**Docket #:** S19-512

# Improved portable eye tracking system

Stanford researchers have developed a portable hybrid frame-event based near eye gaze tracking system that has a superior speed while using a lower data bandwidth. They demonstrated real time results for gaze-tracking.

Portable camera systems for gaze tracking are limited in their speed because of the high bandwidth and power needed to send and process images. This means traditional systems have to sacrifice both accuracy (how well the eye is tracked) and speed (how fast it is tracked). With this invention, accuracy and speed are no longer compromised: this tracking system offers remarkable update rates beyond 10,000 Hz while being as accurate as high-end desktop mounted commercial eye trackers.

This new method is based on a system that simultaneously acquires conventional frames at a low rate (~30 Hz) and also "events," which sense when the eye moves across each individual pixel. Events are reported asynchronously, as soon as a change in location of the pupil occurs. With the introduction of those new sensors, the researchers developed an online 2D pupil fitting method that updates in real-time a parametric model of an eye from one or more events. It was designed to provide very accurate tracking of visual gaze at an unprecedented update rate.

High fidelity, expeditious, eye tracking, and portability are critical in many applications such LASIK eye surgery, augmented and virtual reality, human-computer interactions, advertisements, psychological studies, medical pathology and even sports analysis.

**Stage of Development:**

With this binocular prototype, state-of-the-art precision of 0.5 degree of visual angle error in a 121 fixation point task was demonstrated in addition to the advantages offered by the event based nature of the data. Further research will be ongoing to make the device even more compact and to potentially embed it on a low-power

mobile platform.

## Applications

- LASIK eye surgery
- Augmented and virtual reality
- Human-computer interaction
- Advertisements
- Psychological studies
- Medical pathology
- Sports analysis

## Advantages

- At least 10x faster
- Very powerful efficient
- Accurate
- Not limited by bandwidth -- like other current portable systems
- Higher resolution

## Publications

- Angelopoulos, A., et al. Event Based, Near Eye Gaze Tracking Beyond 10,000Hz

## Patents

- Published Application: WO2021174106
- Published Application: 20230120519
- Issued: 12,066,625 (USA)

## Innovators

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