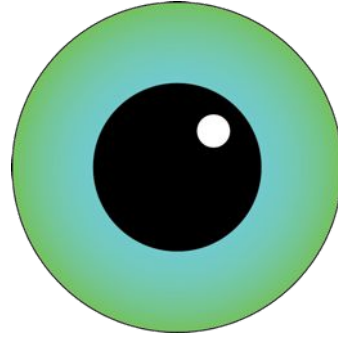


# Pupil

An Open Source Platform  
for Pervasive Eye Tracking and  
Mobile Gaze-based Interaction



# Pupil

Moritz Kassner

Will Patera

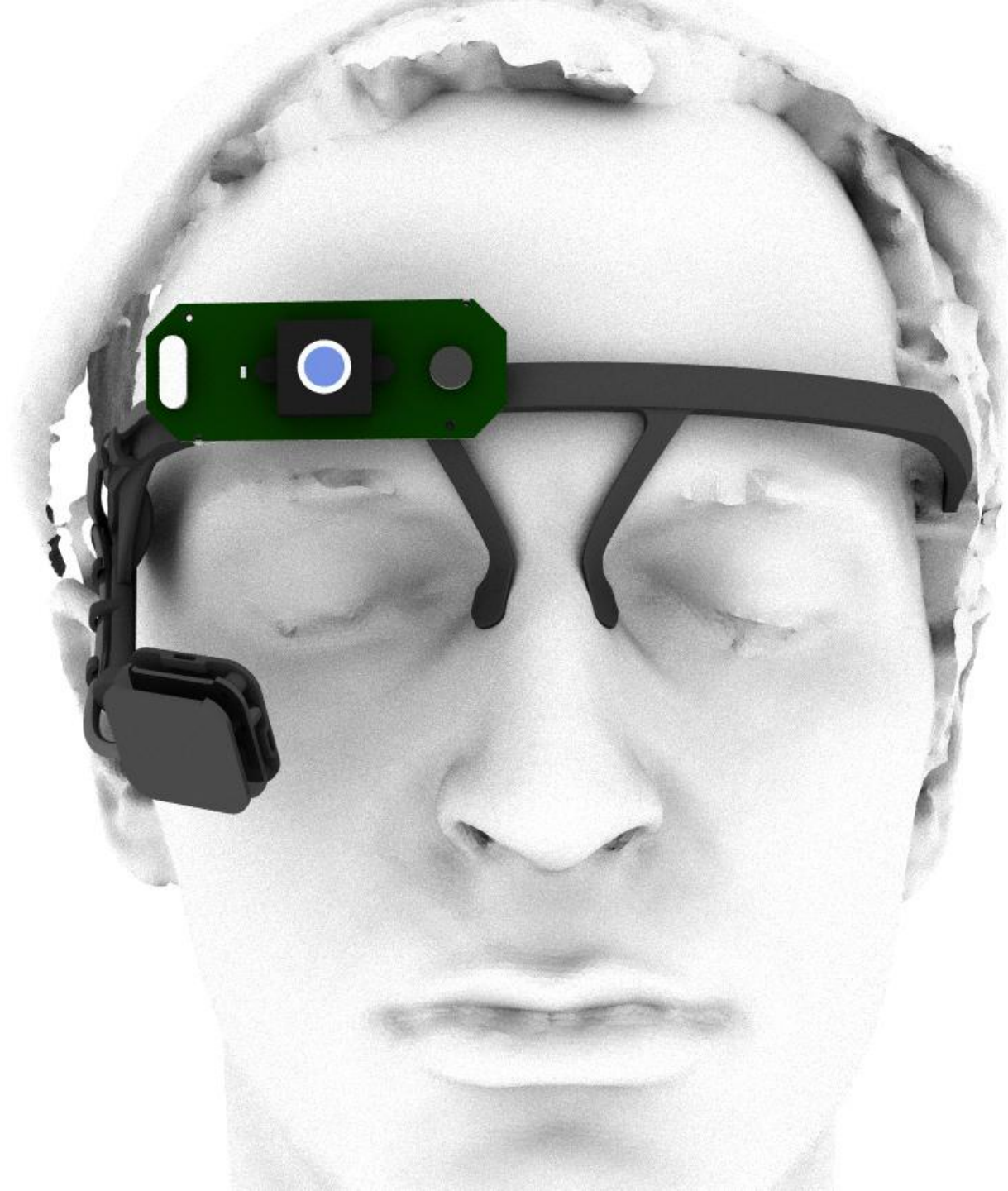
Andreas Bulling

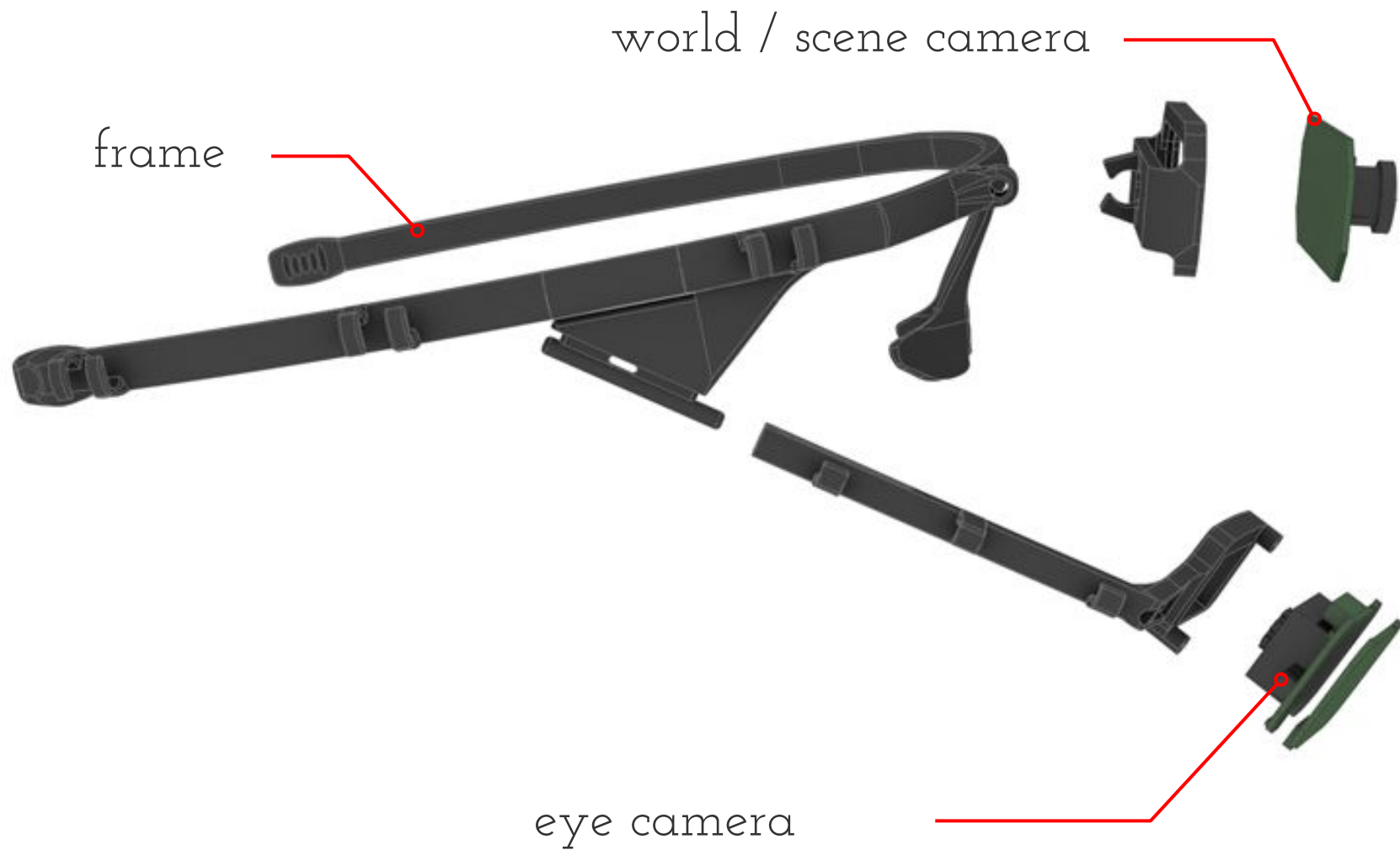
Controls

- World
  - Zoom 1.00
  - Distance 85
  - Show\_World
- Eye
  - Show\_Eye -
  - Camera 0
- Image
  - Scale 0.00174
  - Show\_Images
  - Hide\_Images
  - Show\_Cones
  - Hide\_Cones



# Pupil Dev

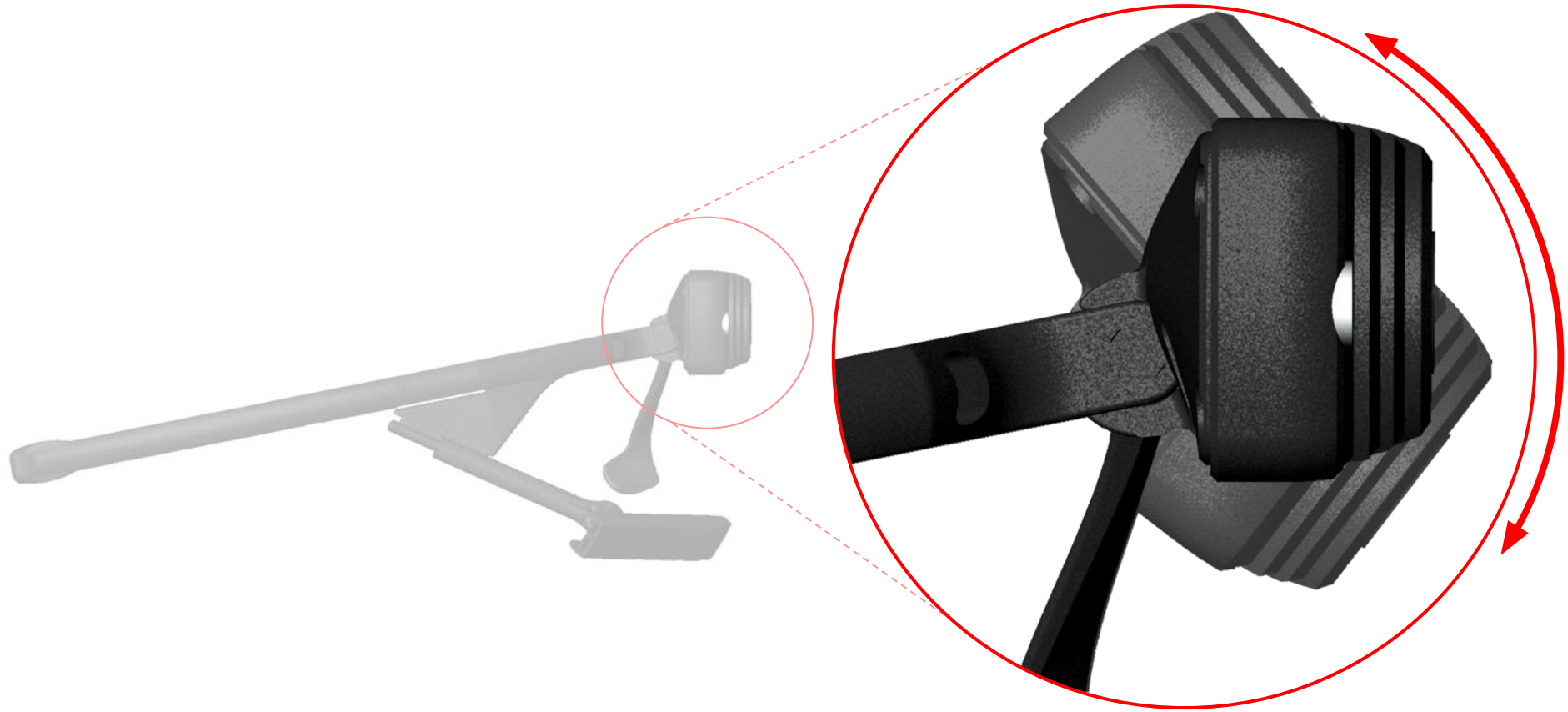




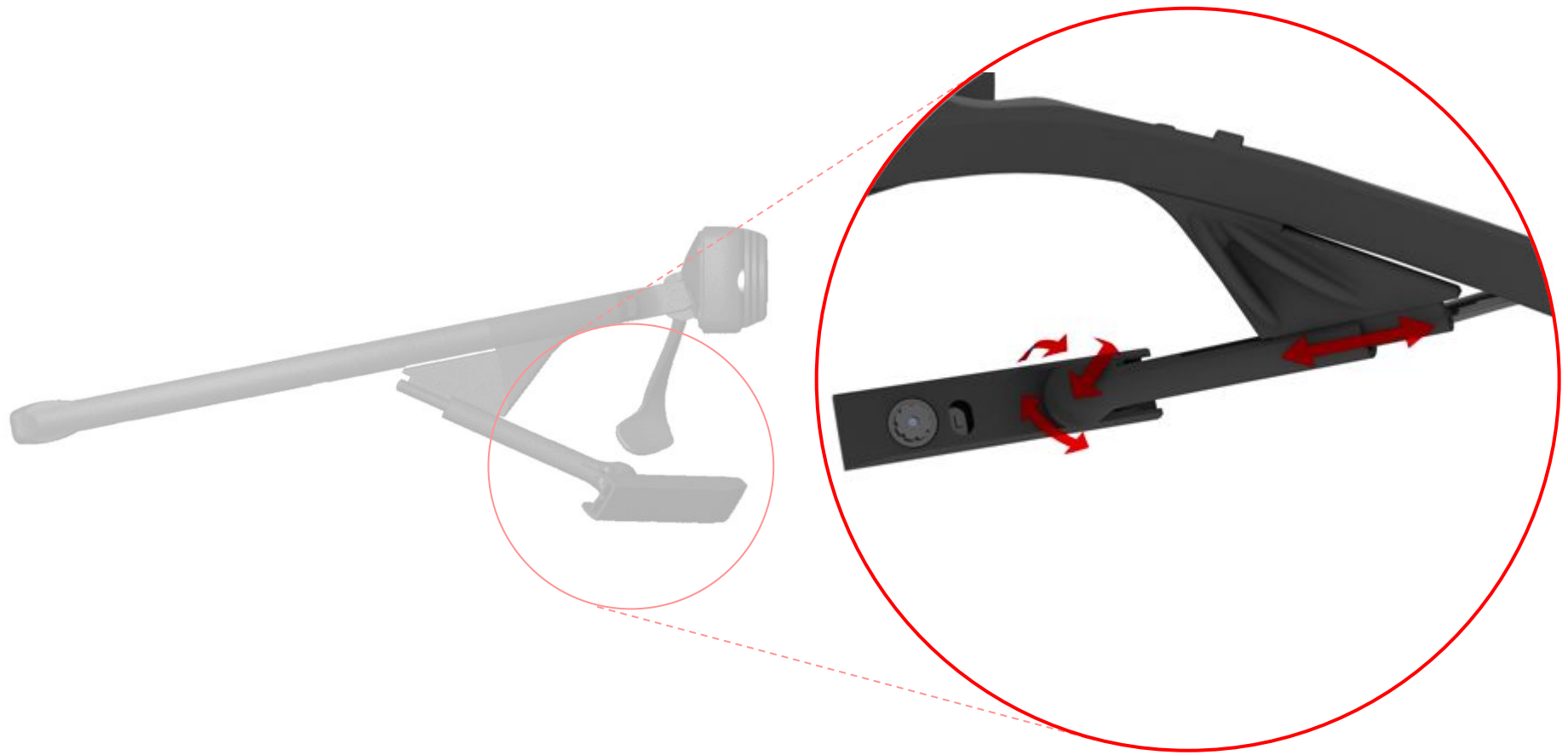
# Pupil Pro







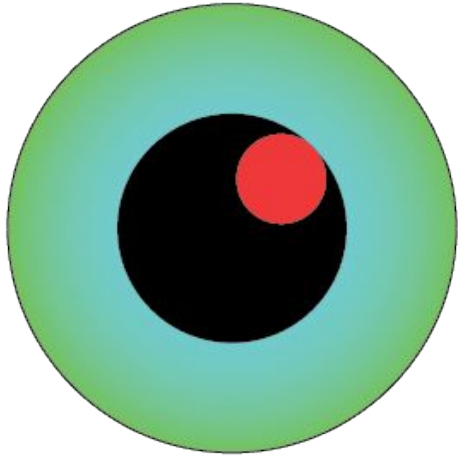




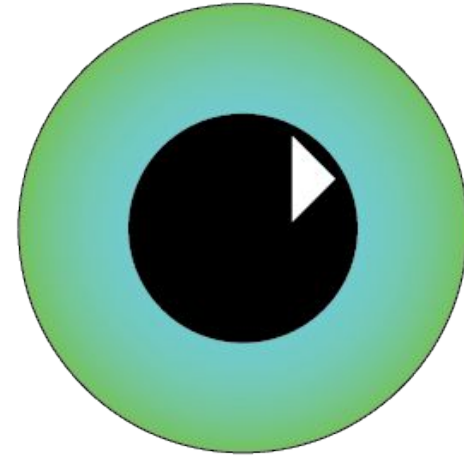




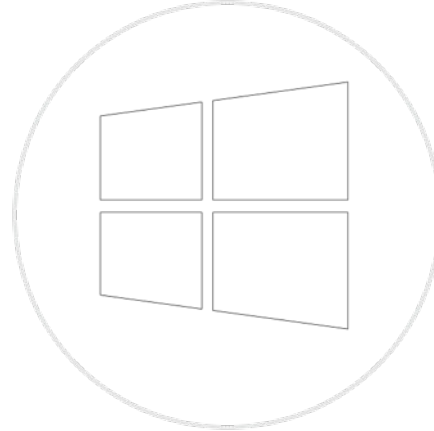
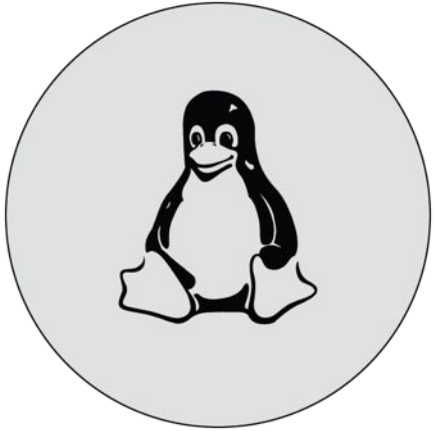


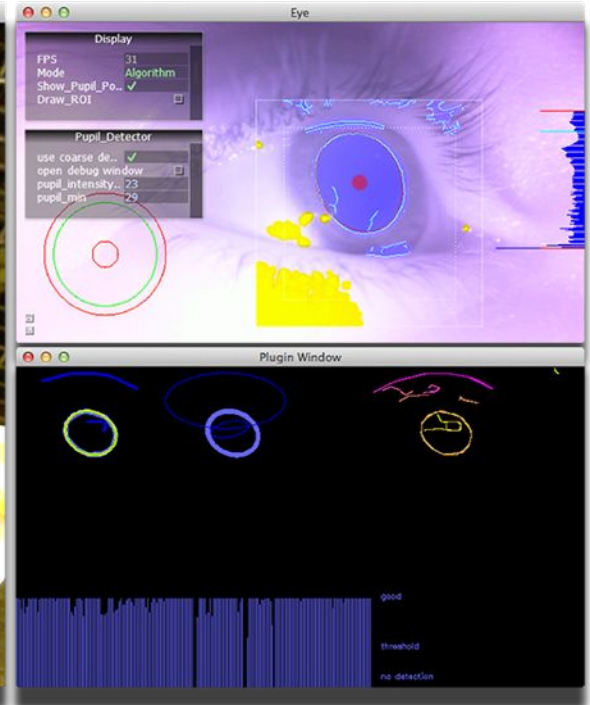


Pupil Capture



Pupil Player





world video

pupil positions

calibration cloud

meta information

---

eye video

surface definitions

audio





Pupil Player: 2014\_07\_10 -

### Controls

fps: 60  
 recoding fps: nan  
 display size: Full  
 play: -  
 step next:   
 step prev:   
 frame index: 1926  
 plugin: Scan\_Path

### Scan Path

duration in sec: 0.5  
 remove:

### Gaze Polyline

+ color:   
 thickne..: 2

### Marker-Detector

close:   
 add surface:   
 Mode: Show..  
 (re)-calculate gaze distribution...:   
 Export Gaze and Surface Data...:

- 7

name	table..
found/registered markers	0 / 3
real width	270
real height	170
open in window	-
remove	<input type="checkbox"/>

- 6

name	box in..
found/registered markers	0 / 2
real width	270
real height	170
open in window	-
remove	<input type="checkbox"/>

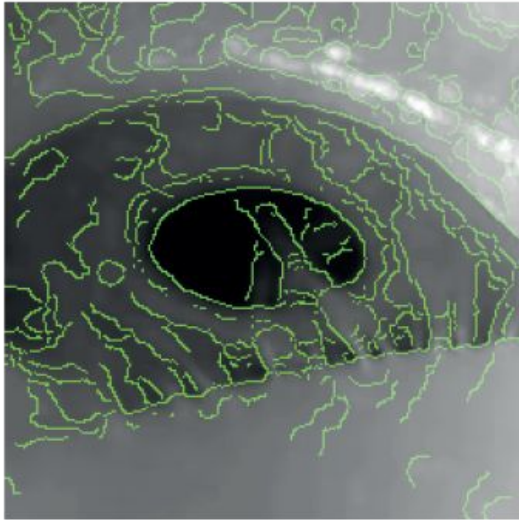
- 5

name	box p..
found/registered markers	0 / 3
real width	400
real height	200
open in window	-
remove	<input type="checkbox"/>

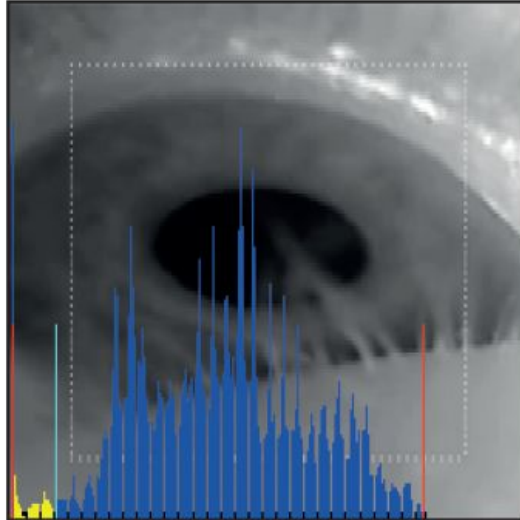
- 4

name	box le..
found/registered markers	0 / 2
real width	200
real height	50

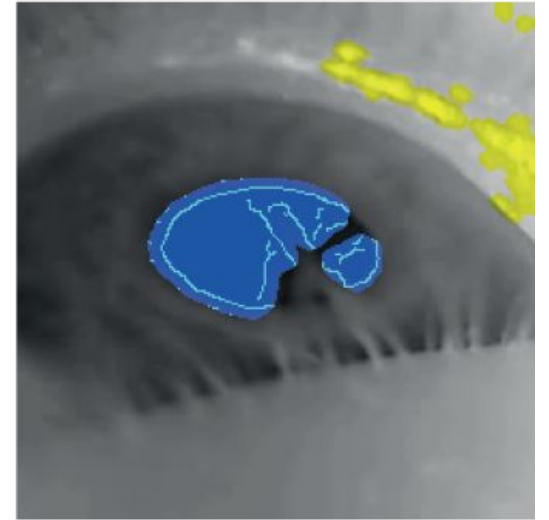
# Performance



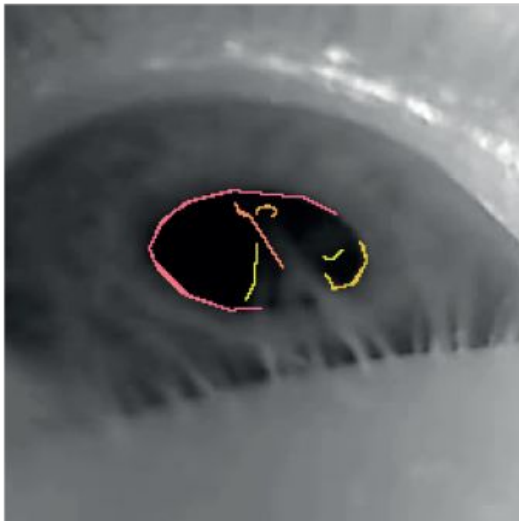
1



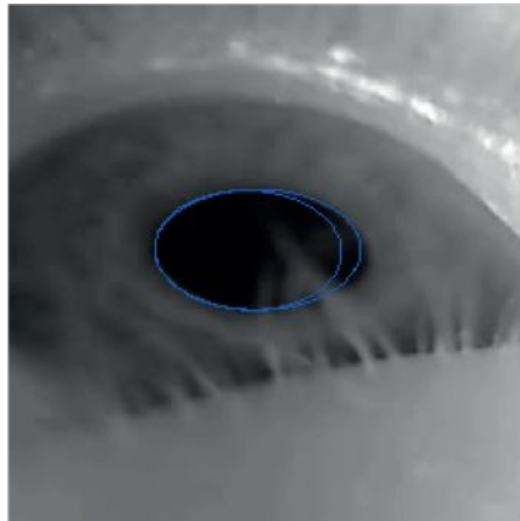
2



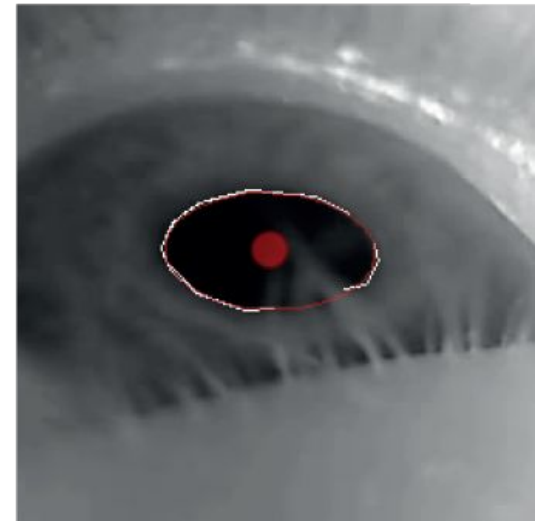
3



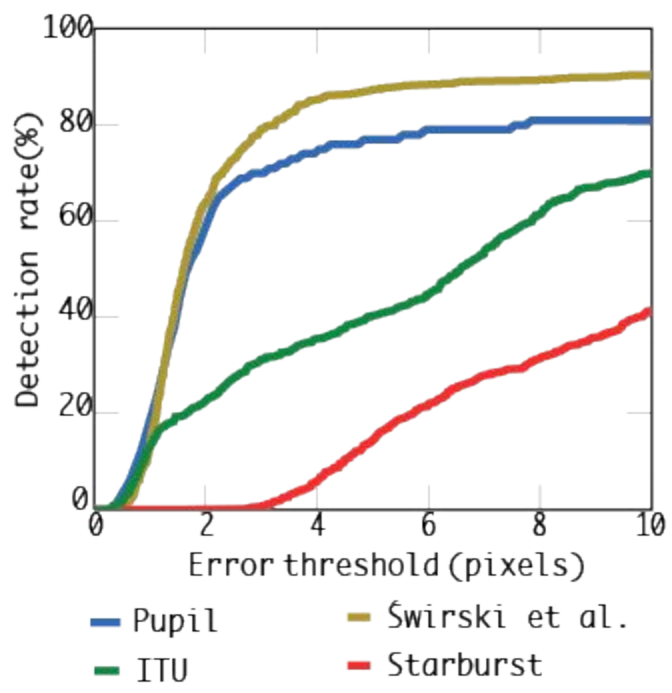
4

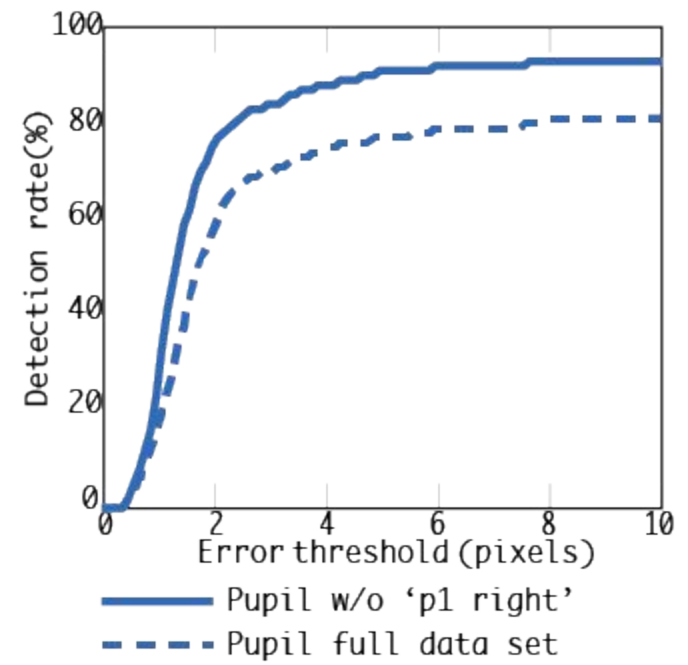
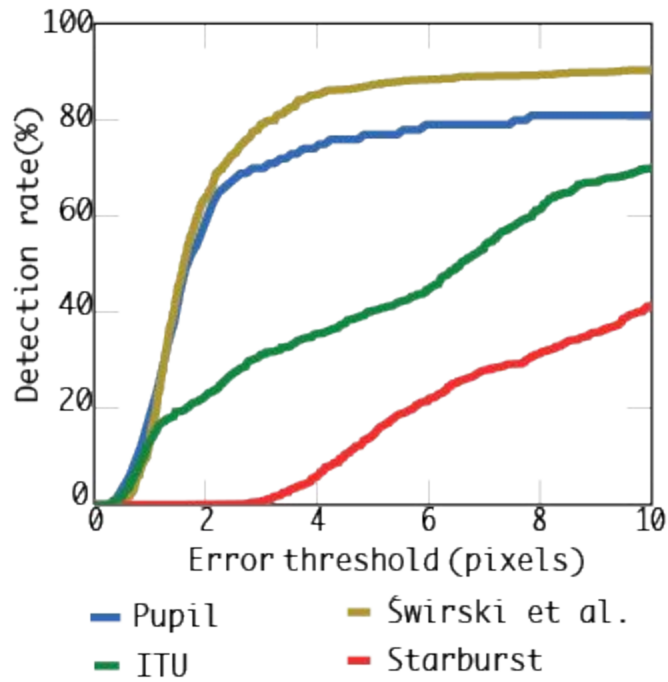


5

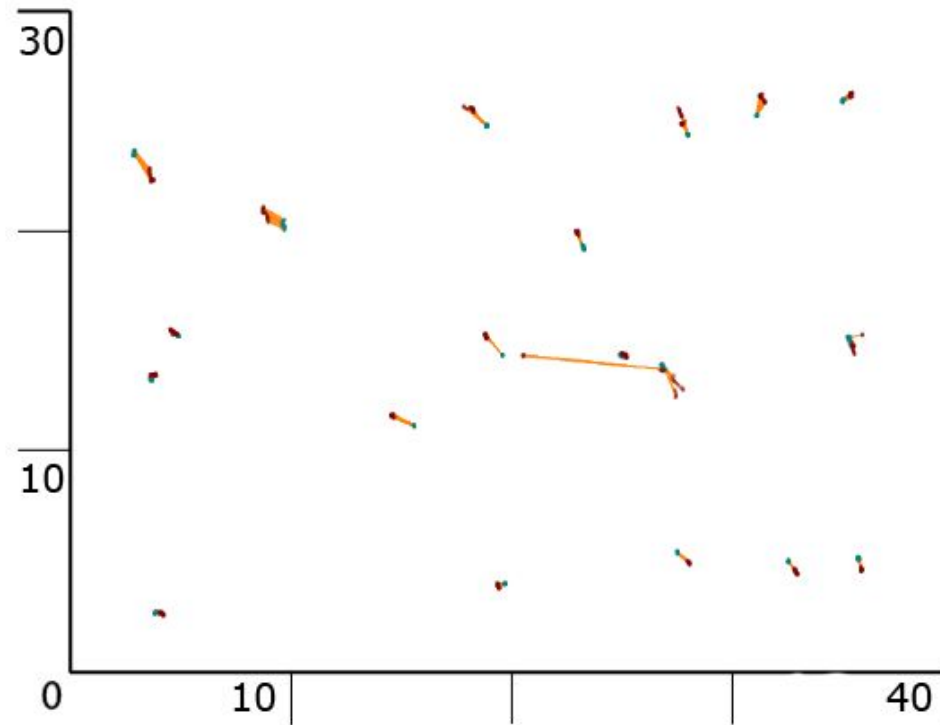


6



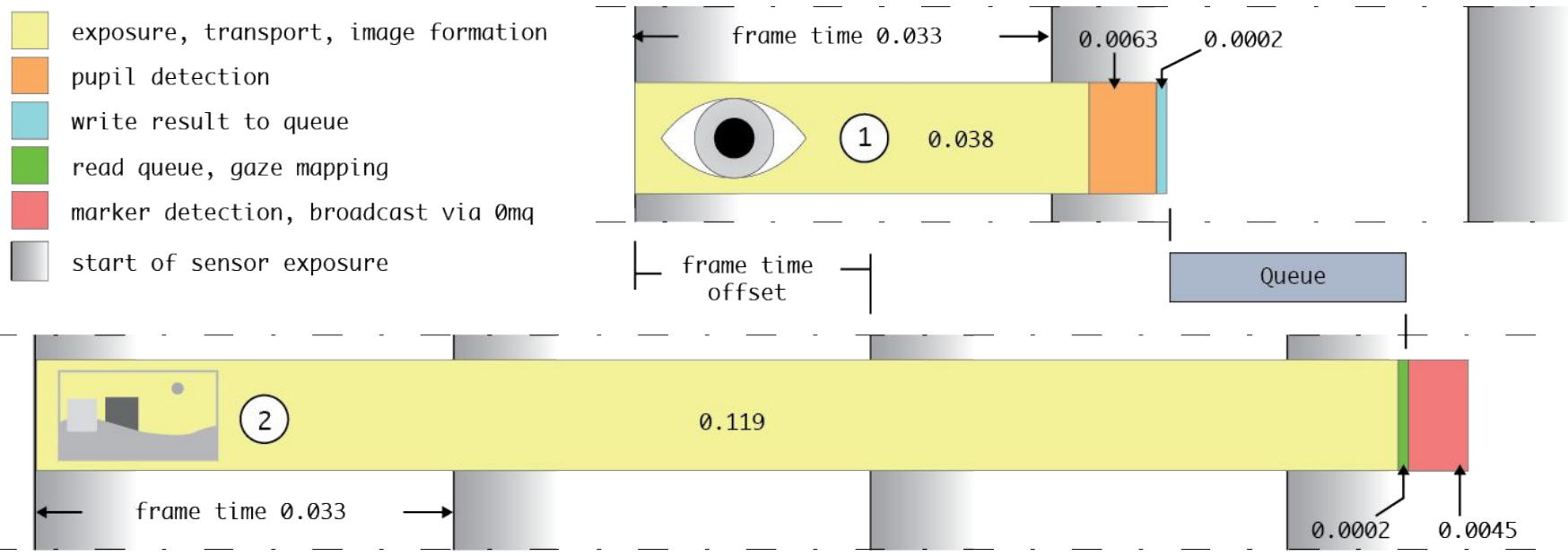


# gaze estimation error across visual field



accuracy: **0.6 deg**  
precision: **0.08 deg**

# system latency



latency eye: **0.045s**  
latency world: **0.124s**

# Development



# Python & C

+

Open Source Libraries

---

OpenCV

NumPy

SciPy

libav

OpenGL

```
git clone https://github.com/pupil-labs/pupil/
```

```
from plugin import Plugin
```

```
class Example_Plugin(Plugin):
```

```
    def __init__(self, g_pool):  
        Plugin.__init__(self)
```

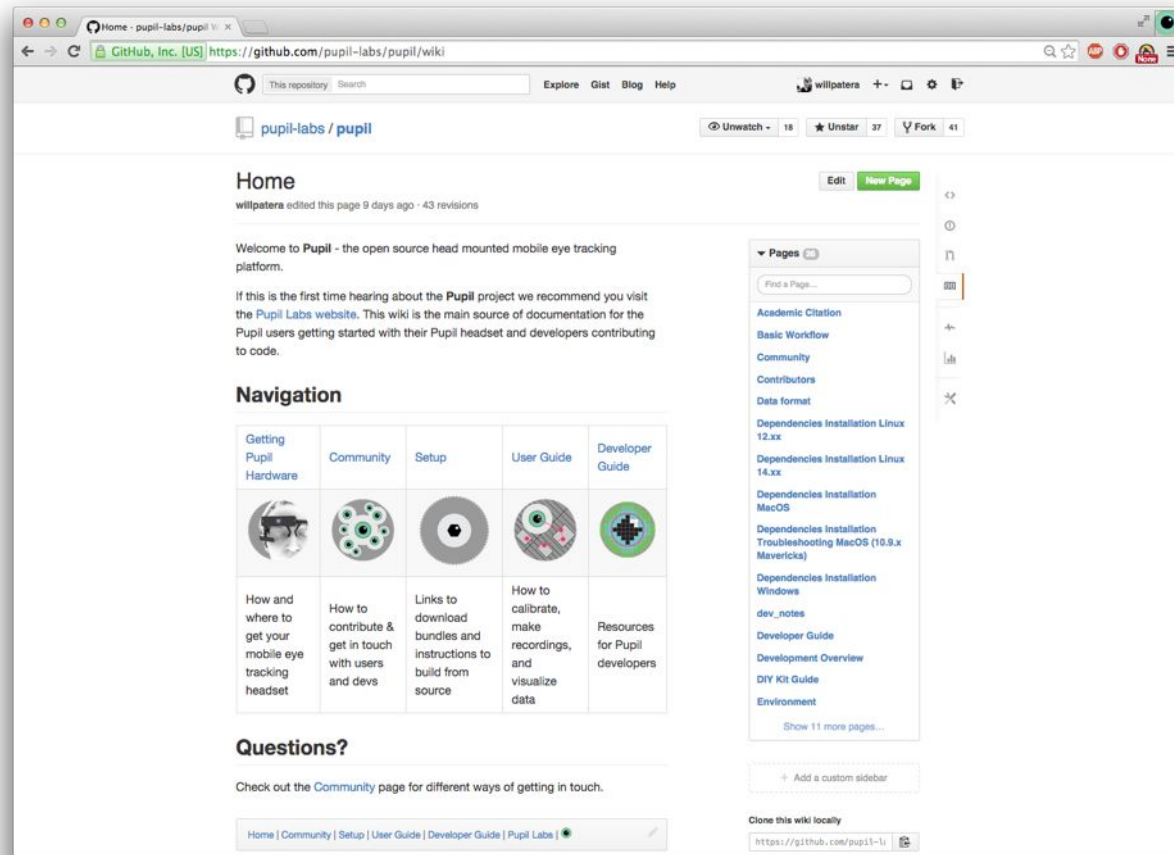
```
    def on_key(self, window, key, scancode, action, mods):  
        pass
```

```
    def on_click(self, pos, button, action):  
        pass
```

```
    def update(self, frame, recent_pupil_positions, events):  
        """  
        Gets called every frame.  
        """  
        # Your code to work with pupil positions goes here.  
        # Your code to work with the scene 'world' camera image  
        # goes here.
```

```
    def gl_display(self):  
        """  
        Use OpenGL calls to render onto the 'world' window.  
        """  
        # Your OpenGL calls go here.
```

# github.com/pupil-labs/pupil/wiki



The screenshot shows the GitHub wiki page for the Pupil Labs project. The page is titled "Home" and was last edited by willpatera 9 days ago. It features a navigation grid with five categories: Getting Pupil Hardware, Community, Setup, User Guide, and Developer Guide. A "Pages" sidebar on the right lists various documentation topics, including Academic Citation, Basic Workflow, and installation guides for Linux, MacOS, and Windows. The page also includes a "Questions?" section and a "Clone this wiki locally" button.

Home - pupil-labs/pupil | X  
← → C GitHub, Inc. [US] https://github.com/pupil-labs/pupil/wiki

This repository Search Explore Gist Blog Help willpatera + - ⚙️ 📄

pupil-labs / pupil Unwatch - 18 ⭐ Unstar 37 🍴 Fork 41






## Home

willpatera edited this page 9 days ago · 43 revisions Edit New Page

Welcome to **Pupil** - the open source head mounted mobile eye tracking platform.

If this is the first time hearing about the **Pupil** project we recommend you visit the [Pupil Labs website](#). This wiki is the main source of documentation for the Pupil users getting started with their Pupil headset and developers contributing to code.

### Navigation

Getting Pupil Hardware	Community	Setup	User Guide	Developer Guide
				
How and where to get your mobile eye tracking headset	How to contribute & get in touch with users and devs	Links to download bundles and instructions to build from source	How to calibrate, make recordings, and visualize data	Resources for Pupil developers

### Questions?

Check out the [Community](#) page for different ways of getting in touch.

Home | [Community](#) | [Setup](#) | [User Guide](#) | [Developer Guide](#) | [Pupil Labs](#) | 🌱

#### Pages

Find a Page...

- Academic Citation
- Basic Workflow
- Community
- Contributors
- Data format
- Dependencies Installation Linux 12.xx
- Dependencies Installation Linux 14.xx
- Dependencies Installation MacOS
- Dependencies Installation Troubleshooting MacOS (10.9.x Mavericks)
- Dependencies Installation Windows
- dev\_notes
- Developer Guide
- Development Overview
- DIY Kit Guide
- Environment

Show 11 more pages...

+ Add a custom sidebar

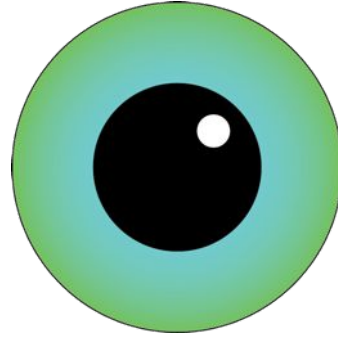
Clone this wiki locally  
https://github.com/pupil-l-l | 📄

# pupil-labs.com/pupil

The screenshot shows a web browser window displaying the Pupil Labs website. The page features a navigation bar with links for 'Pupil Labs', 'Pupil - Eye Tracking', and 'Blog'. There is also a 'Pupil Labs Newsletter' sign-up field and a 'Sign Up' button. The main content area is divided into two columns for 'Pupil Dev' and 'Pupil Pro'. Each column includes a photograph of a person wearing the respective eye-tracking glasses. Below the photos is a table comparing the two models across various specifications.

	Pupil Dev	Pupil Pro
<b>Description</b>	This is the "bare" version, with uncovered cameras and 720p World camera. It is intended for individuals that want to experiment and use Pupil for their projects.	Pupil Pro is the next step up from Pupil Dev. It has upgraded Eye and World Cameras, improved cable management, and fully enclosed cameras.
<b>Specifications</b>		
<b>Eye Camera</b>	Maximum Resolution - 640x360 @ 30fps Infrared camera with IR Filter	Maximum Resolution - 640x480 @ 30fps Infrared camera with IR Filter Adjustable Camera Arm. <a href="#">Detailed Specs</a>
<b>World Camera</b>	Maximum Resolution - 1280x720 @ 30fps 68 degree view angle	Maximum Resolution - 1920x1080 @ 30 fps 90 degree view angle
<b>Design</b>	Exposed camera boards	Fully enclosed camera boards
<b>Connection</b>	USB	USB with improved cable management
<b>Material</b>	PLA	PLA





# Pupil

[pupil-labs.com](http://pupil-labs.com)

[github.com/pupil-labs/pupil](https://github.com/pupil-labs/pupil)

[pupil-discuss@googlegroups.com](mailto:pupil-discuss@googlegroups.com)