

Abstract

Development of an Eye Tracking System for Ophthalmic Diagnosis, Treatment and Surgery

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This thesis presents the development of a real time eye tracking system that helps ophthalmologists to perform more convenient diagnosis, treatment, and surgery. This research starts with a comparative study between three real-time image processing techniques for an eye tracking system. The techniques tested in this research are a projection-data based method, the circular Hough transform, and the template matching method. The strength and weakness of each technique is revealed through computer simulations. This research also proposes a new technique named a scale-variable template matching technique for real-time human eye tracking. The proposed technique is a combination of a conventional template matching technique and the circular Hough transform. Firstly, the template matching technique is used for tracking the patients eye (the pupil and iris). The circular Hough transform is then applied to the best matching region to acquire the size of the eye. When the scale of the eye varies, the size of the template is equally varied. In this way, a scale-variable template matching technique is realized and implemented.