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# Gaze Tracking for HCI

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## Abstract

Digital camera devices are getting cheaper at better resolutions. So video based gaze tracking will be soon available for nearly no costs. There is hope in the HCI research community that gaze tracking can become a new interaction modality for the future. My research tries to find out how the users can benefit from this technological development.

## Keywords

Gaze tracker, multimodal interaction.

## Problem Statement and Research Question

Nature designed the eye as an input channel for visual information and the eyes do a lot of unconscious movements. It is not clear how much additional control tasks can be put on the eyes.

With the gaze as a pointing device the users could get rid of the mouse, which is a big advantage especially for mobile devices. Gaze input also promises to be really fast.

The questions of my research are: How can gaze tracking assist the user? Can gaze tracking be a substitute for pointing devices? Can gaze tracking make the computer work more comfortable?

## Approach and Methodology

A commercial gaze tracker was bought by the university. It has an application programming interface,

so testing environments for measurements and prototypes of gaze-aware applications can be developed. Testing environments and prototypes are used to conduct user test.

The development of prototypes proves something is possible. User tests can measure benefits and acceptance. There is no way to avoid prototypes and user tests.

### **Related Work**

Research on eye movements exists for already hundred years, but mostly done by psychologists. A good overview on gaze tracking for HCI is given in: Eye Tracking Methodology: Theory and Practice [1].

The scientific work done up to now was influenced by Zhai's MAGIC Pointing [2]. Zhai et al. suggested placing the mouse cursor at the gaze position in the moment of a first mouse move after text input. The deliberate use of the gaze position avoids the Midas touch problem.

Another research field was inspired by Campbell's reading detection [3]. The algorithm introduced makes it possible to create message boxes which disappear after being read or which have to be read before it disappears.

### **Preliminary Results**

In my first experimental setup the mouse move in Zhai's MAGIC Pointing was replaced by a mouse touch. The initiated mouse movement causes an overshooting of the target which can be solved by a touch sensitive mouse.

Users feel comfortable when setting the mouse cursor

with the gaze and a touch sensitive mouse. They believe to be faster with the eyes even if they aren't.

It seems there is a mental notion of the position of the mouse pointer like there is a mental notion for the position of the hand. To hit a target the gaze and the mouse move independently to meet in the target.

### **Conclusions and Future Steps**

The experiments done with the gaze tracker and a touch sensitive mouse were encouraging. The next step will be to use a sensor or a key on the keyboard.

The aim is to find out which feedback for the gaze position is appropriate and how to interact with the standard widgets like a scrollbar.

If this all works, the vision of a computer without mouse is close to reality.

It would be nice to cooperate with scientist investigating novel interaction methods and especially doing research on gaze tracking hardware and algorithms, for example for outdoor use.

### **References**

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