Real Time Estimation of the Eye Pupil Center by Using Deep Learning Methods

Thesis Defence Presentation

by

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Abstract:

With the rapid development of technology, estimation of the eye pupil center has become one of the most frequently studied subjects in the field of computer vision in recent years. Systems working on detecting human eye pupil center can be used in many human-computer interaction applications in our daily life. Examples of such applications include driver attention tracking systems, eye-controllable systems for disabled people, human gaze estimation systems, fatigue detection systems and sleep detection systems.

Commercially available systems that detect eye pupil center generally require a specialized hardware. In the literature, studies developed as an alternative to these systems that require a specialized hardware are becoming popular in this field. In this work, eye pupil center was estimated by using both a weighted average method and a real time method by using a single webcam without any need of a specialized hardware. The proposed method uses CNN from deep learning algorithms. Four different scale mage patches gathered from the eye region were combined and fed into AlexNet in order to train the model. The class label information required for training the images was determined according to the eye pupil center locations. In the test phase of the system, four different algorithms were applied: weighted average, brute force search based random point, optimization based random point and two stage optimization based random point.

According to the experiment results, the system reached an average rate of 12,1 FPS on the BioID dataset with optimization based random point method. Our results achieved more success then similar state of the art methods. The highest success rate was obtained by two-stage optimization based random point method.

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Place: Meeting Room, Department of Computer Engineering, GTU