

**Macoun**



# Cardboard für iOS

Matthias Krauß

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Vorweg

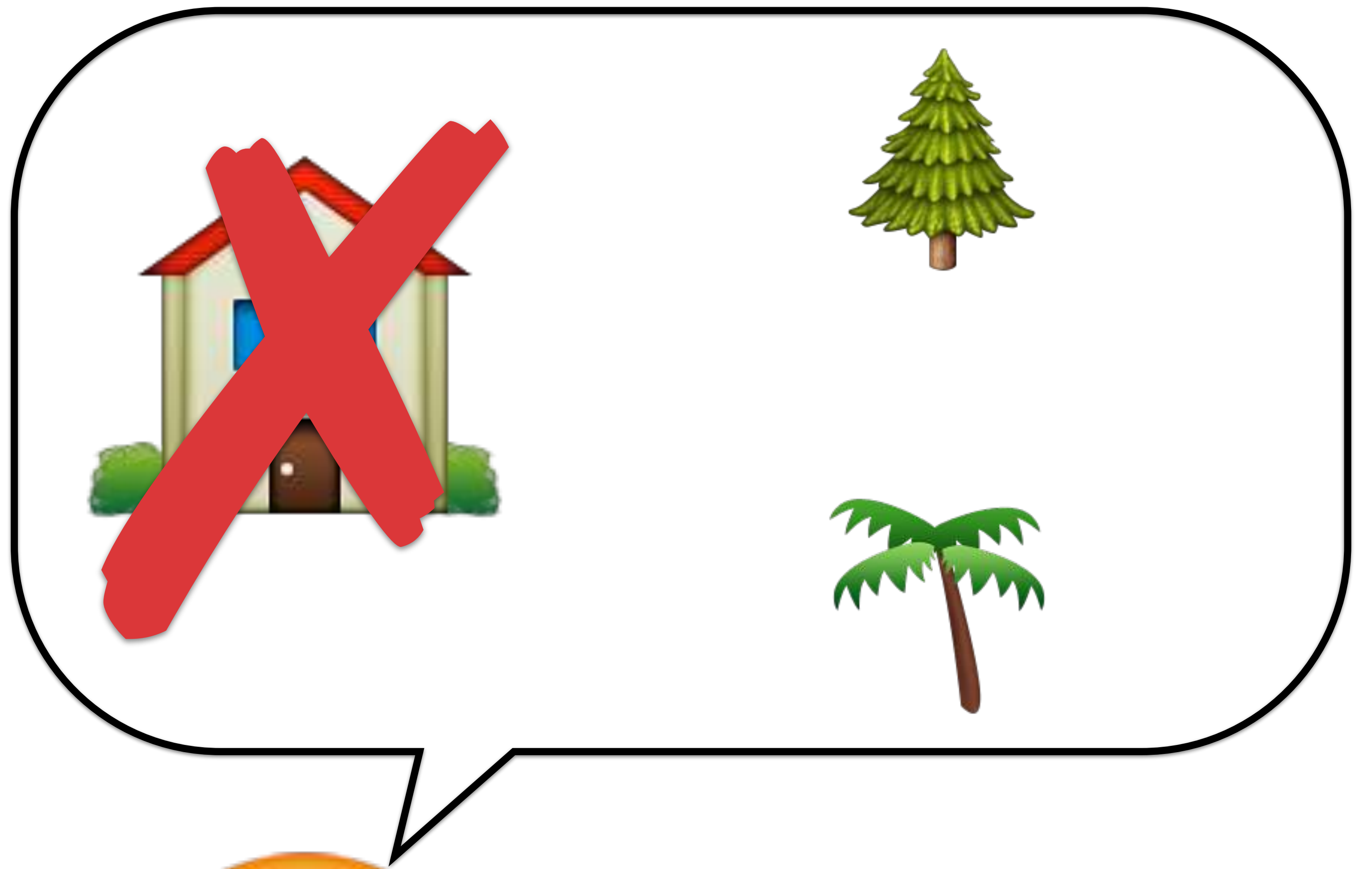
# Ablauf

- VR
- Los geht's: Stereoskopie
- Head Tracking
- Jetzt richtig
- Jetzt noch richtiger
- Wie geht's weiter?

VR

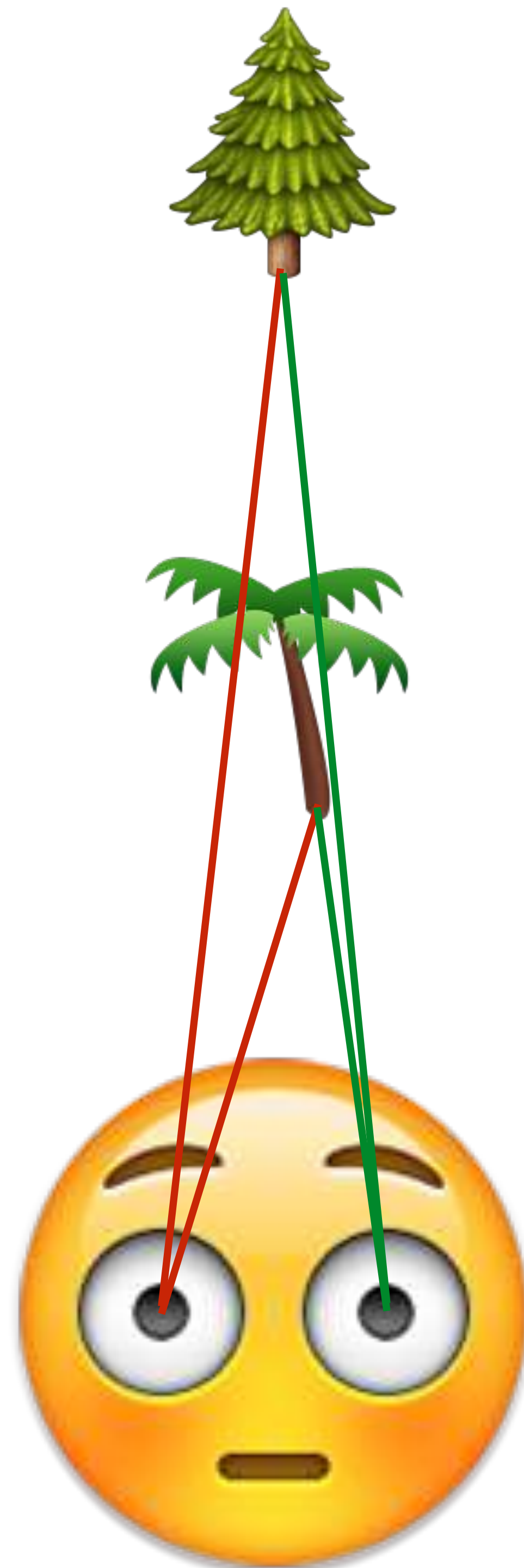


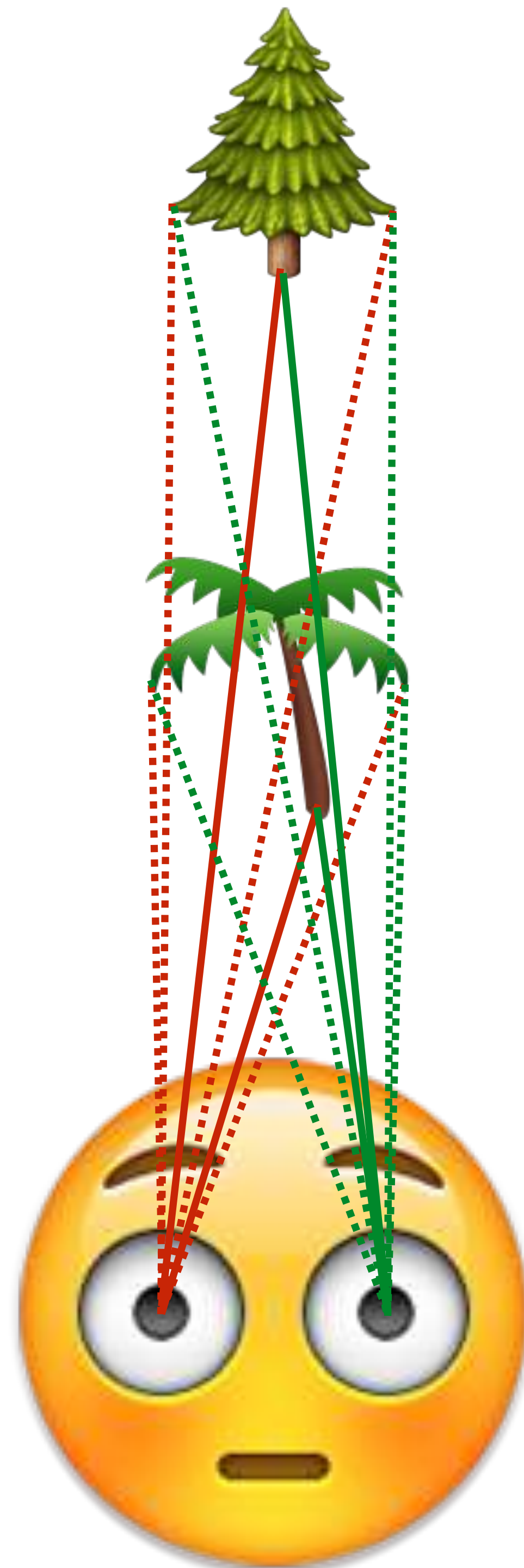


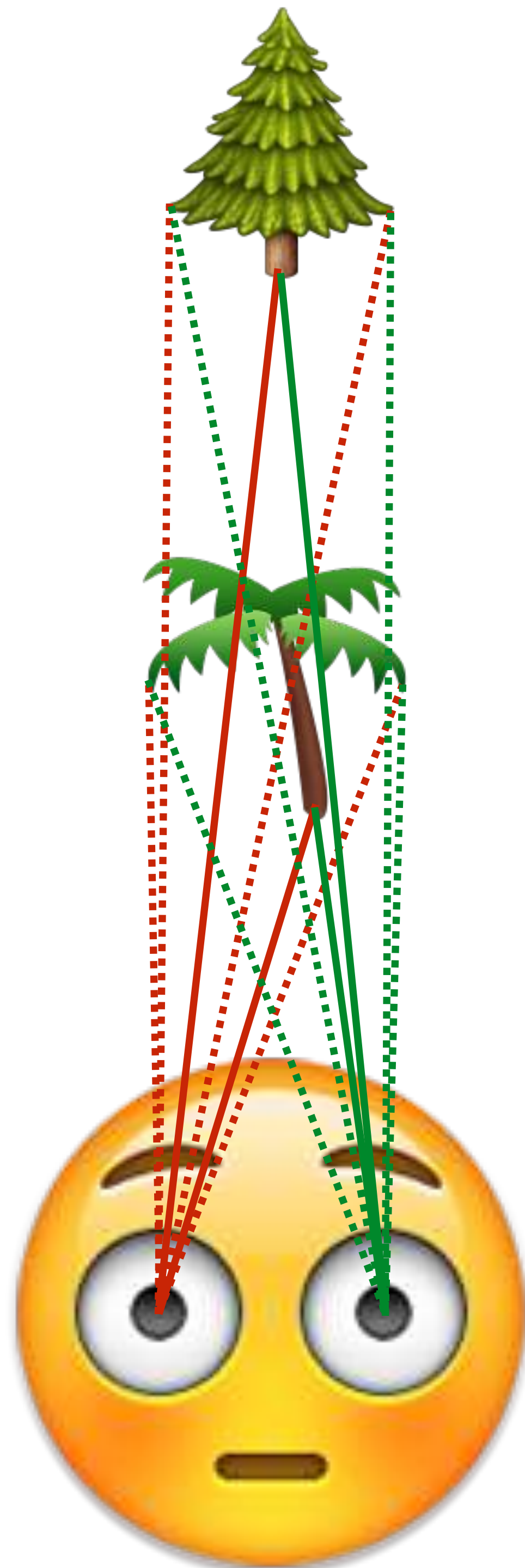




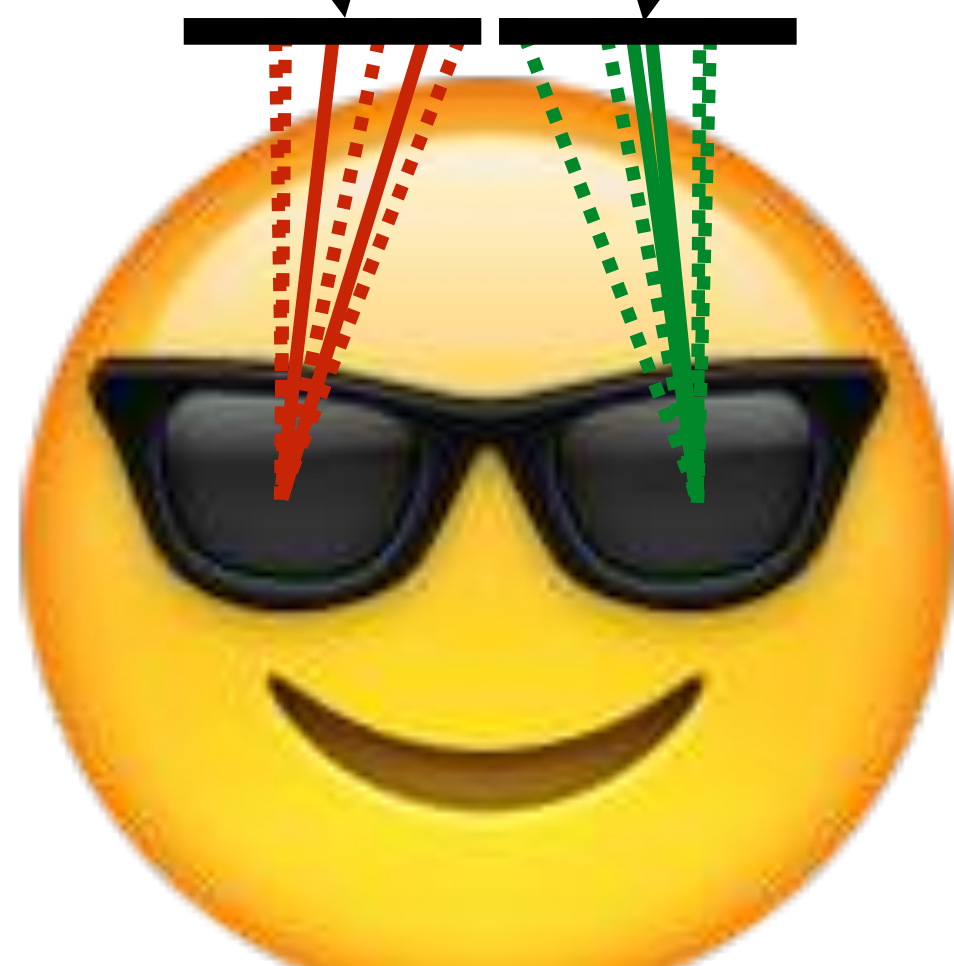












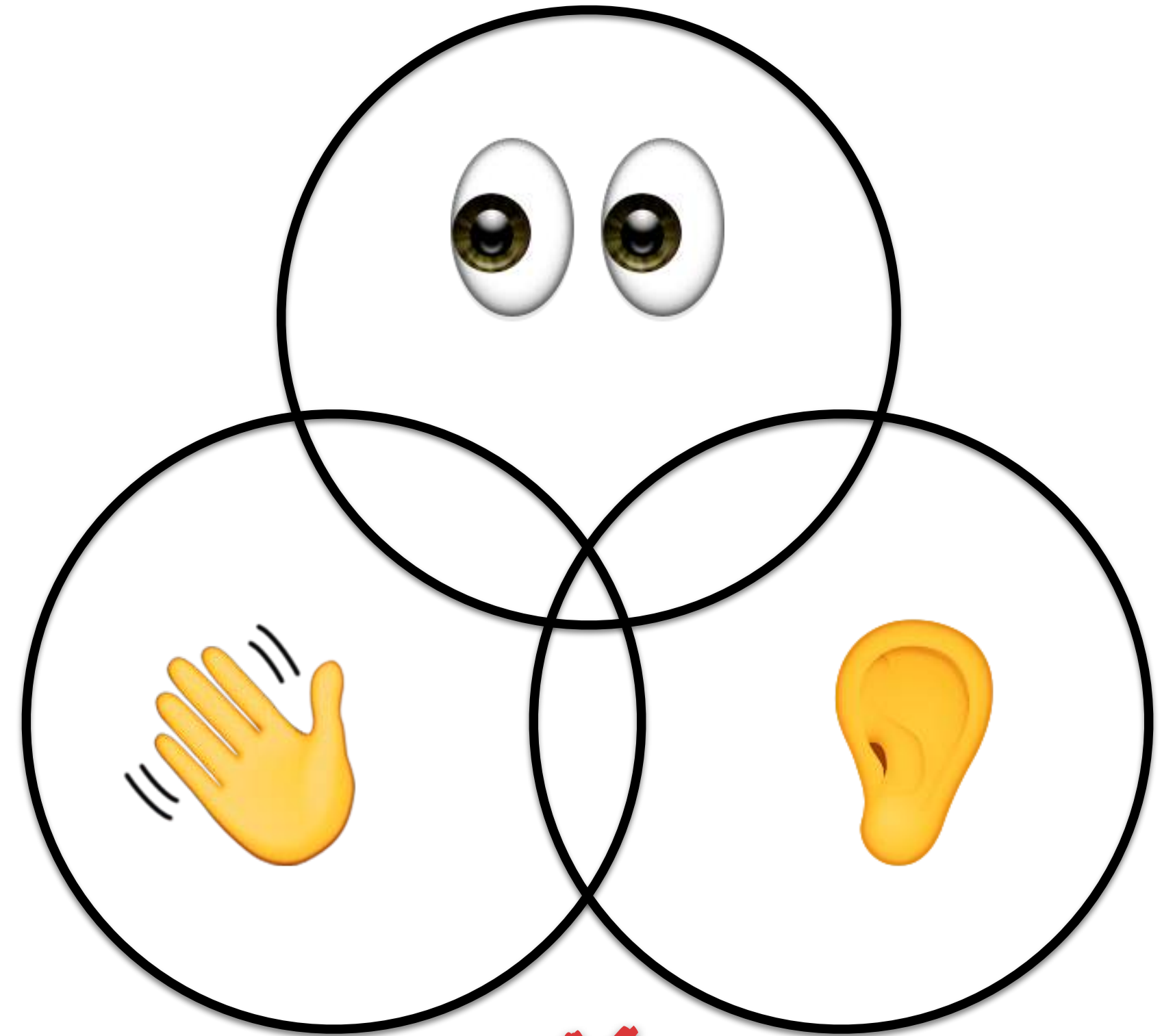
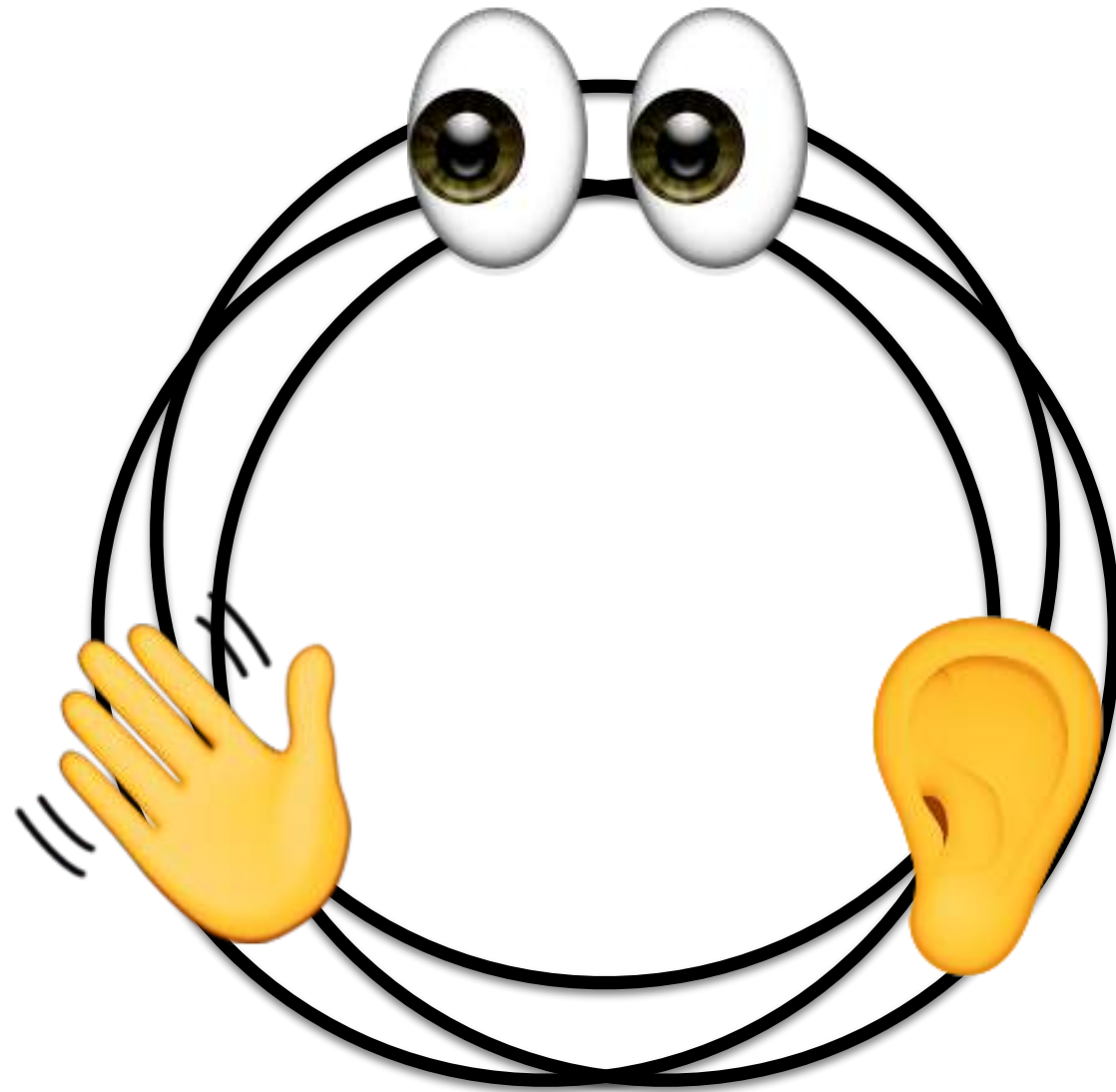


# Cardboard





# Immersion



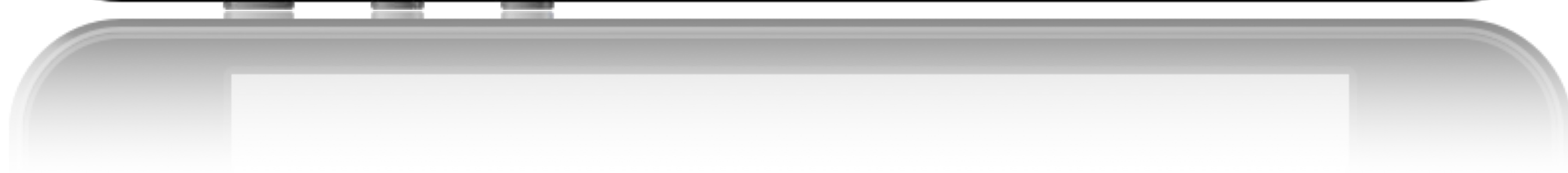
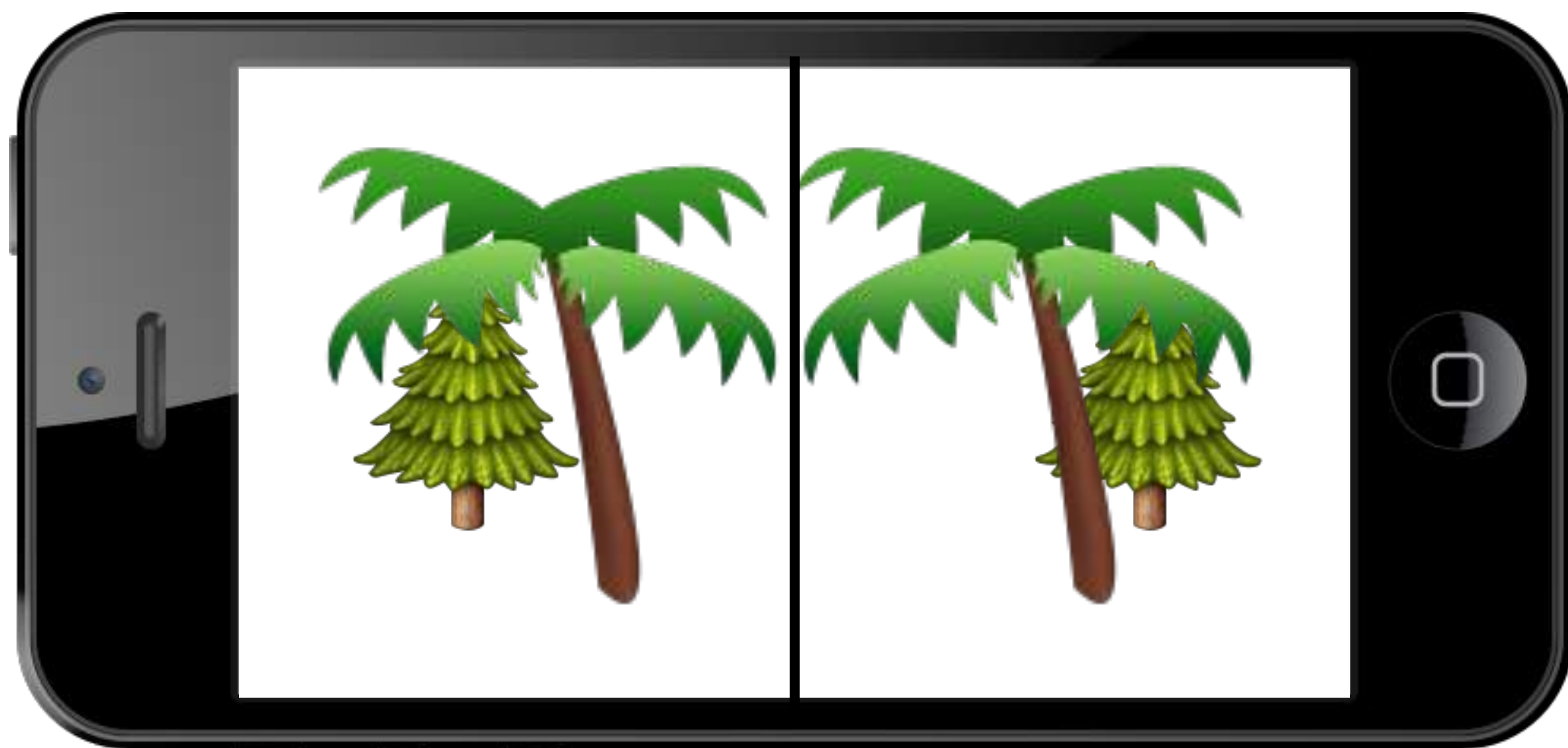
# Problematisch

- Widersprüchliche Tiefenhinweise („Depth Cues“)
- Inkonsistenzen zwischen Sinneseindrücken
- Artefakte
- Latenz
- HUD / Overlays
- Sehr nahe Objekte





Los geht's: Stereoskopie



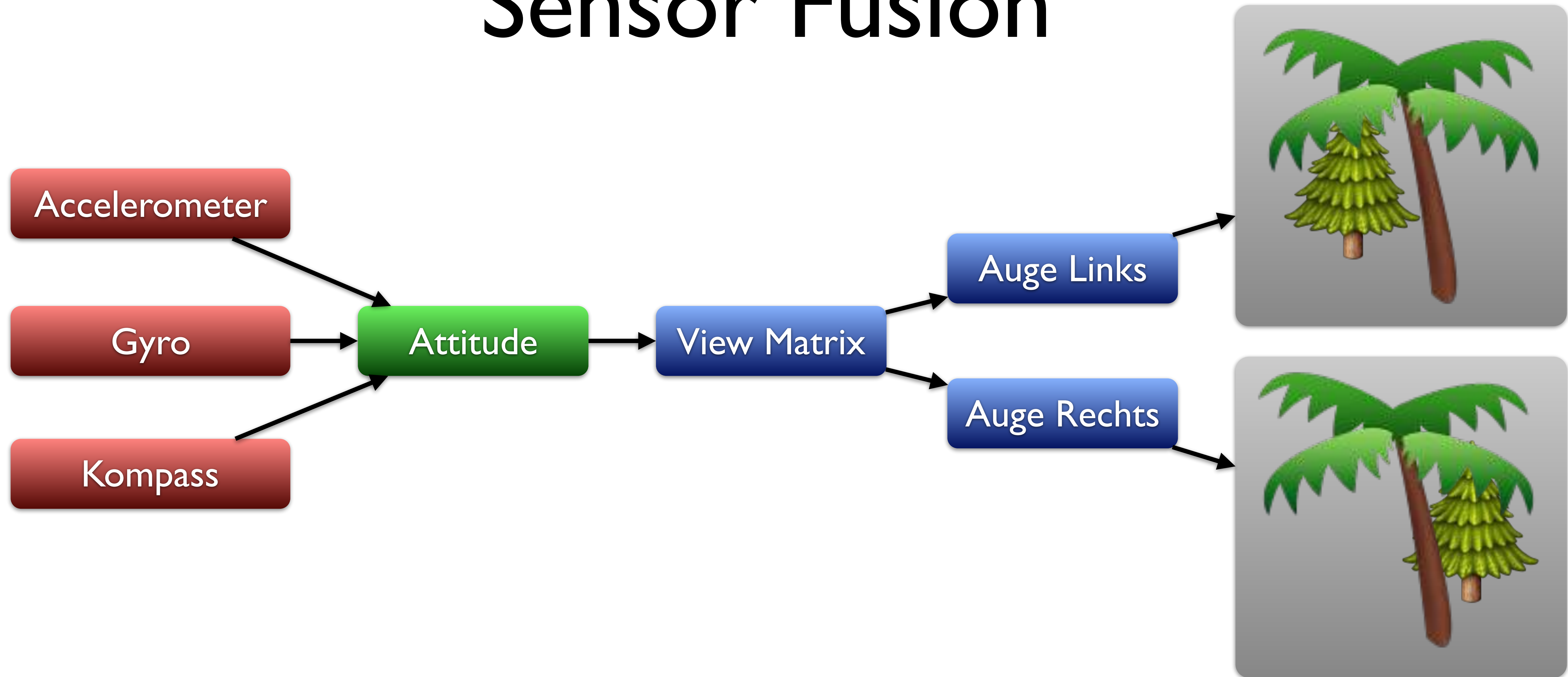
Demo





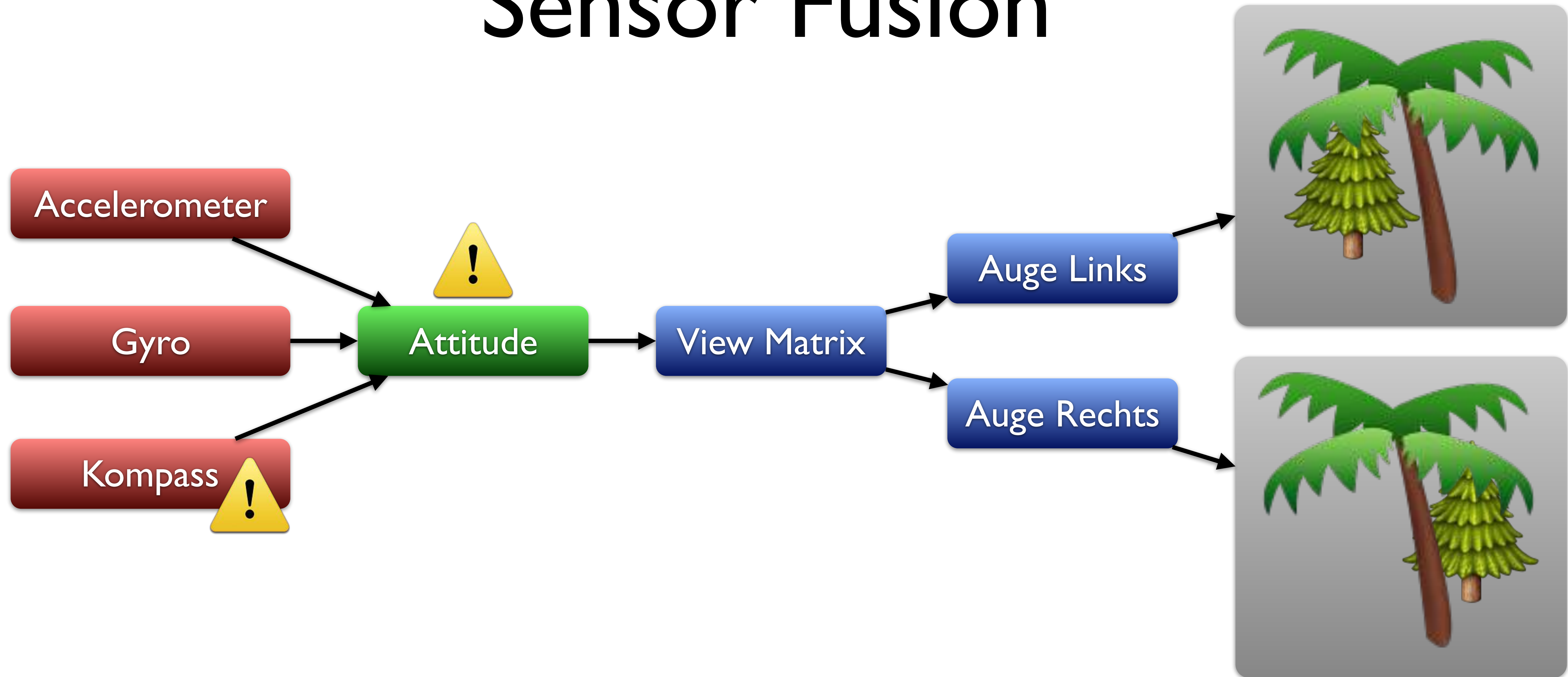
# Head Tracking

# Sensor Fusion





# Sensor Fusion



```
self.mm = [CMMotionManager new];  
self.mm.deviceMotionUpdateInterval = 0.01;  
[self.mm startDeviceMotionUpdatesUsingReferenceFrame:  
    CMAttitudeReferenceFrameXArbitraryZVertical];  
// CMAttitudeReferenceFrameXArbitraryCorrected <- Mit Kompass
```

```
CMAttitude* att = self.mm.deviceMotion.attitude;  
// Eulerwinkel (pitch,yaw,roll), Matrix oder Quaternion
```

Demo

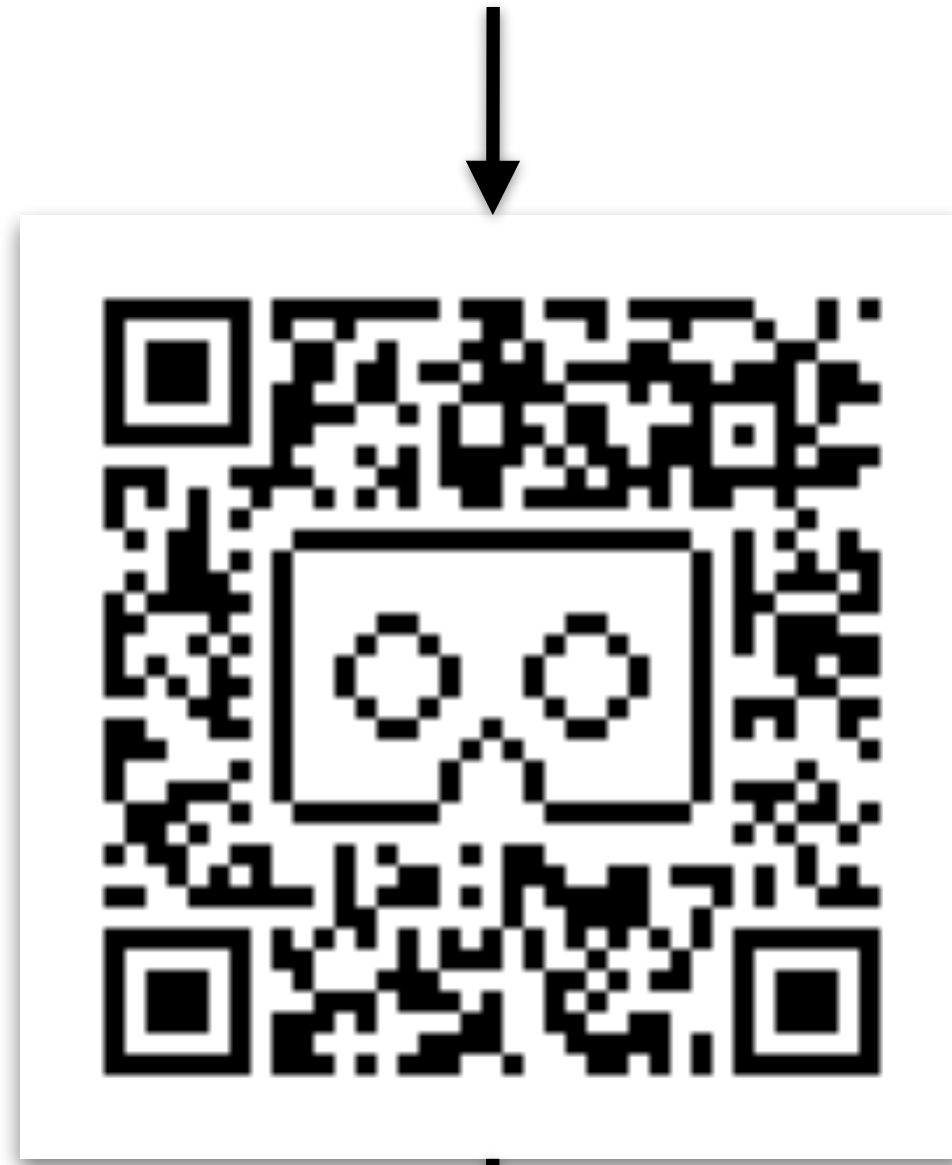




Jetzt richtig

# Viewer Profile

<https://www.google.com/get/cardboard/viewerprofilegenerator/>



[goo.gl/hBlbjv](https://goo.gl/hBlbjv)

# „API“

```
GET /hBlbJv HTTP/1.1  
Host: goo.gl
```

```
HTTP/1.1 301 Moved Permanently  
Location: http://google.com/cardboard/cfg?  
p=Cg9QcmVzcyBFdmVyeSBLZXkSDER1bW15IFZpZXdlch0xCCw9JY_CdT0qEAAASEIAAEhCAABIQgAASEJ  
YADUpXA89OggAAIA_AACAP1ABYAE
```

- <http://goo.gl/hBlbJv>
- <http://google.com/cardboard/cfg?p=Cg9Qcm...>
- <https://www.google.com/get/cardboard/download/?p=Cg9Qcm...>
- „Cardboard ist toll“-Seite



# „API“

```
GET /hBlbJv HTTP/1.1  
Host: goo.gl
```

```
HTTP/1.1 301 Moved Permanently  
Location: http://google.com/cardboard/cfg?  
p=Cg9QcmVzcyBFdmVyeSBLZXkSDER1bW15IFZpZXdlch0xCCw9JY_CdT0qEAAASEIAAEhCAABIQgAASEJ  
YADUpXA89OggAAIA_AACAP1ABYAE
```

# „API“

Cg9QcmVzcyBFdmVyeSBLZXkSDER1bW15IFZpZXdlch0xCCw9JY\_CdT0qEAAASEIAAEhCAABIQgAASEJYA  
DUpXA89OggAAIA\_AACAP1ABYAE

Base64URL decode

Protobuffer decode

CardboardDeviceParams

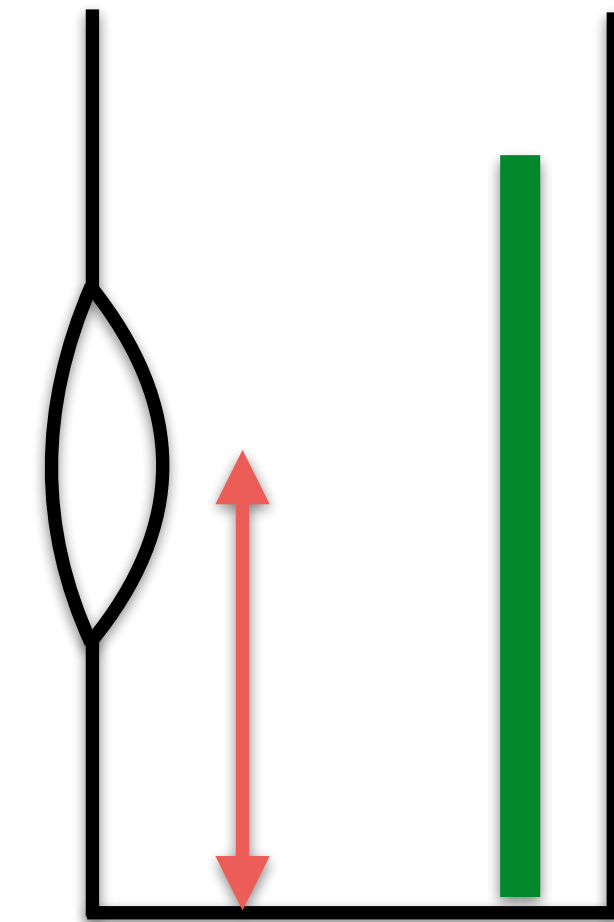
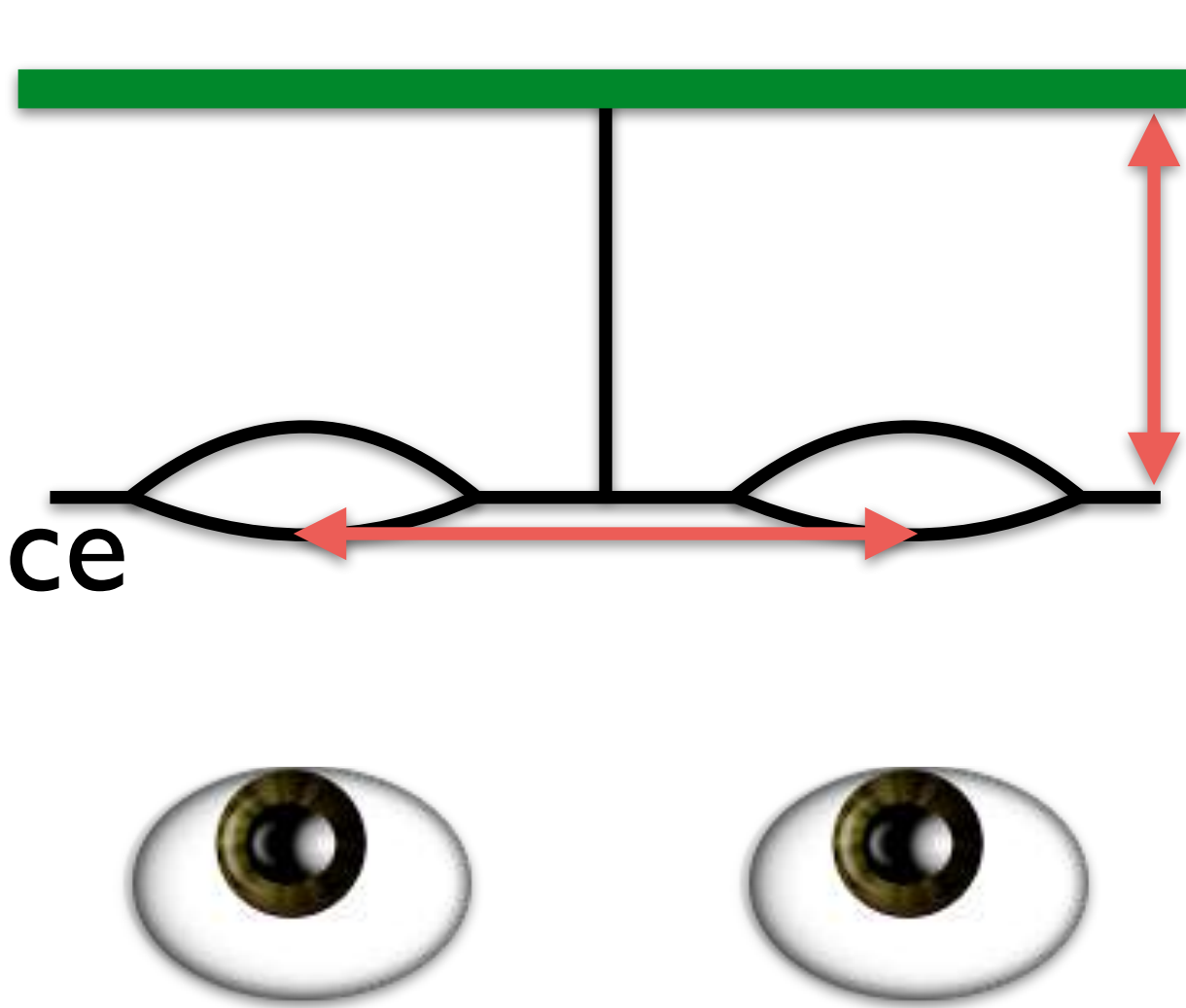


# CardboardDeviceParams

screenToLensDistance

verticalDistanceToLensCenter

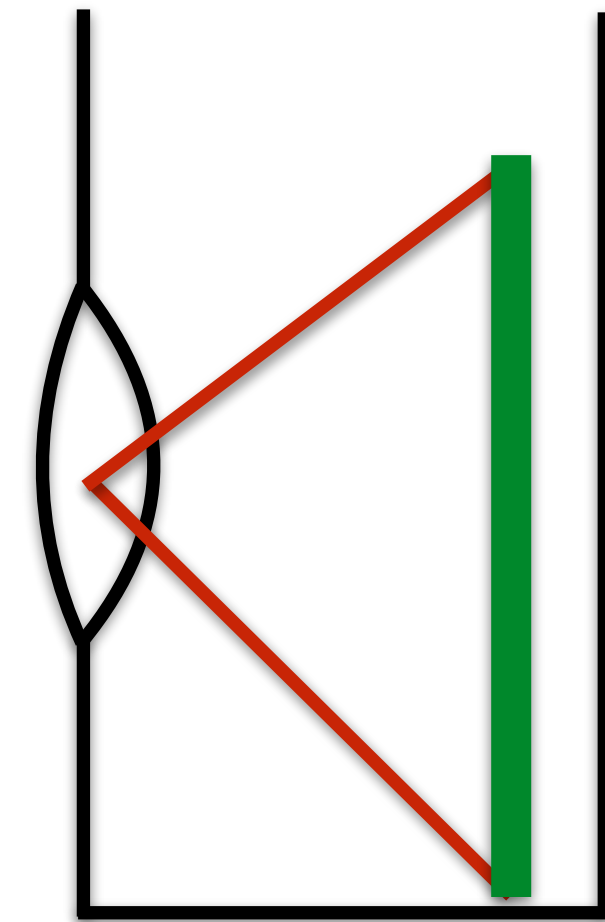
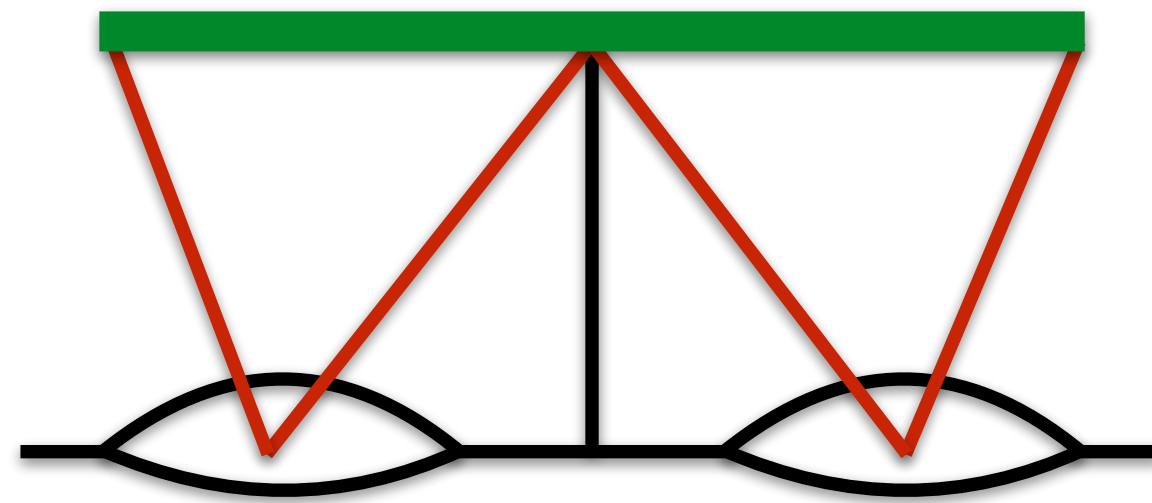
interLensDistance



+ hasMagnet, distortionParams, primaryButtonType, ...

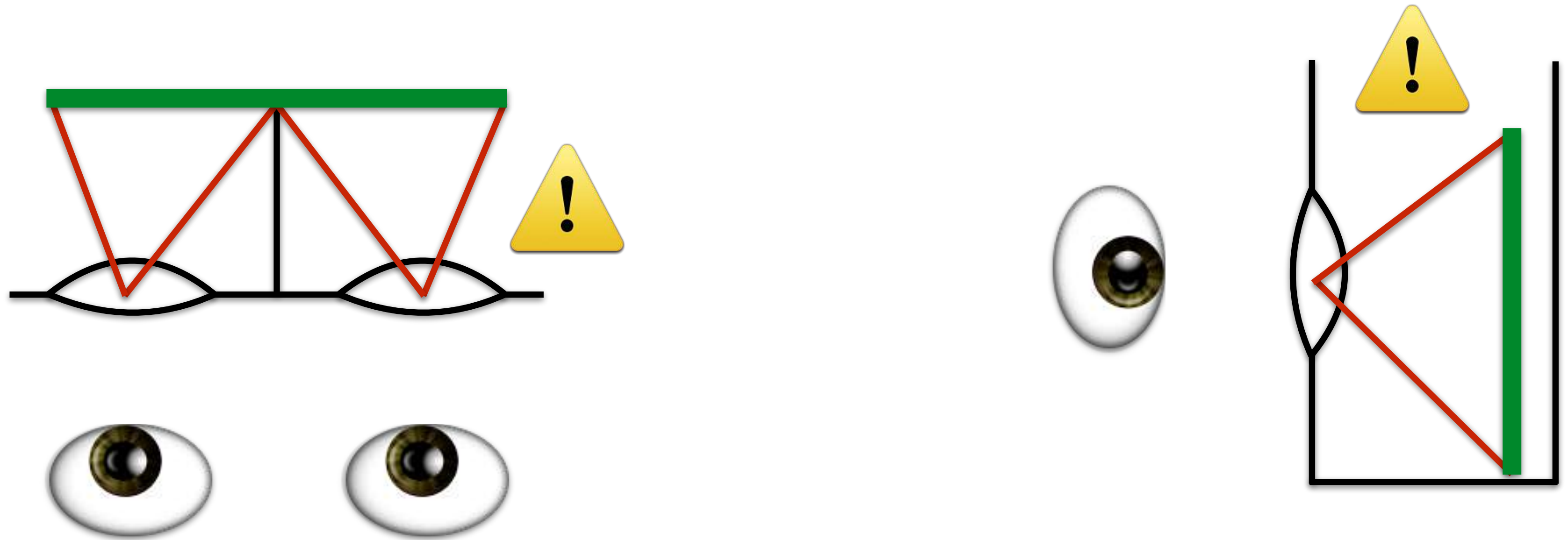
# Field of View

(so fast richtig)



# Field of View

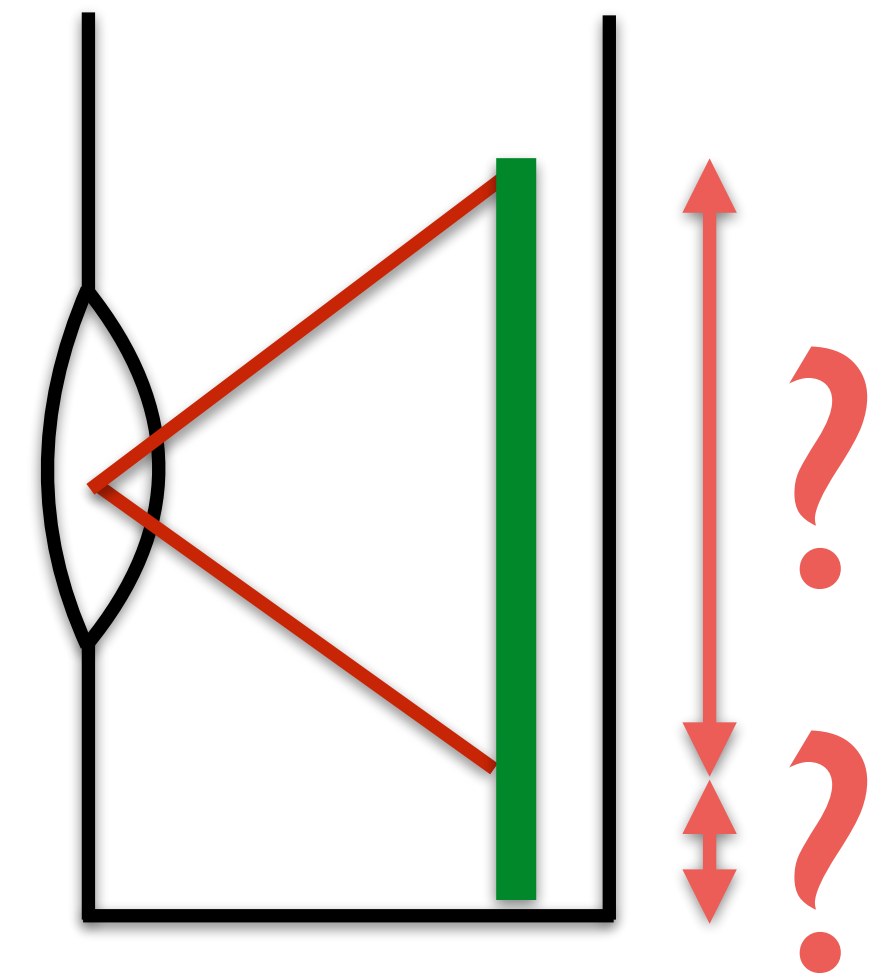
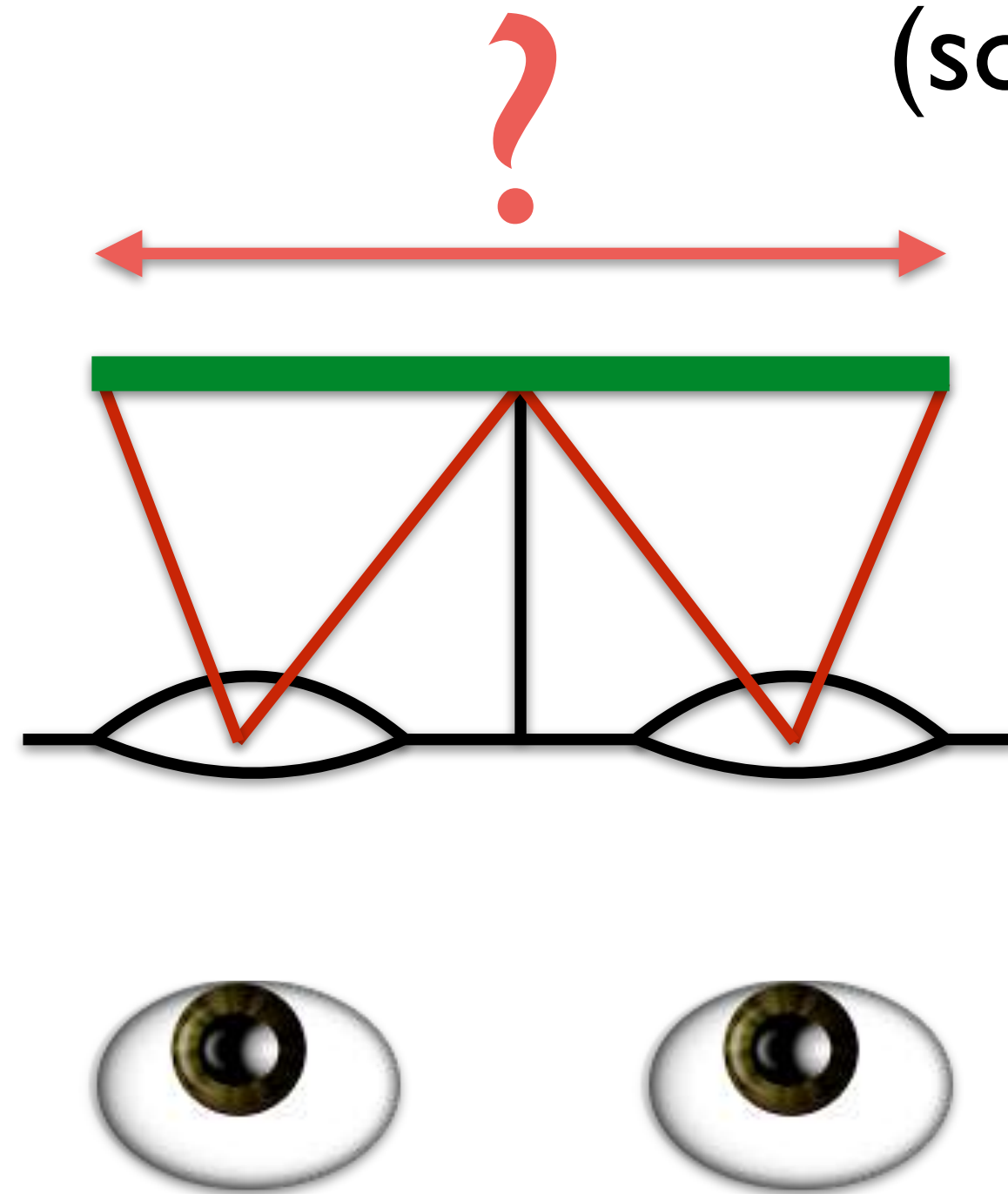
(so fast richtig)





# Field of View

(so fast richtig)



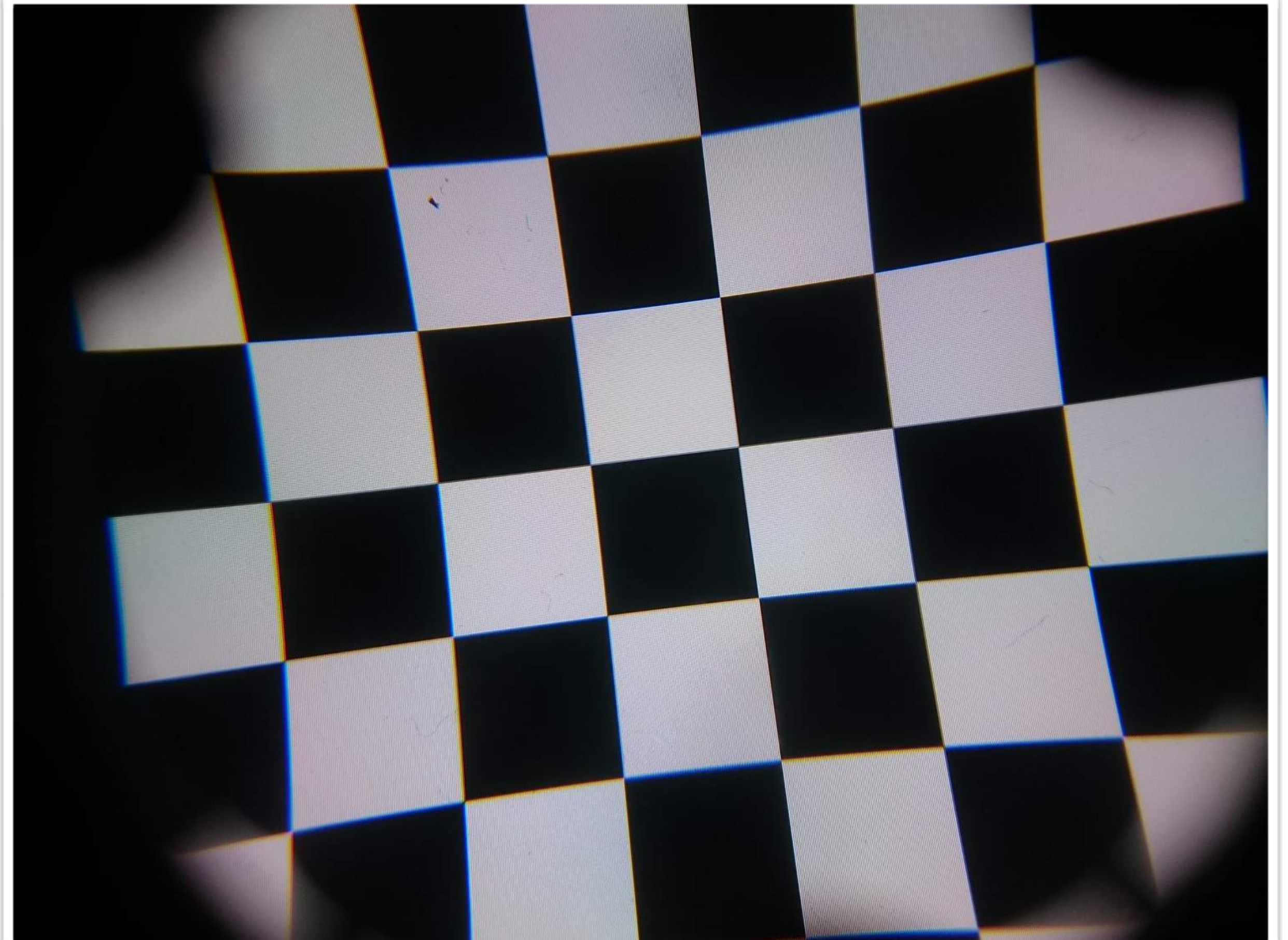
Demo



Jetzt noch richtiger

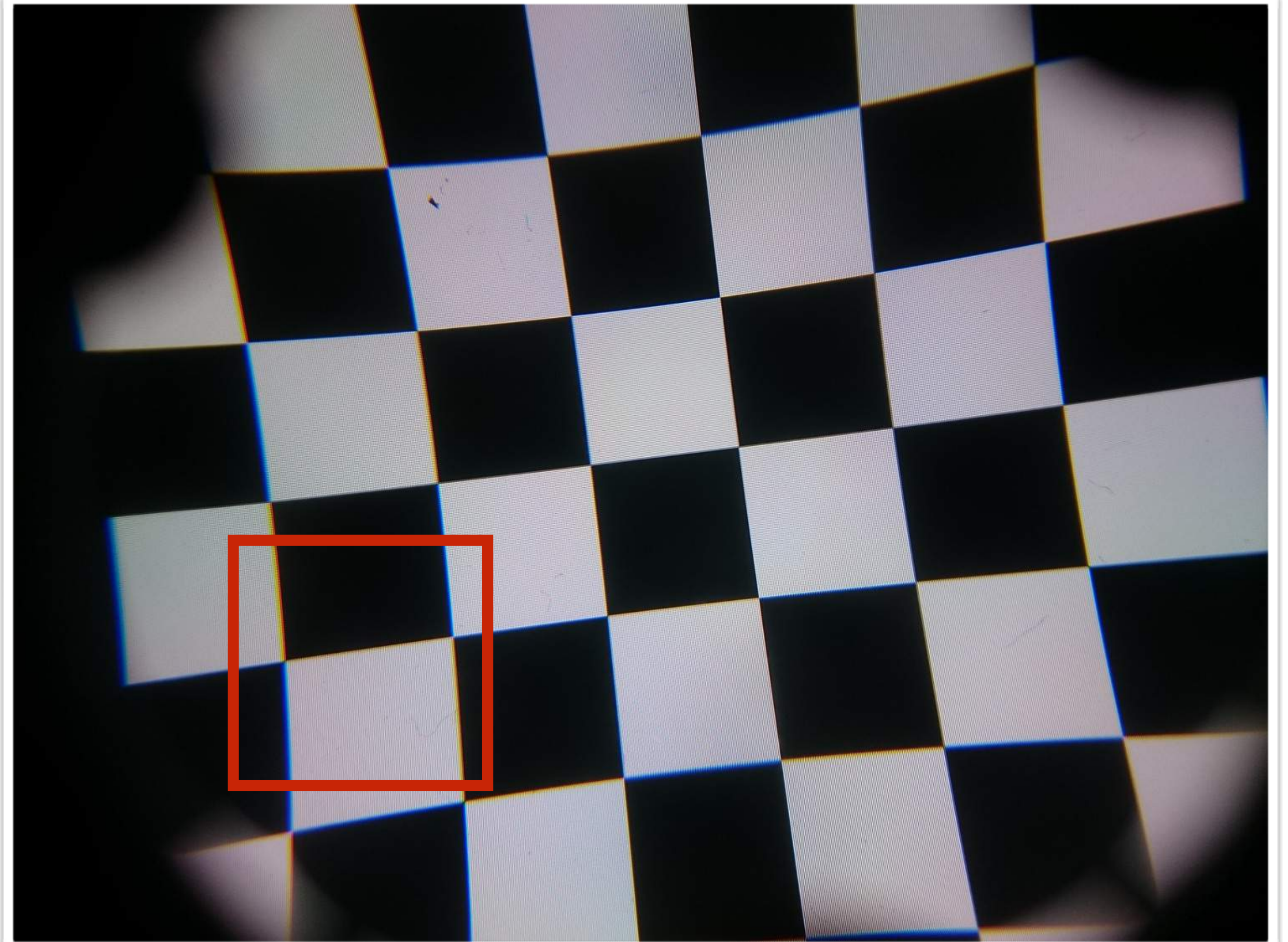
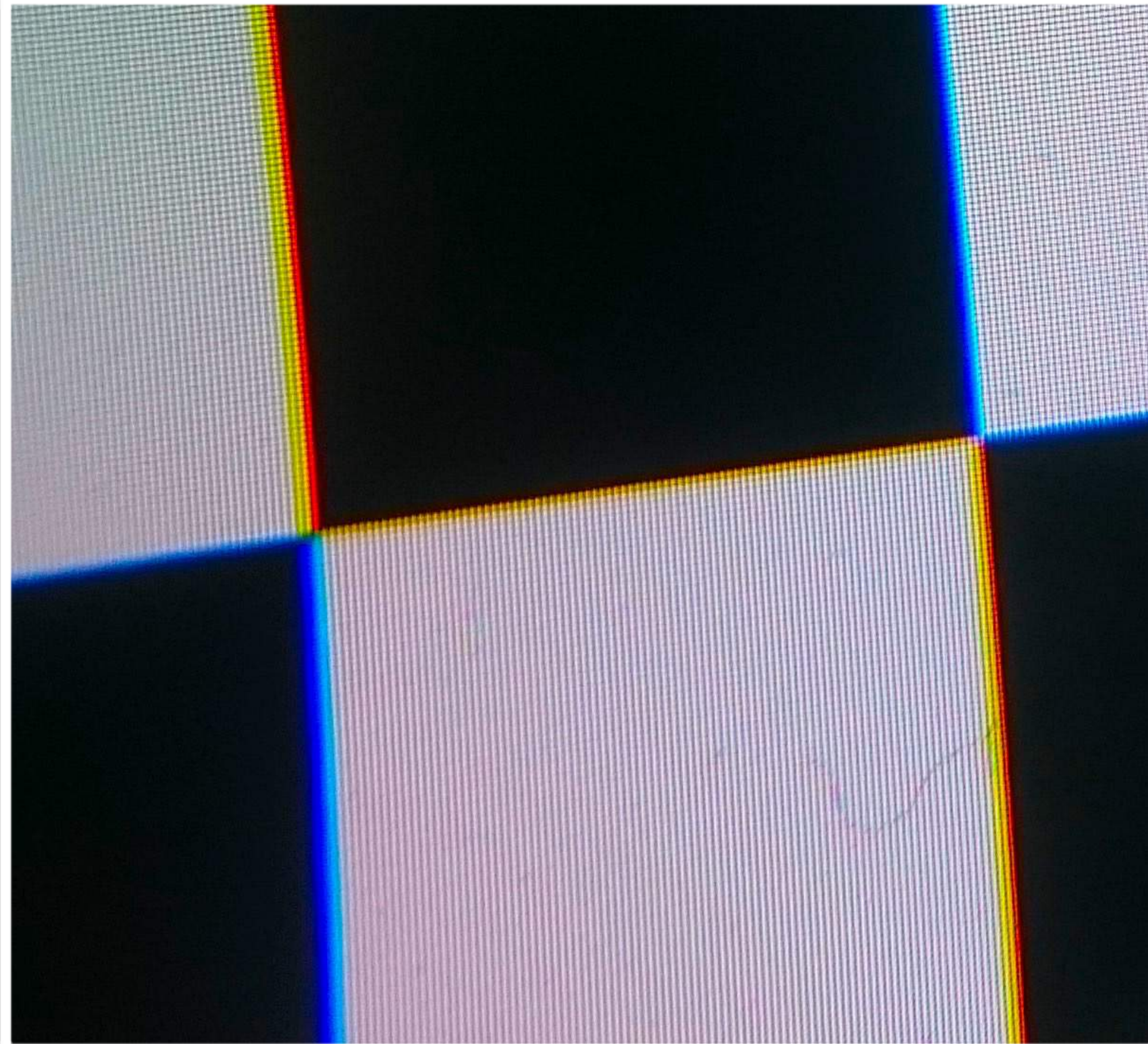


# Kissenverzerrung



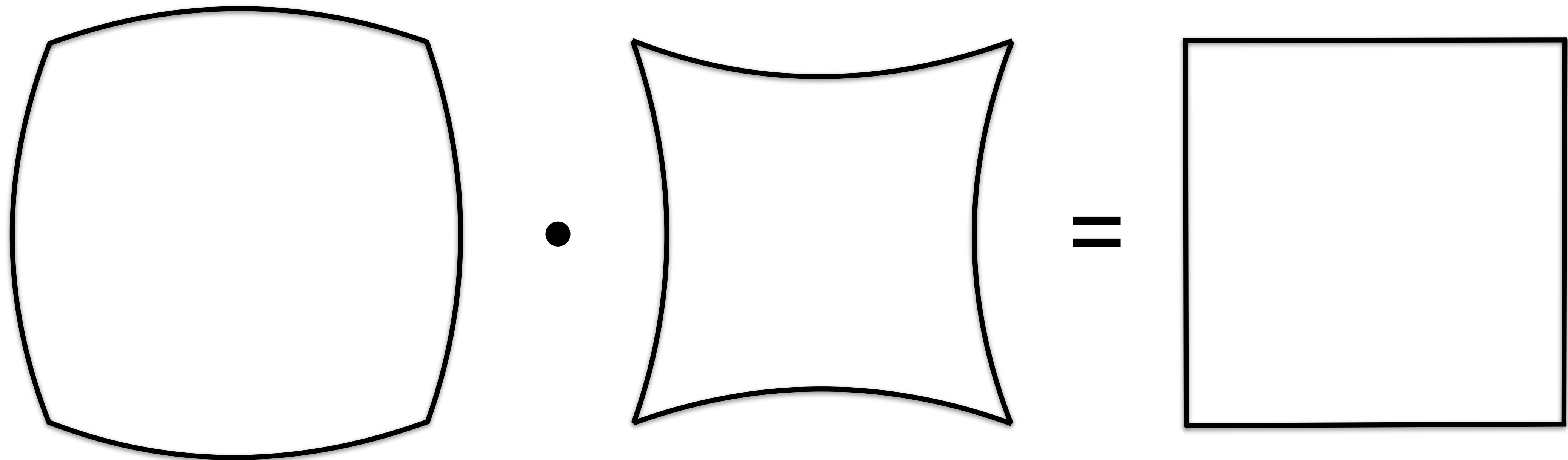


# Chromatische Aberration





# Kompensation

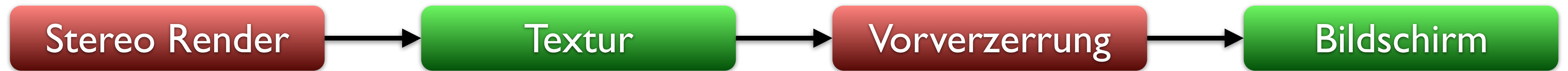




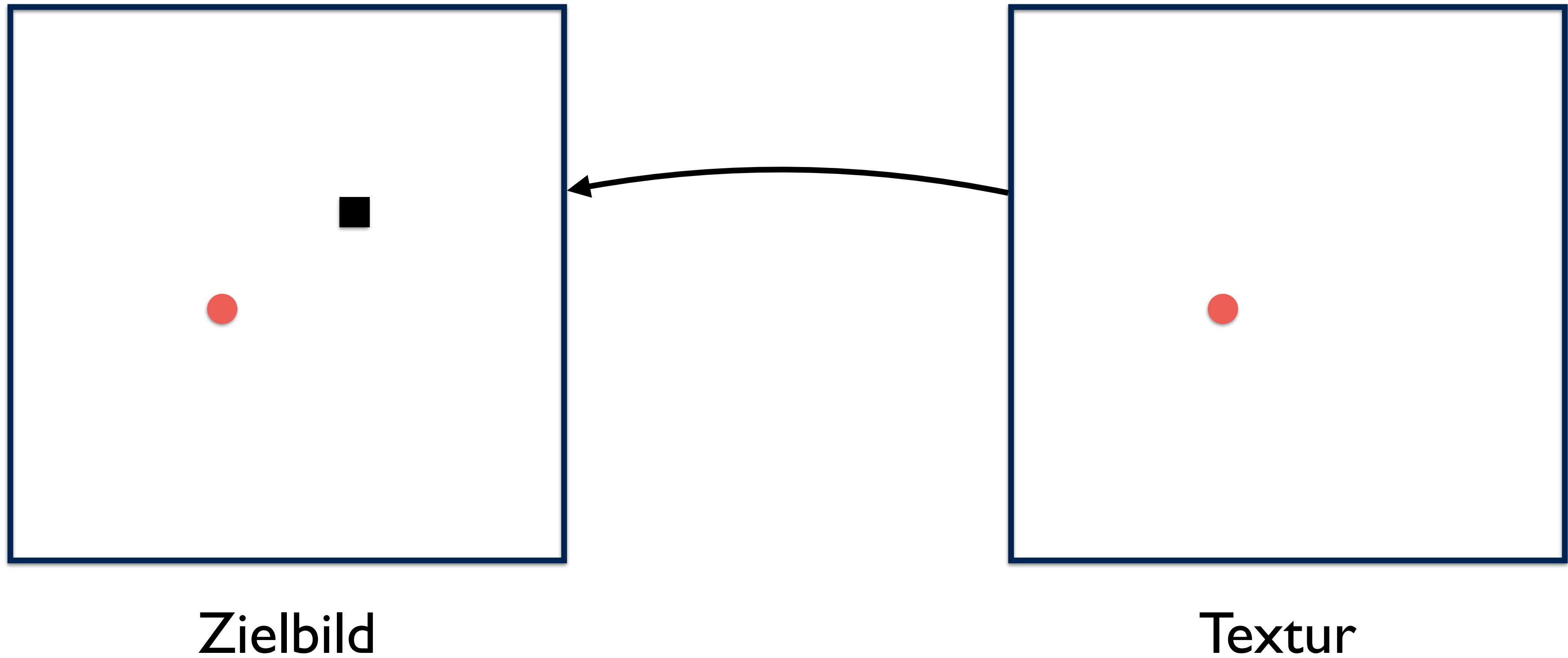
# Distortion Render



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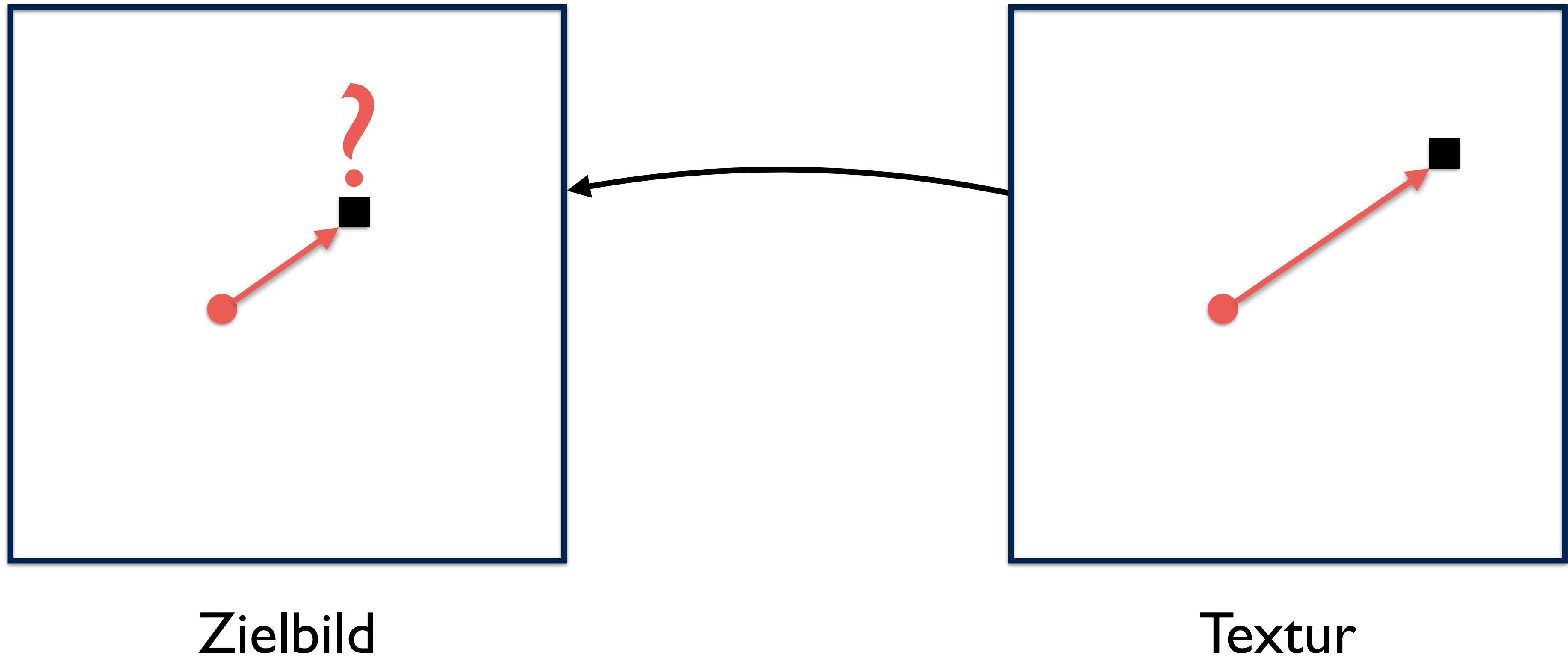


# Distortion Render





# Distortion Render



Demo



Wie geht's weiter?

# Wie geht's weiter?

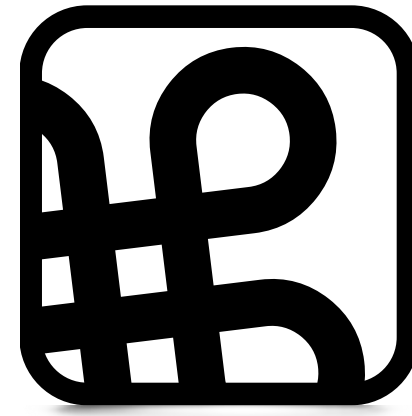
- 6DOF head tracking
- Tracking-Latenz reduzieren
- Interaktion: Kompass, Kameras, Watch, ...
- Sinnvolle Anwendung finden



# Fazit

Fragen?

**Vielen Dank**



**Macoun**