EyeDroid: An Open-Source Mobile Gaze Tacker on Android for Eyewear Computers

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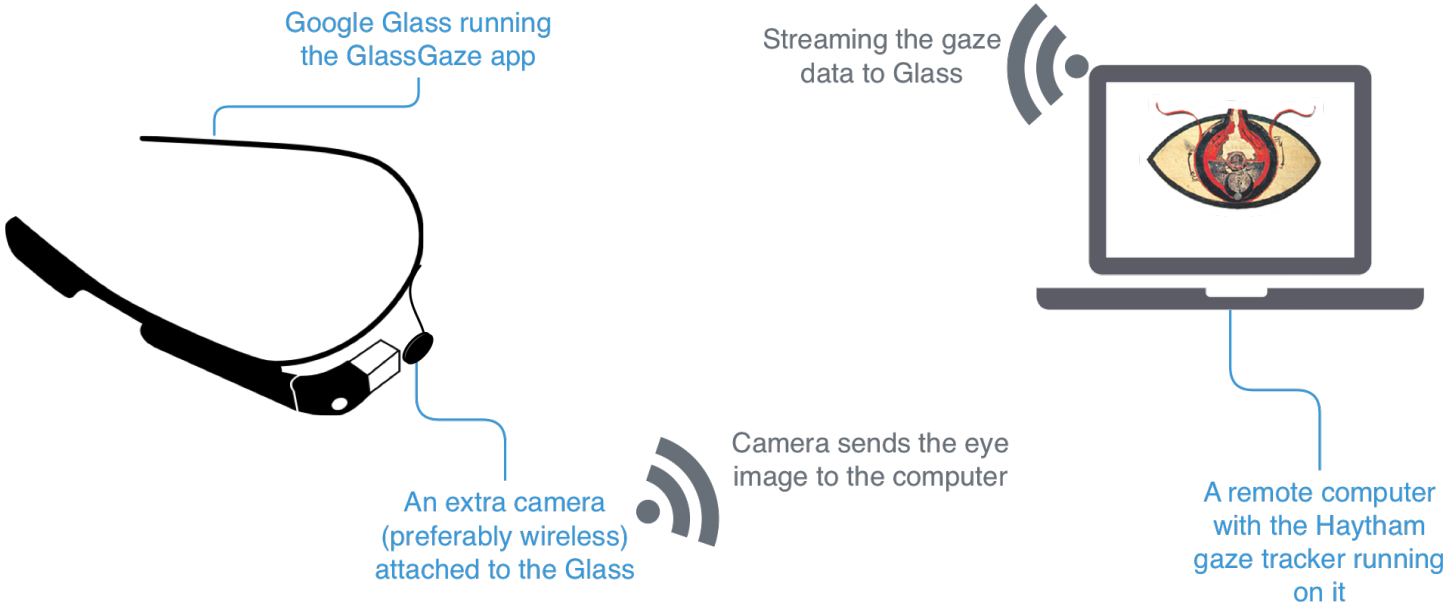
Why gaze-based interaction on eyewear computers?

- Need for touch-less interaction
  - Interaction on the move
  - In parallel with real world tasks

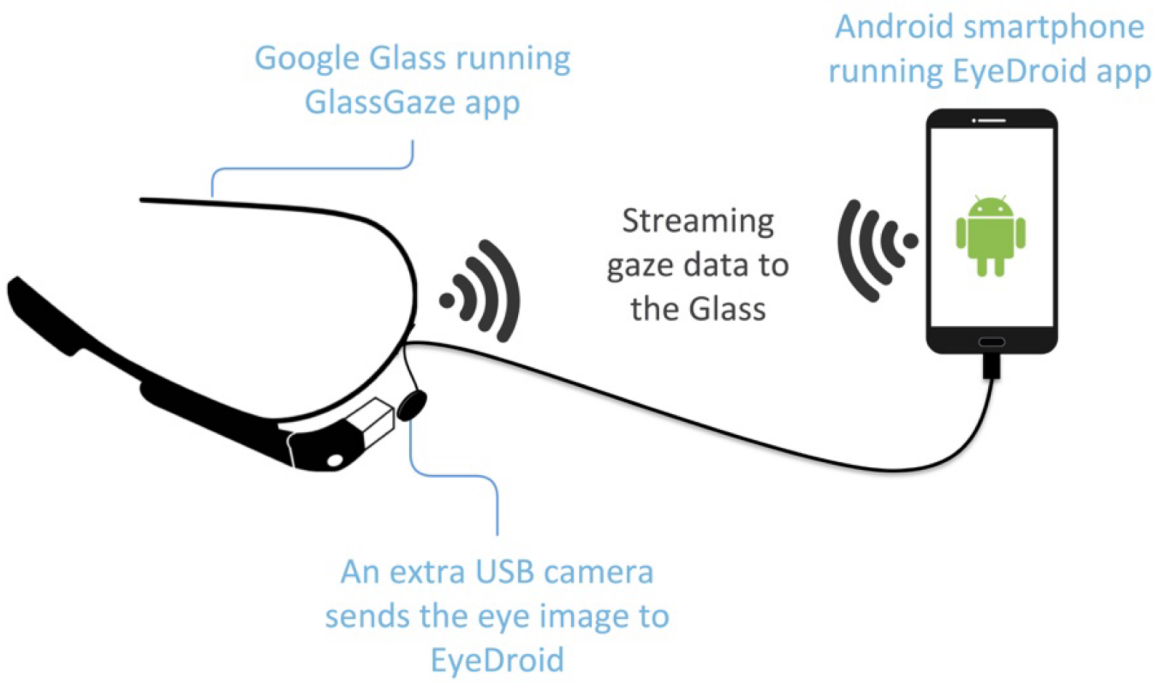
- The eyewear device as a platform for gaze-tracker

Previous work	Hardware platform
OMG! (Lukander et al, 2013)	Laptop in backpack
OpenEyes (Li et al, 2006)	Laptop in backpack
A cheap portable eye tracker (Ferhat et al. 2014)	Raspberry Pi
iShadow (Mayberri et al, 2014)	Microcontroller

Motivation

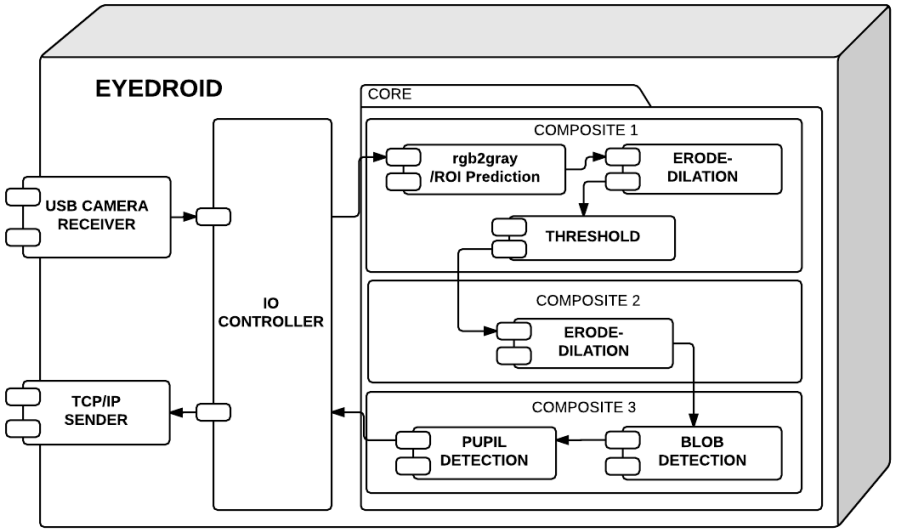

Google Glass running the GlassGaze app
Streaming the gaze data to Glass
An extra camera (preferably wireless) attached to the Glass
Camera sends the eye image to the computer
A remote computer with the Haytham gaze tracker running on it

Idea

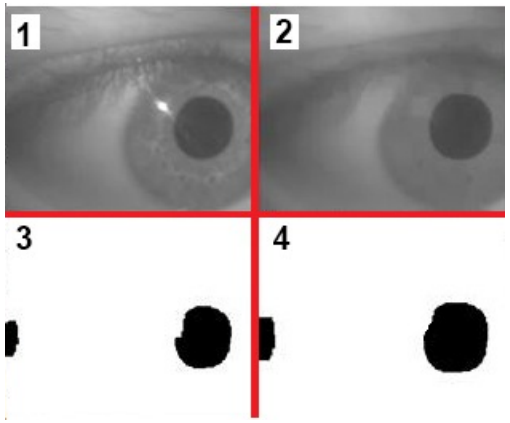

Google Glass running
GlassGaze app
Android smartphone
running EyeDroid app
Streaming
gaze data to
the Glass
An extra USB camera
sends the eye image to
EyeDroid

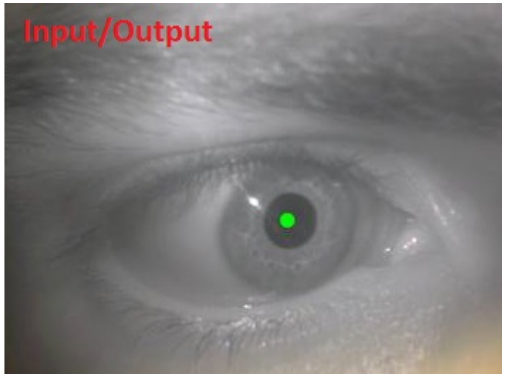
EyeDroid design

- Pipes & filters design pattern for running parallel tasks
- Java Lightweight Processing Framework as library for scheduling tasks on processor
- Composite design pattern for combining tasks
- Android NDK support for C++ instead of the regular Android SDK for java
- Frame rate: 6.4 fps



Simple pupil tracking





Evaluation: Accuracy of gaze tracking

- 10 Participants
- 4-point calibration
- Task: Looking at 15 markers (3rows X 5Columns) on the HMD
- Smartphone: LG-G2, 2 GB RAM, Quad-core 2.26 GHz processor, an Adreno 330 GPU & running Android 4.4

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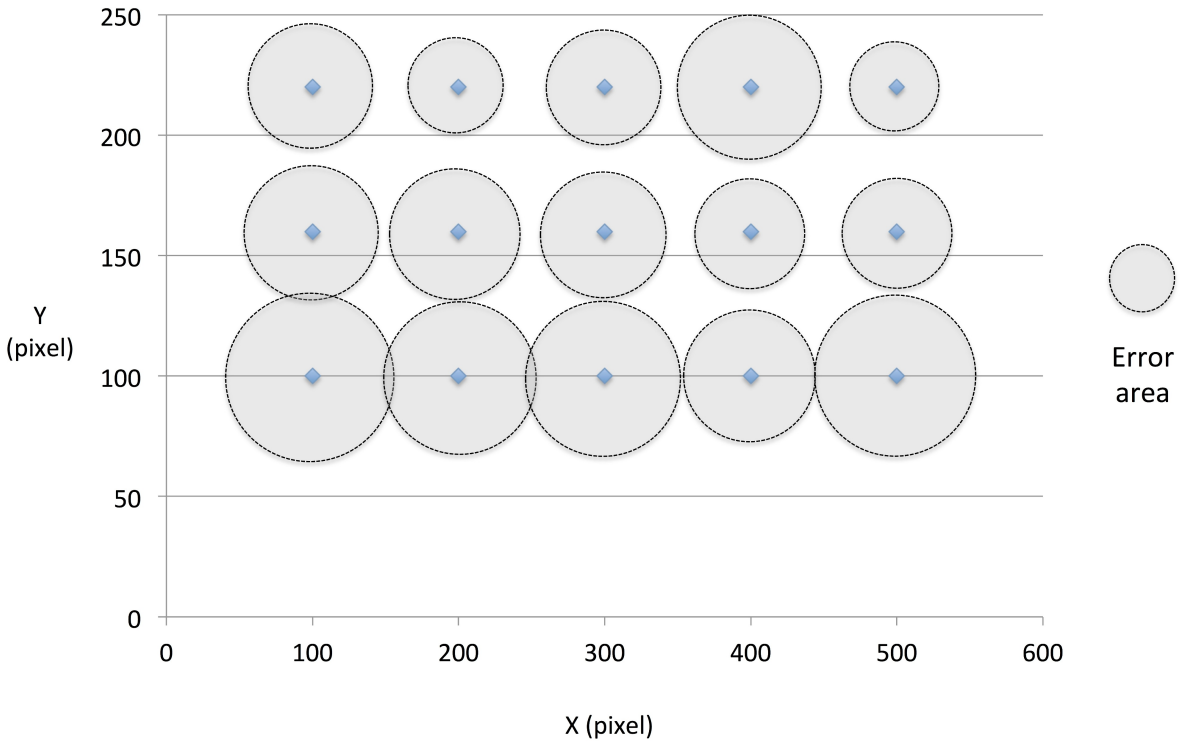
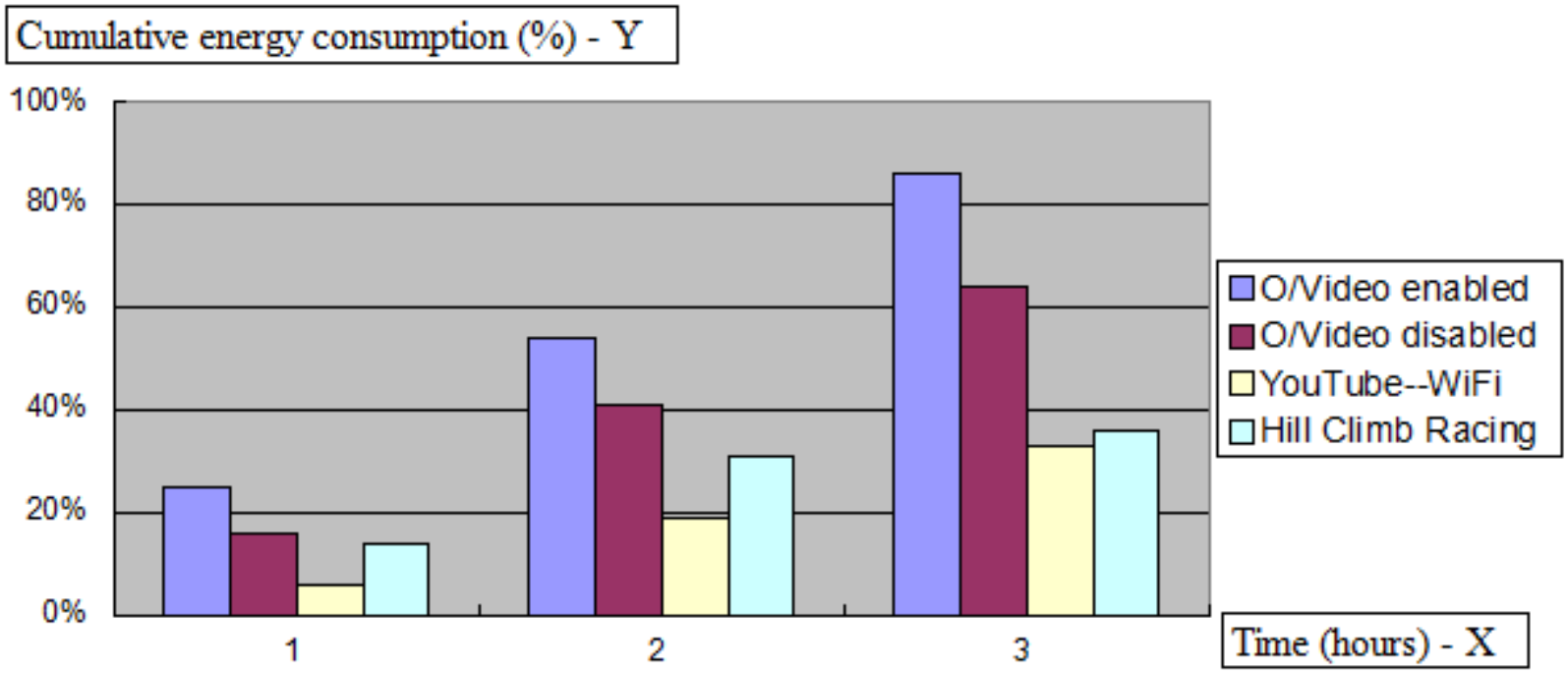
Result: Accuracy (~1.06°)



Result: Battery life



Further development

- More advanced pupil tracking approach
- Add glint detection to increase robustness of the gaze tracking
- Try smaller Android-based hardware platforms such as Odroid

Thanks!