

# Gaze Estimation and Tracking for Human Computer Interface

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## Abstract

The objective of gaze estimation is to determine where the user is looking at on a monitor screen. Gaze tracking offers a convenient means of human-machine interface for disabled people that have lost total control of their limbs. Tracking gaze point in real time helps monitor the level of driver alertness to prevent car accident from happening. This talk presents a gaze estimation and tracking technique that can be applied to various applications such as gaze-based web browsing and detect driver drowsiness for driver assistance. Most existing commercial gaze estimation systems require special devices such as infrared illuminators. The proposed approach estimates and tracks the user's eye and head movements in real time with a regular webcam, without infrared illuminators. The need of infrared illuminators poses limitations to practicability as the distance is limited. The proposed gaze estimation technique has a better potential to be deployed in practice. Gaze estimation begins with face detection followed by pupil center detection. Eye states such as closed, half-closed, and open can also be detected. The proposed approach works in real time at different distances from the camera and under various lighting conditions.

**Seong G. Kong** received the B.S. and the M.S. degrees in Electrical Engineering from Seoul National University, Seoul, Korea, in 1982 and 1987, respectively. He received the Ph.D. degree in Electrical Engineering in 1991 from the University of Southern California, Los Angeles, California. He was Associate Professor of Electrical Engineering at Soongsil University, Seoul, Korea from 1992 to 2000. He served as Department Chair from 1998 to 2000. In 2000, he joined School of Electrical and Computer Engineering at Purdue University, West Lafayette, Indiana as a visiting professor. From 2002 to 2007, he was an Associate Professor at the University of Tennessee, Knoxville. Currently Dr. Kong is an Associate Professor and Graduate Program Director of Electrical and Computer Engineering Department at Temple University in Philadelphia, Pennsylvania. He has been summer faculty research fellow at Naval Research Laboratory, Washington, DC since 2006. He received several awards including the Most Cited Paper Award for *Computer Vision and Image Understanding* in 2007 and 2008 and Honorable Mention Paper Award from American Society of Agricultural and Biological Engineers in 2004. His work on hyperspectral imaging was featured in *Photonics International Magazine* in 2004. He is a Senior Member of IEEE and served as an Associate Editor of *IEEE Transactions on Neural Networks*. His recent work on terahertz signal enhancement was featured in March 2010 issue of the *Electronics Letters* journal.