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
<table>
<thead>
<tr>
<th>Previous work</th>
<th>Hardware platform</th>
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<tbody>
<tr>
<td>OMG! (Lukander et al, 2013)</td>
<td>Laptop in backpack</td>
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<tr>
<td>OpenEyes (Li et al, 2006)</td>
<td>Laptop in backpack</td>
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<td>A cheap portable eye tracker (Ferhat et al. 2014)</td>
<td>Raspberry Pi</td>
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<tr>
<td>iShadow (Mayberri et al, 2014)</td>
<td>Microcontroller</td>
</tr>
</tbody>
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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

Streaming gaze data to the Glass

Android smartphone running EyeDroid app

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 (3 rows x 5 columns) on the HMD
- Smartphone: LG-G2, 2 GB RAM, Quad-core 2.26 GHz processor, an Adreno 330 GPU & running Android 4.4
Result: Accuracy (~1.06°)
Result: Battery life

Cumulative energy consumption (%) - Y

Time (hours) - X

- O/Video enabled
- O/Video disabled
- YouTube--WiFi
- Hill Climb Racing
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!