

Gaze Tracking & Optical Identification

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What are you looking
at and what is it?



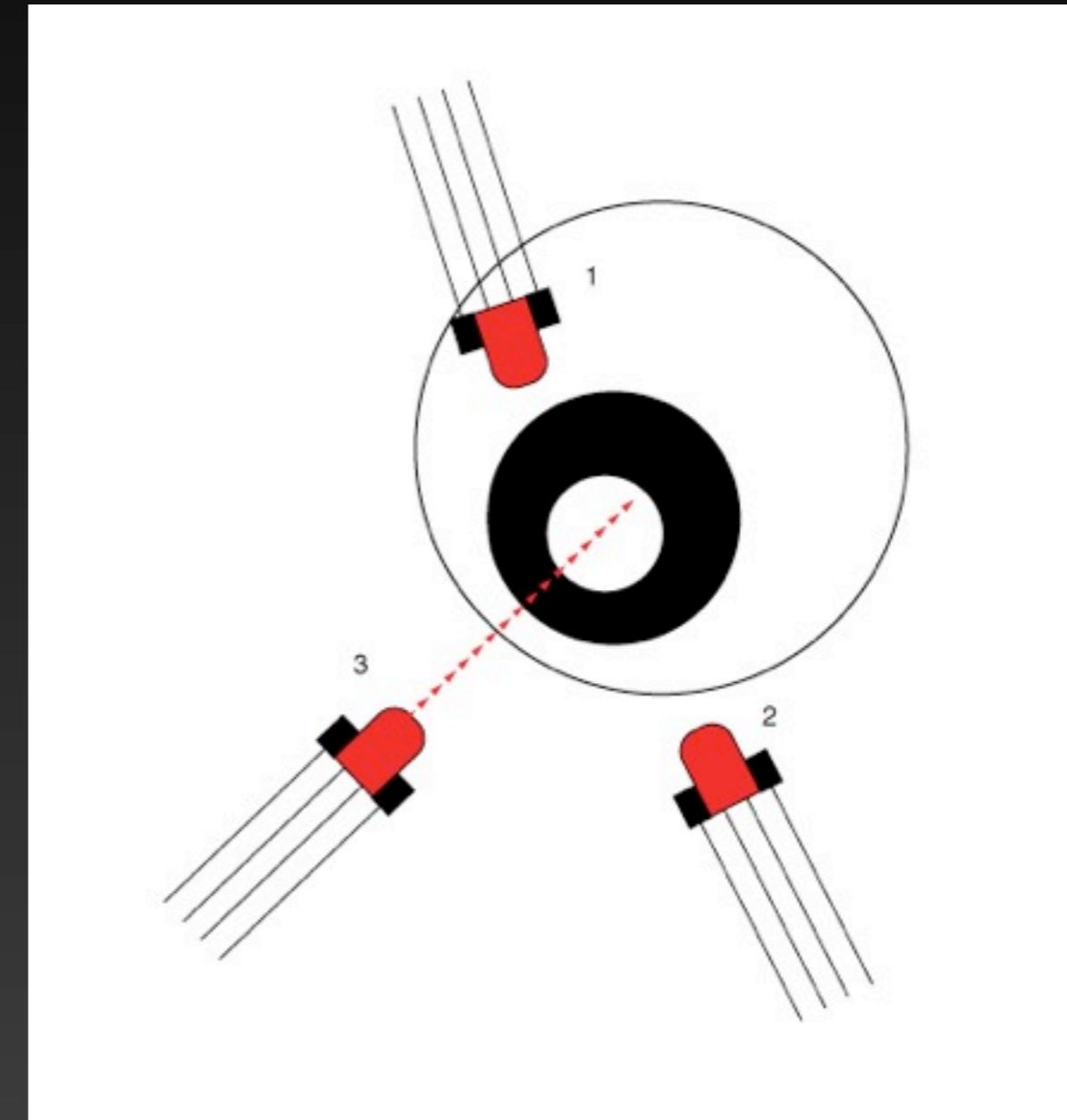
Gaze Tracking

IR Multi-flash Retina Retroreflection



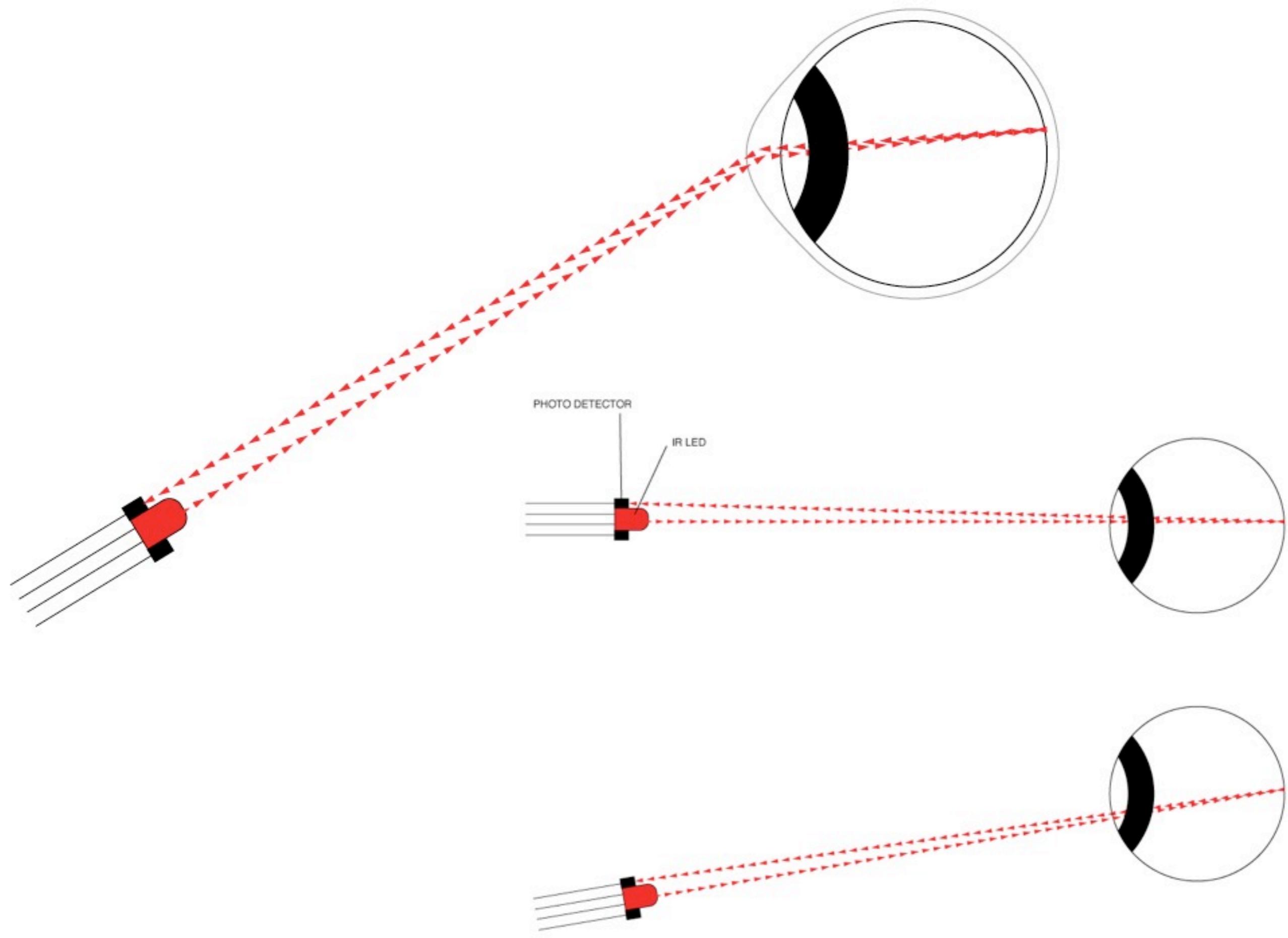
Exploit Red-Eye retroreflective properties of the eye
LED's directed at retina

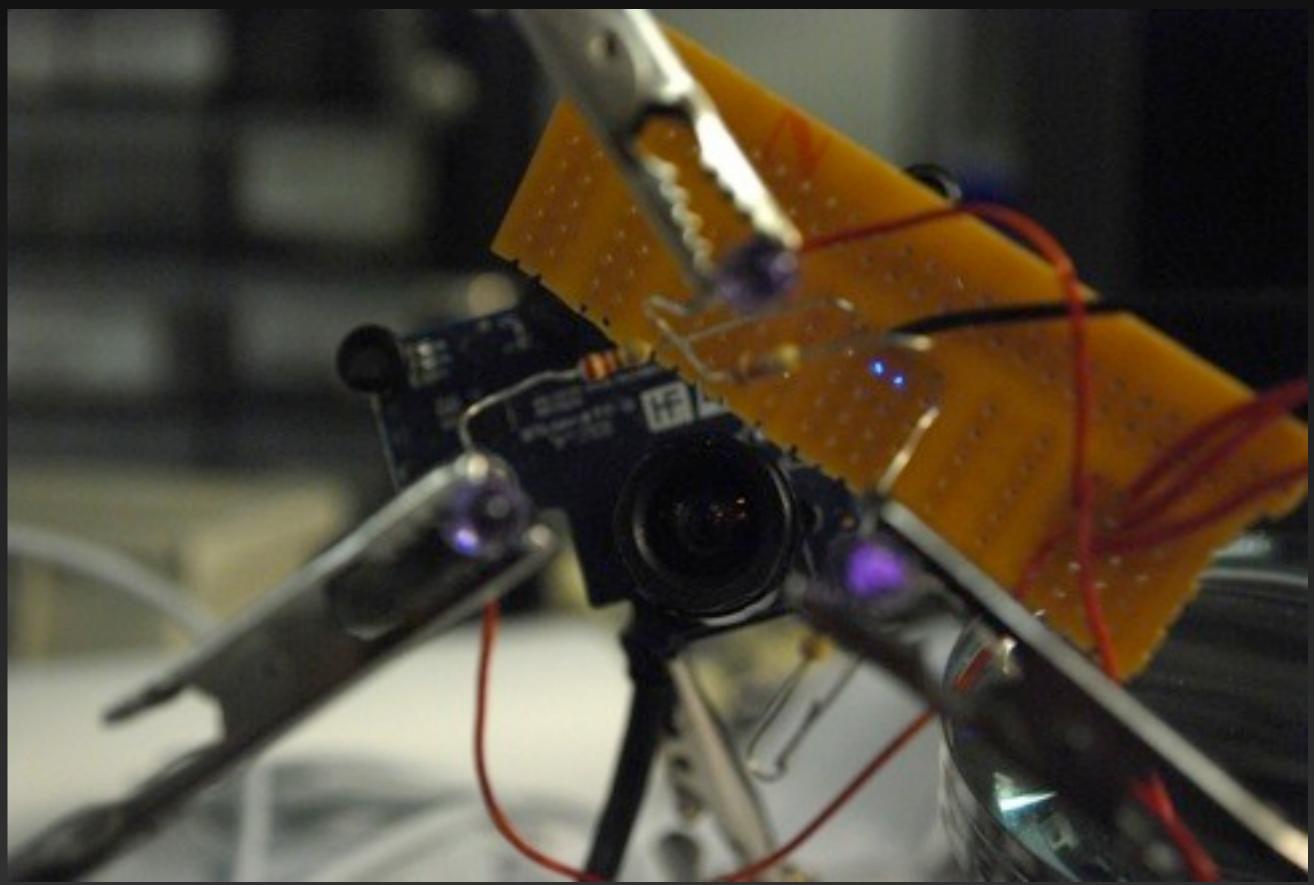
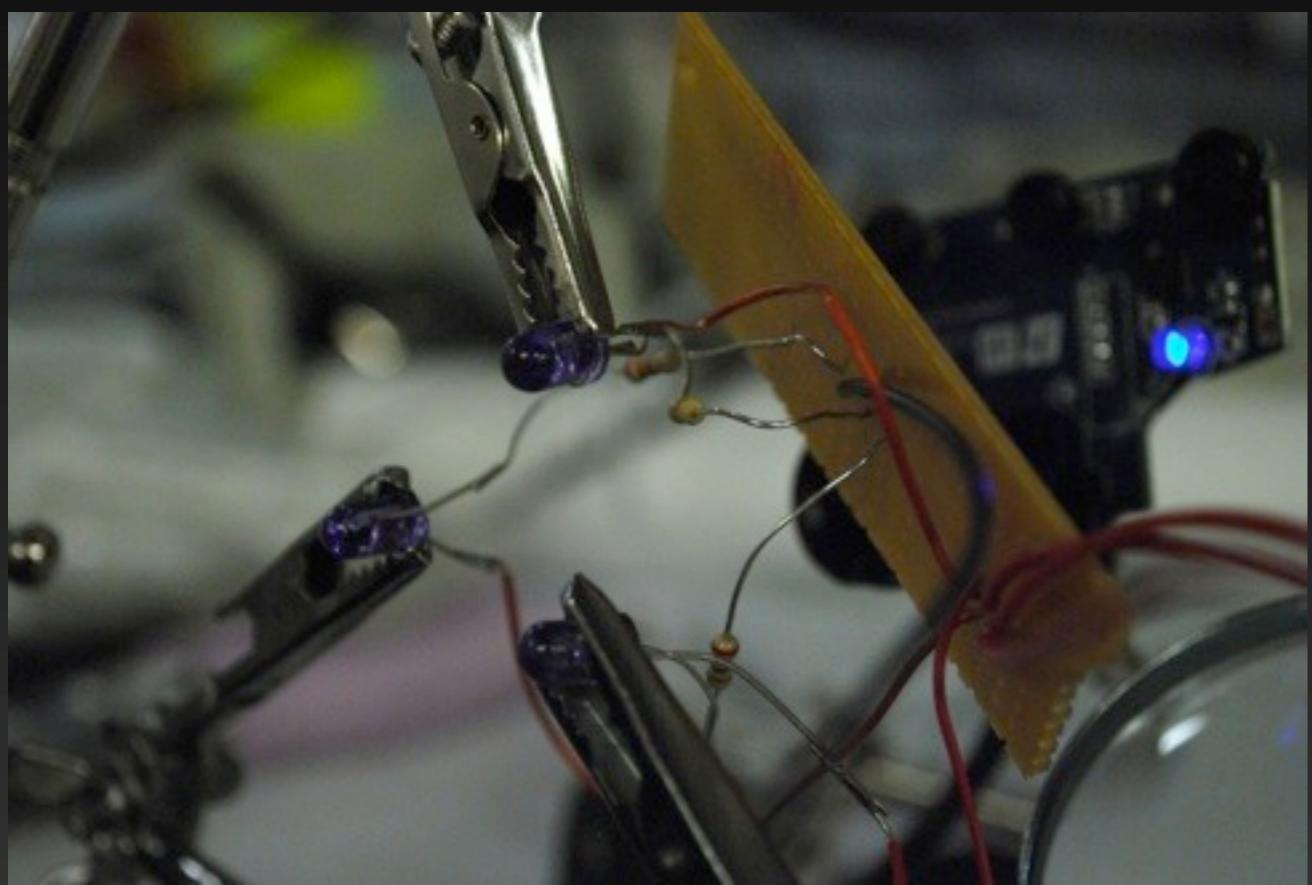
```
Sequence
loop{
    flash led #i
    read from all 3 photodiodes
    compare diode#i with average of diode g and h
}
```



Gaze Tracking

- Low-cost
- Fast
- Light
- Less intrusive





Prototype #1: Simulation with 60fps camera & IR LEDs directed at retina



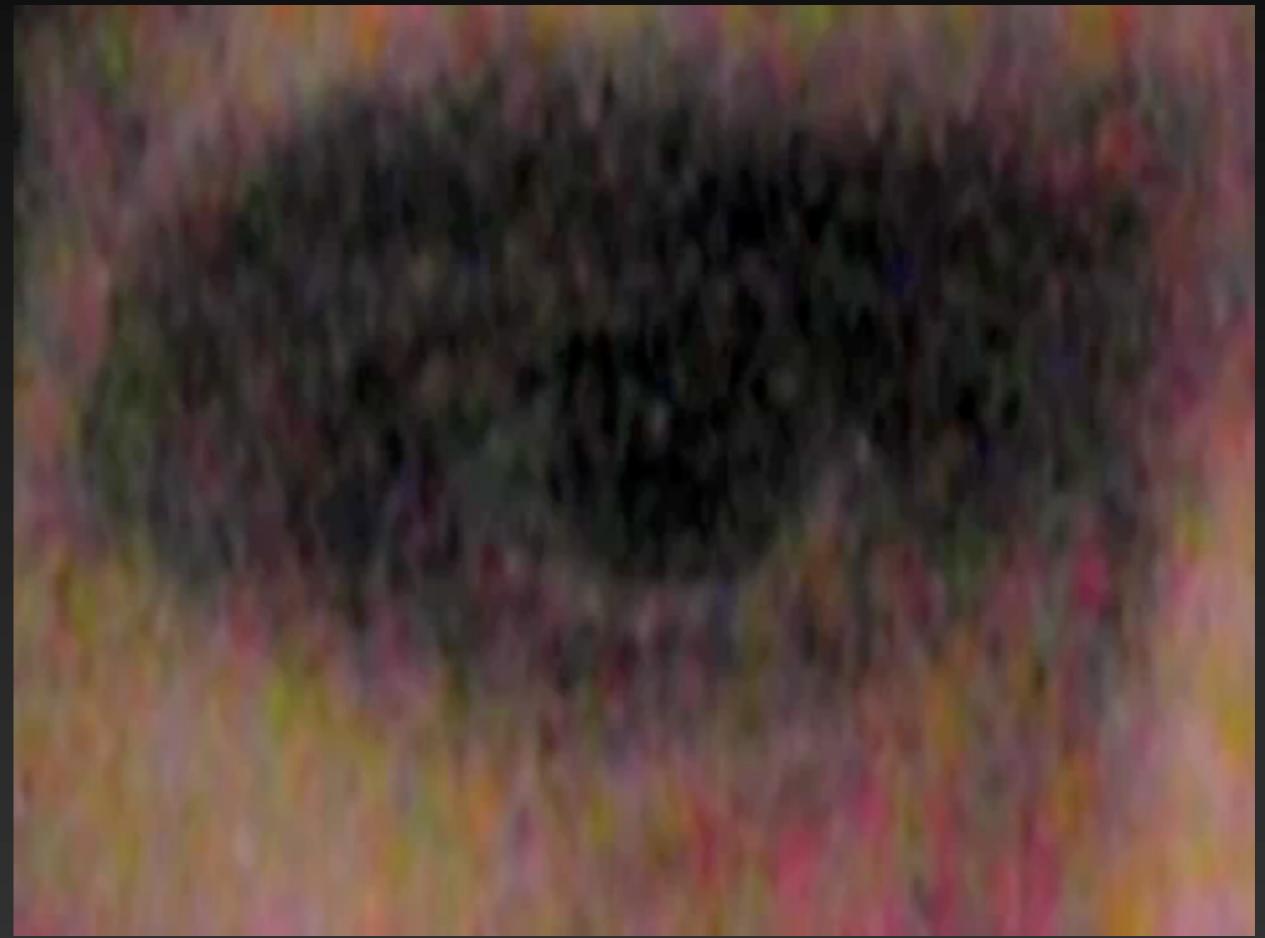
Prototype #1: Simulation with 60fps camera & IR LEDs directed at retina: No retroreflection



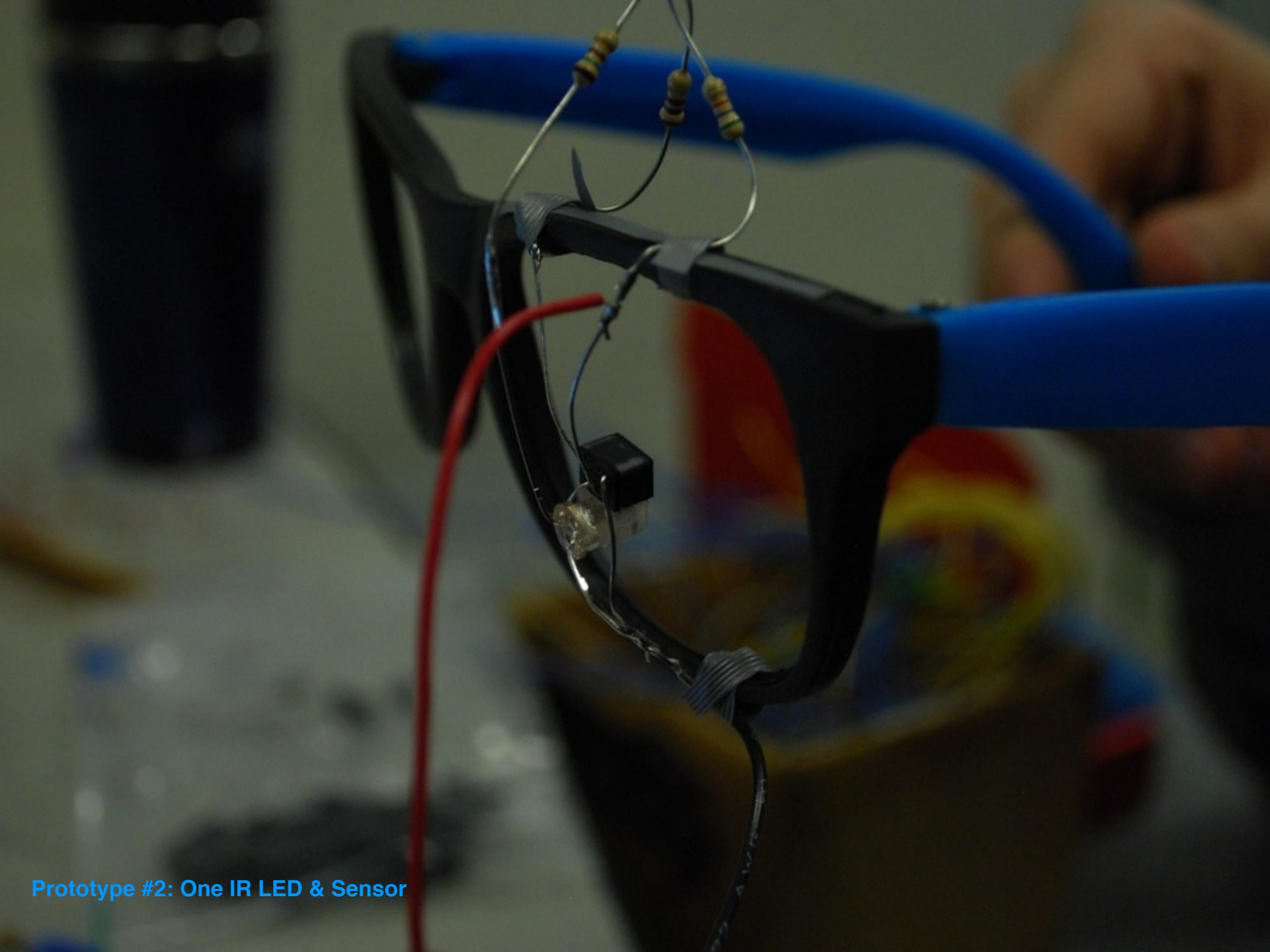
IR flood: No retroreflection only Purkinje image



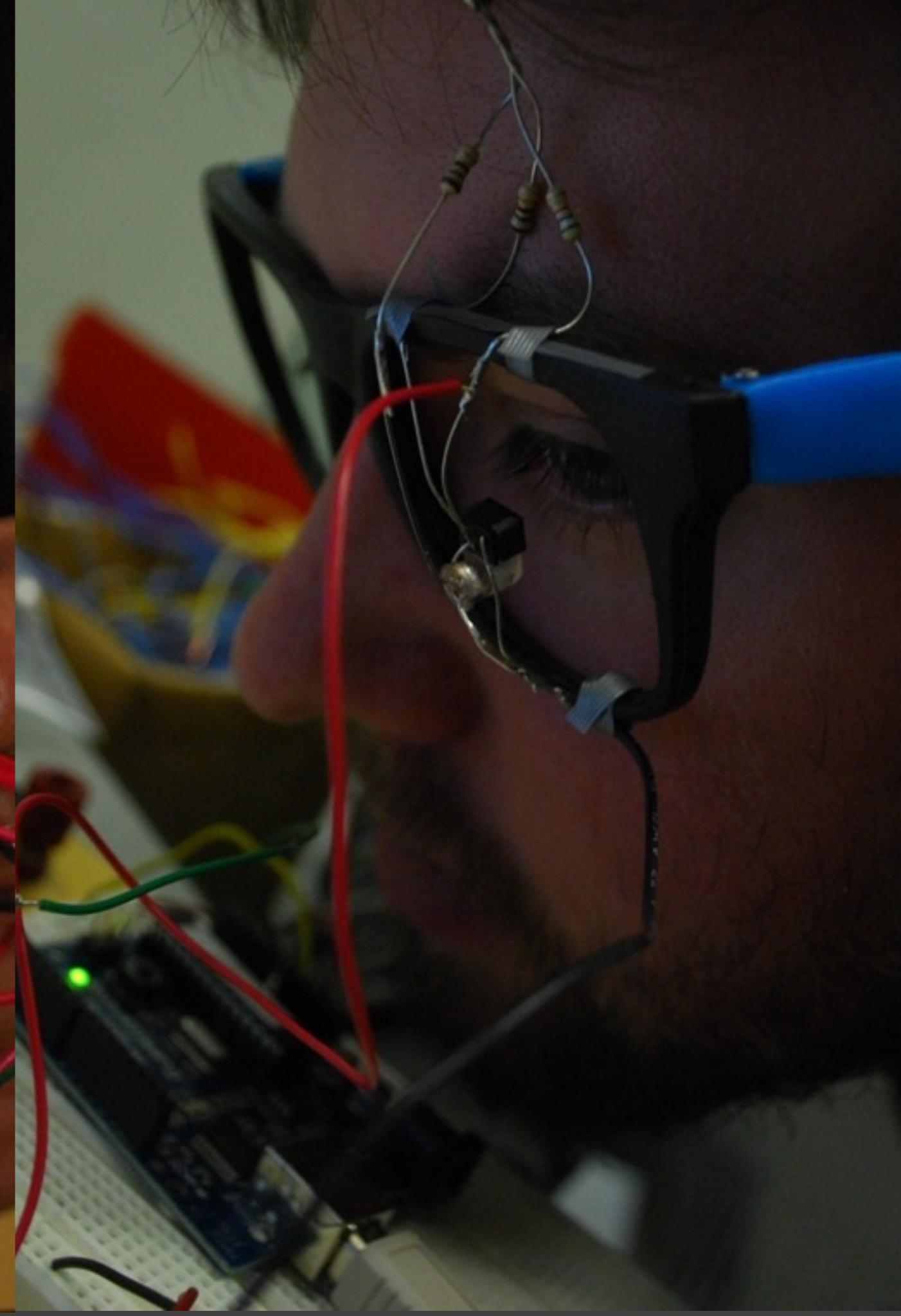
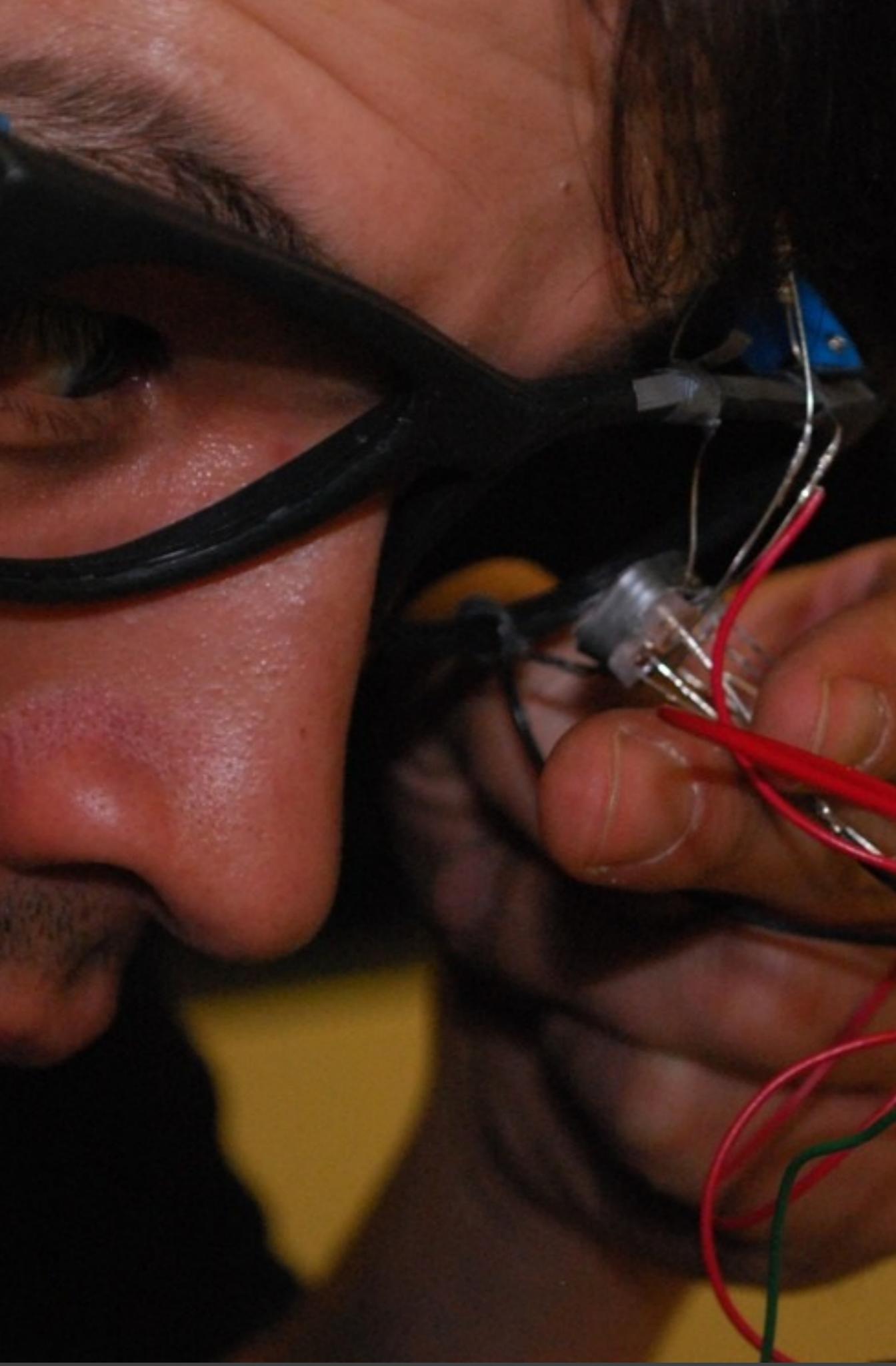
Retroreflection results with cell phone camera flash

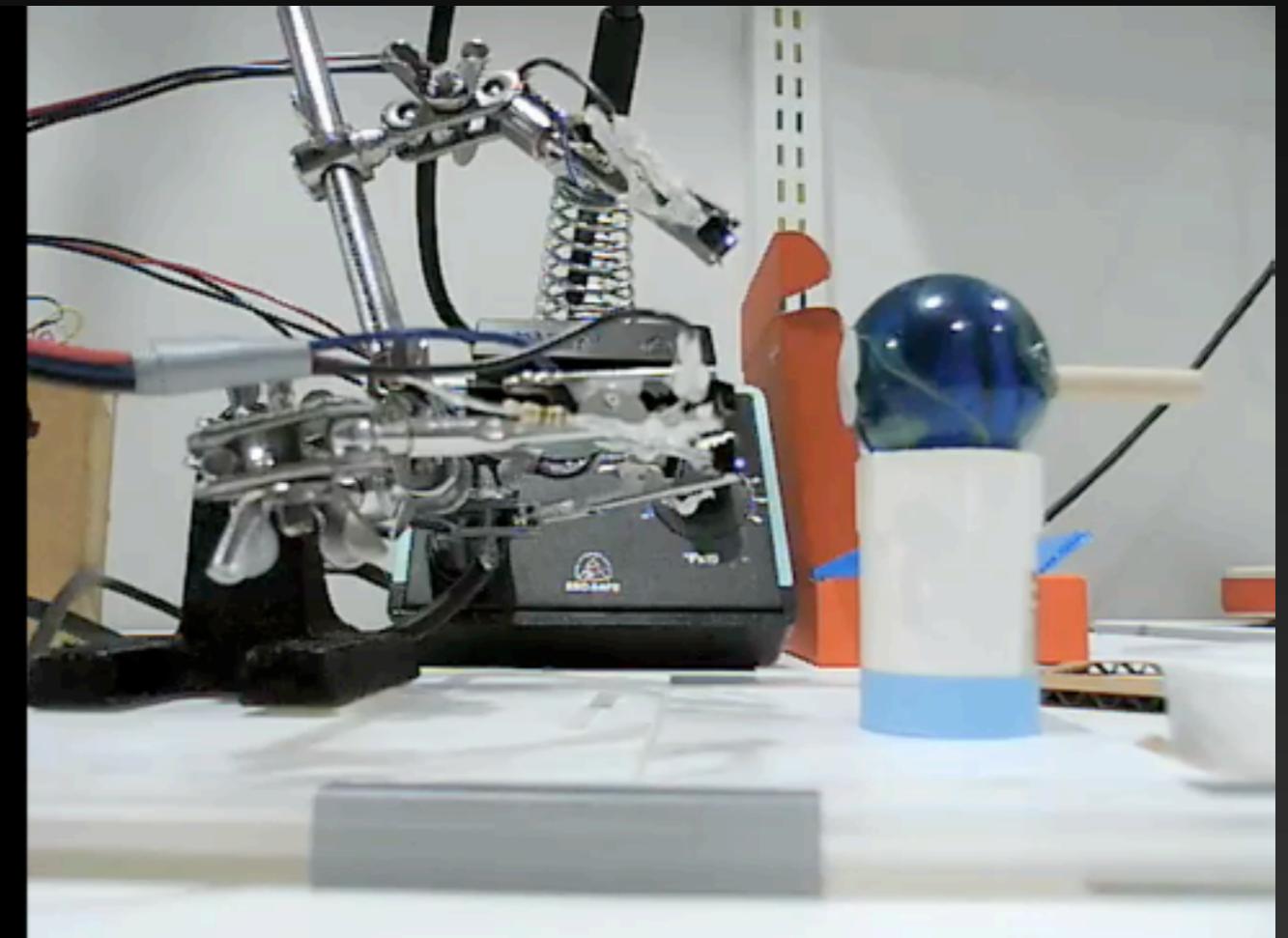


Retroreflection results with xenon flash and IR filter. Video captured with 200fps

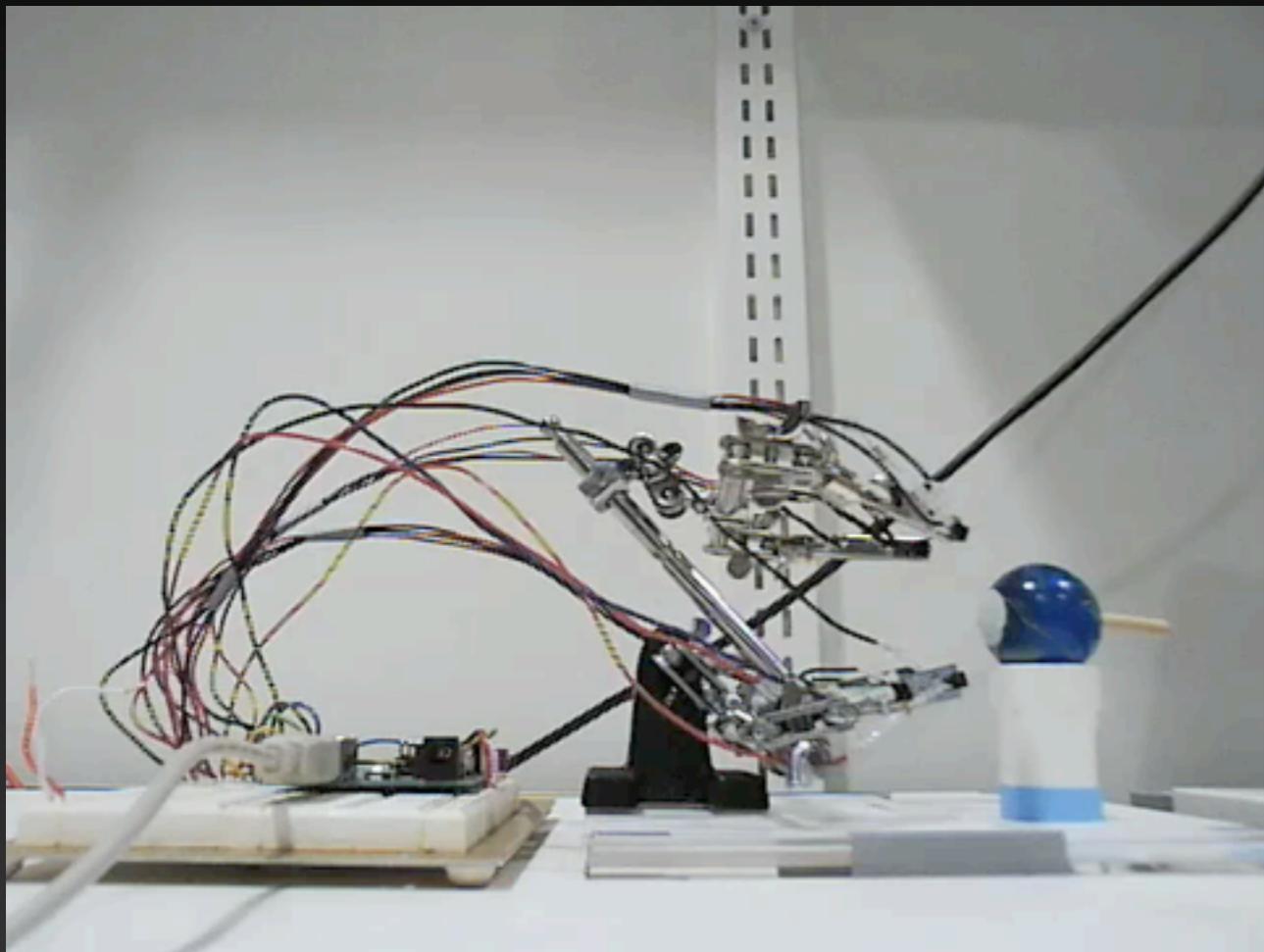


Prototype #2: One IR LED & Sensor





Prototype #3: Model setup, eye-ball sphere, three LEDs and sensors



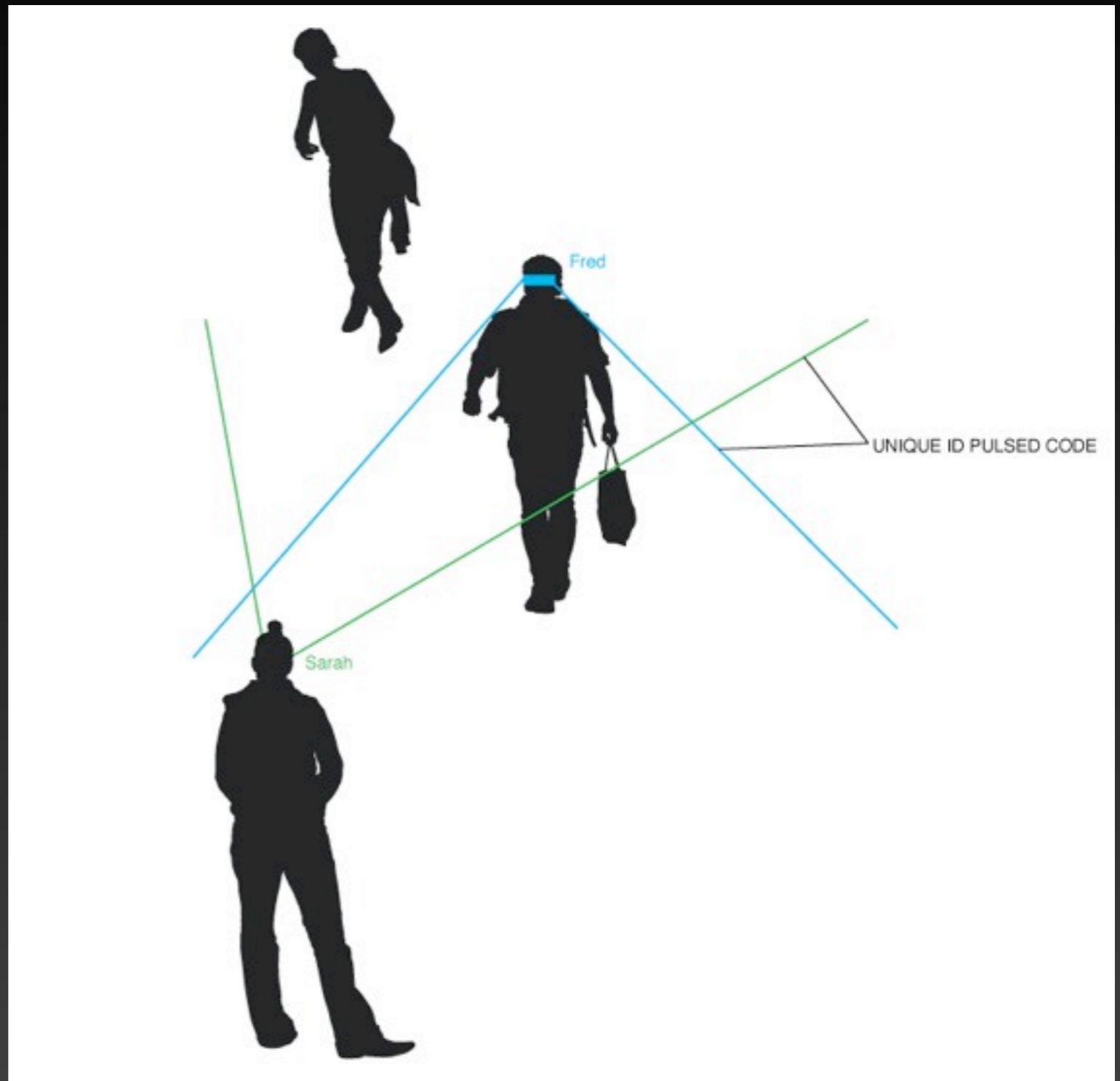
Prototype #4: Model setup, eye-ball sphere, four LEDs and sensors

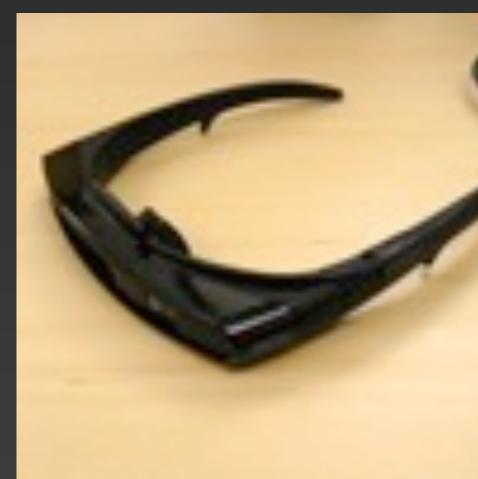
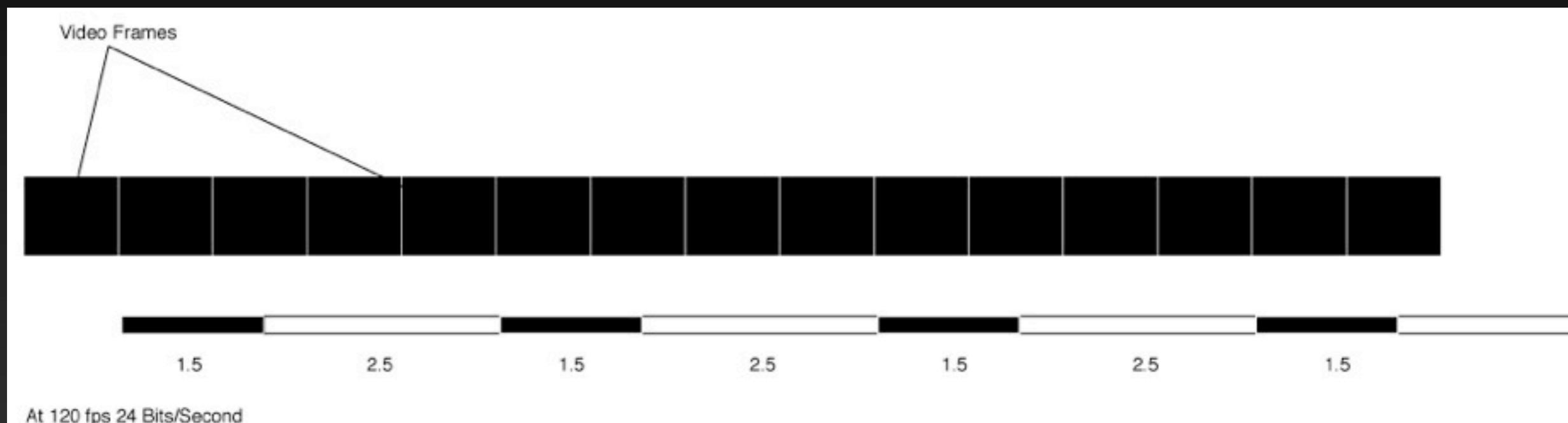
Future Work

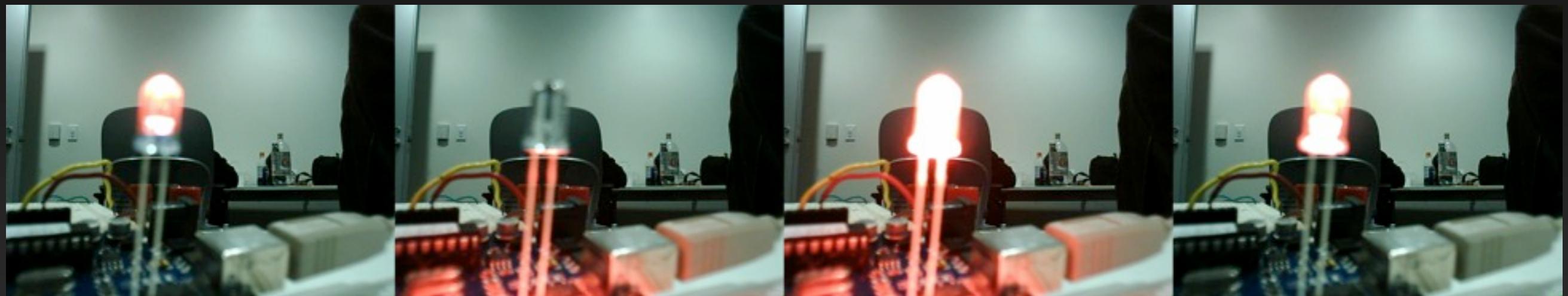
- Safety issues
- Functional prototype with real eyes
- Signal processing (Saccades etc)
- Low cost, light, wireless glasses

Optical Identification

- Temporal encoding based on video frames
- cyclic code (no initial trigger necessary)
- geohash + timestamp for each resource
- variable code length
- passive tags: low cost, no network connection



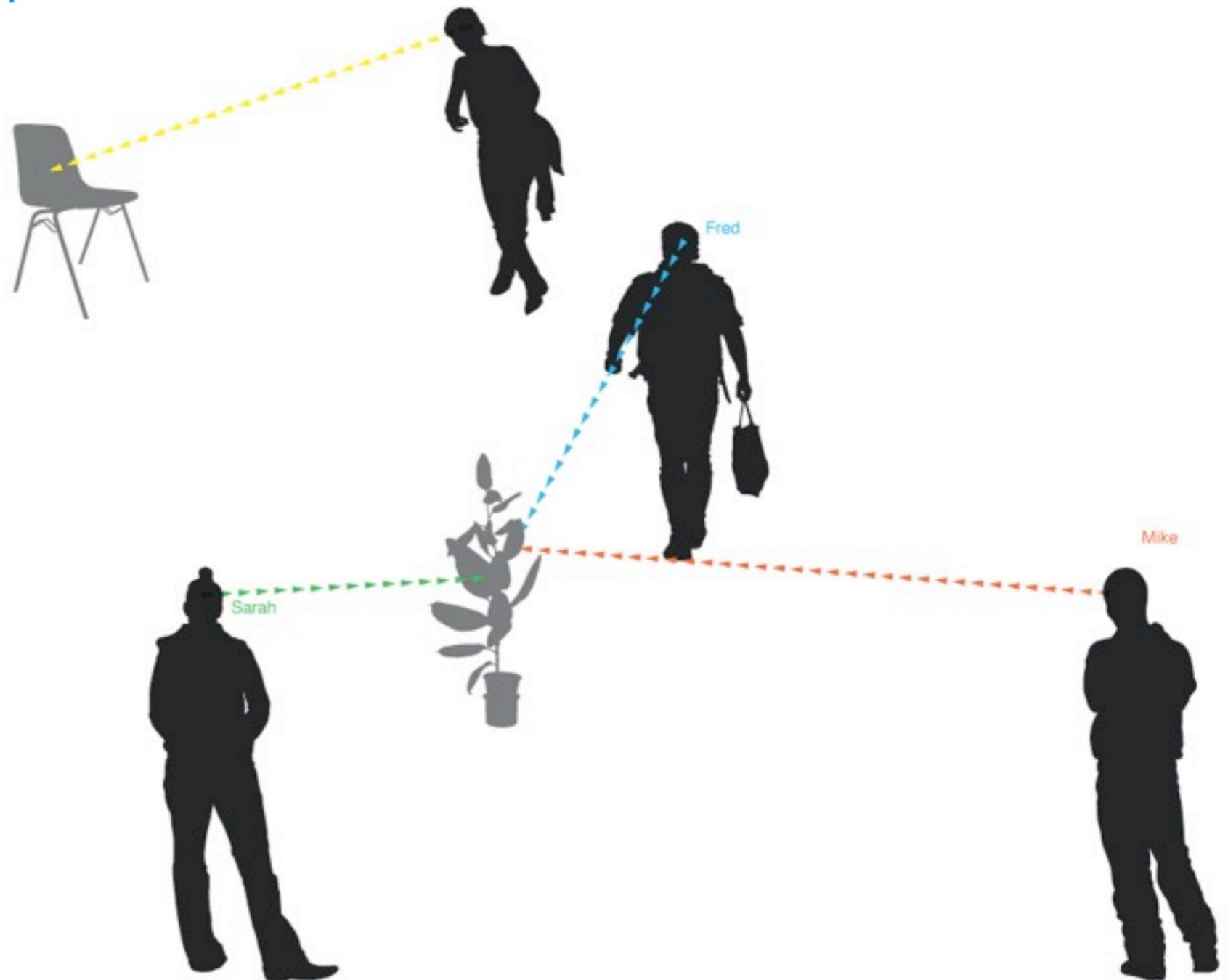




Vision

- Reciprocal Identification
- 3D gaze positioning

Applications:
AR/VR environments





garment district
Boston MFA
ZombieLand



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