DETERMINATION OF SACCADE LATENCY DISTRIBUTIONS USING VIDEO RECORDINGS FROM CONSUMER-GRADE DEVICES

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Main Contribution: A method that enables measurement of saccade latency outside of the clinical environment.

Motivation & Background

Accurate tracking of neurocognitive decline remains an ongoing challenge due to the lack of an objective, quantifiable biomarker.

Gaze Estimation Algorithm

Convolutional Neural Network for gaze estimation trained on data collected from iPhones and iPads

Horizontal Eye Movement Modeling



- A way to address this problem is by **monitoring changes in a** set of physiological variables obtained through portable platforms, such as laptops and smartphones, that correlate with disease progression ("digital biomarkers").
- One such digital biomarker is **saccade latency** the time delay between the appearance of a visual stimulus and the eye movement towards the stimulus.

We propose a novel method to measure saccade latency using a smartphone camera and report on the saccade latency distributions of individual subjects.

Materials & Methods

Visual Stimulus

Results

More than 900 saccade latency measurements in each of four healthy subjects show that intra-subject variability can be substantial and that the shape of the distributions differ across subjects.

Ten healthy subjects were recorded with a smartphone camera while performing a visual fixation/stimulus task displayed on a laptop.





Saccade latency measurements per individual across time show that the mean and the standard deviation change noticeably across recording sessions.



Time(ms)

The task was repeated 40 times per trial with randomized stimuli.

Pipeline for Calculation of Saccade Latency



Conclusions

- We present a method to measure saccade latency outside of the clinical environment using a consumer-grade camera.
- We collected over 11,000 measurements and observed that normal subjects have distinctive saccade latency distributions.

G. Saavedra-Peña, H.-Y. Lai, V. Sze and T. Heldt, "Determination of Saccade Latency Distributions Using Video Recordings from Consumer-Grade Devices", in IEEE Engineering in Medicine and Biology Society Conference (EMBC), 2018.

H.-Y. Lai, G. Saavedra-Peña, C. Sodini, T. Heldt and V. Sze. "Enabling Saccade Latency Measurements with Consumer-Grade Cameras", in IEEE International Conference on Image Processing (ICIP), 2018.