelid regions by Hough transform based algorithms. The relative pupil size, which is defined as the ratio of pupil diameter to iris diameter, is used as a robust indicator of pupil size to exclude the effect of head motion. Then, a novel SVM-based model is trained to predict the degree of visual fatigue from the continuously estimated relative pupil sizes. Extensive experiments show that the designed system which combines Haar-based AdaBoost and correlation filter for pupil and iris monitoring and SVM for visual fatigue classification is effective for eyestrain prediction for prolonged smart phone users.

Awards Won:
Second Award of $1,500
Association for the Advancement of Artificial Intelligence: Honorable Mention