

3D Media Workshop
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Autostereoscopic Displays with Extended Eye Tracking

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Outline

- Ulrich Leiner, Fraunhofer Heinrich-Hertz-Institute, heading the department “Interactive Media – Human Factors”
- Known for autostereoscopic displays with eye-tracking

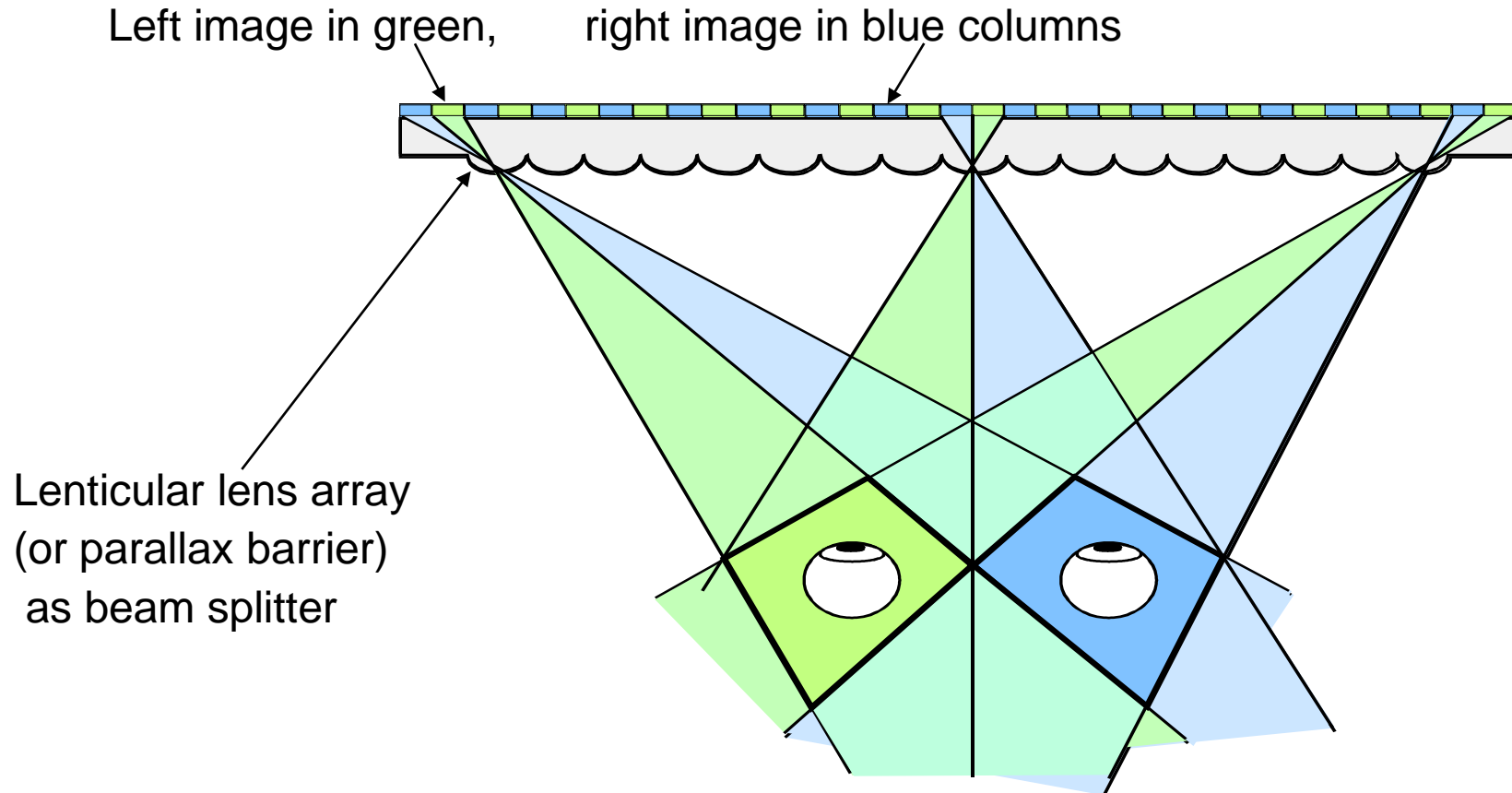


Today's topics:

- Real time motion parallax simulation utilizing eye-tracking
- Multiview displays with eye-tracking

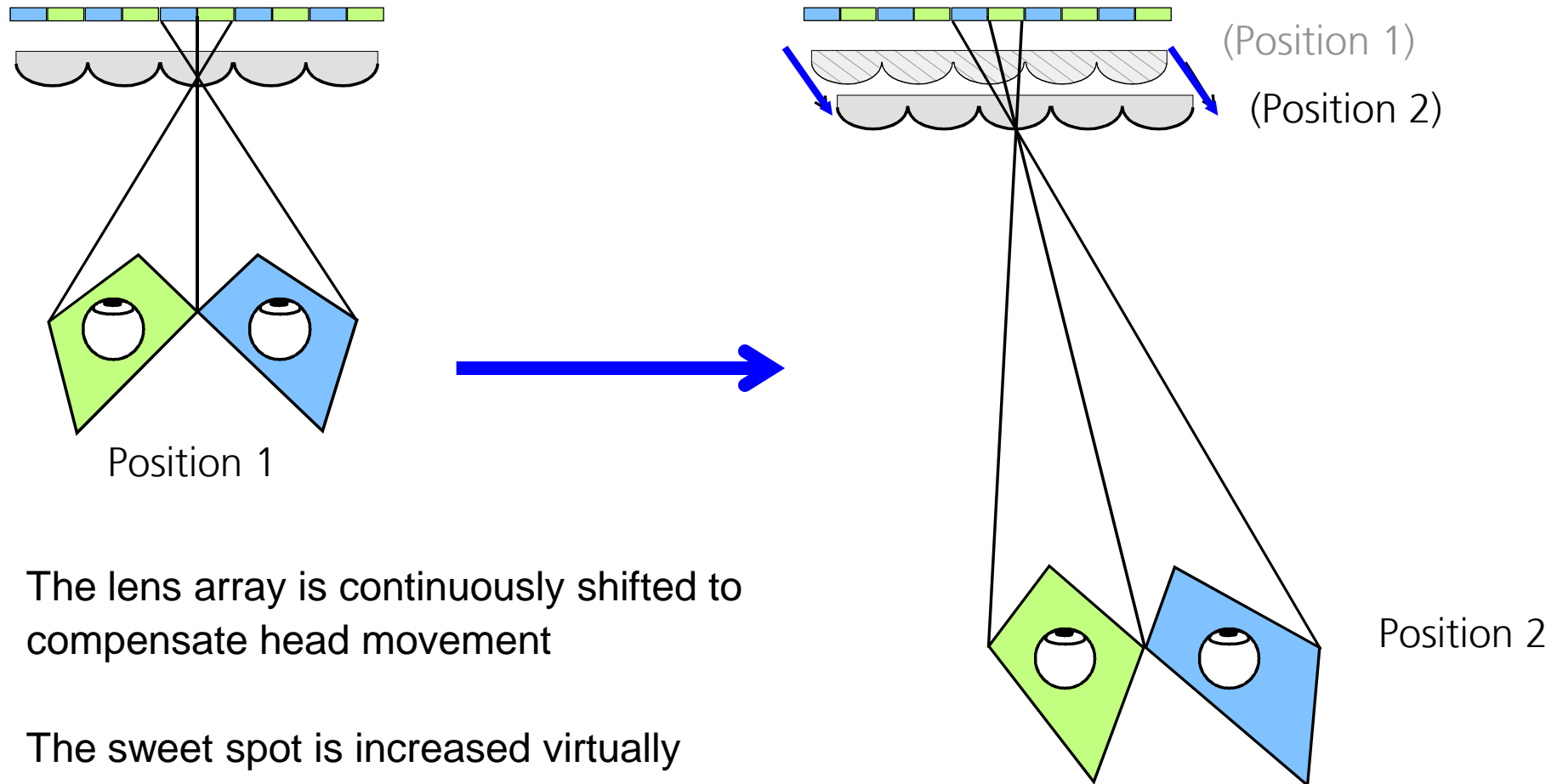


Autostereoscopic Basics



With 2 views only, high resolution is maintained but the sweet spot is rather limited!

Two-dimensional Adjustment of Lens Array

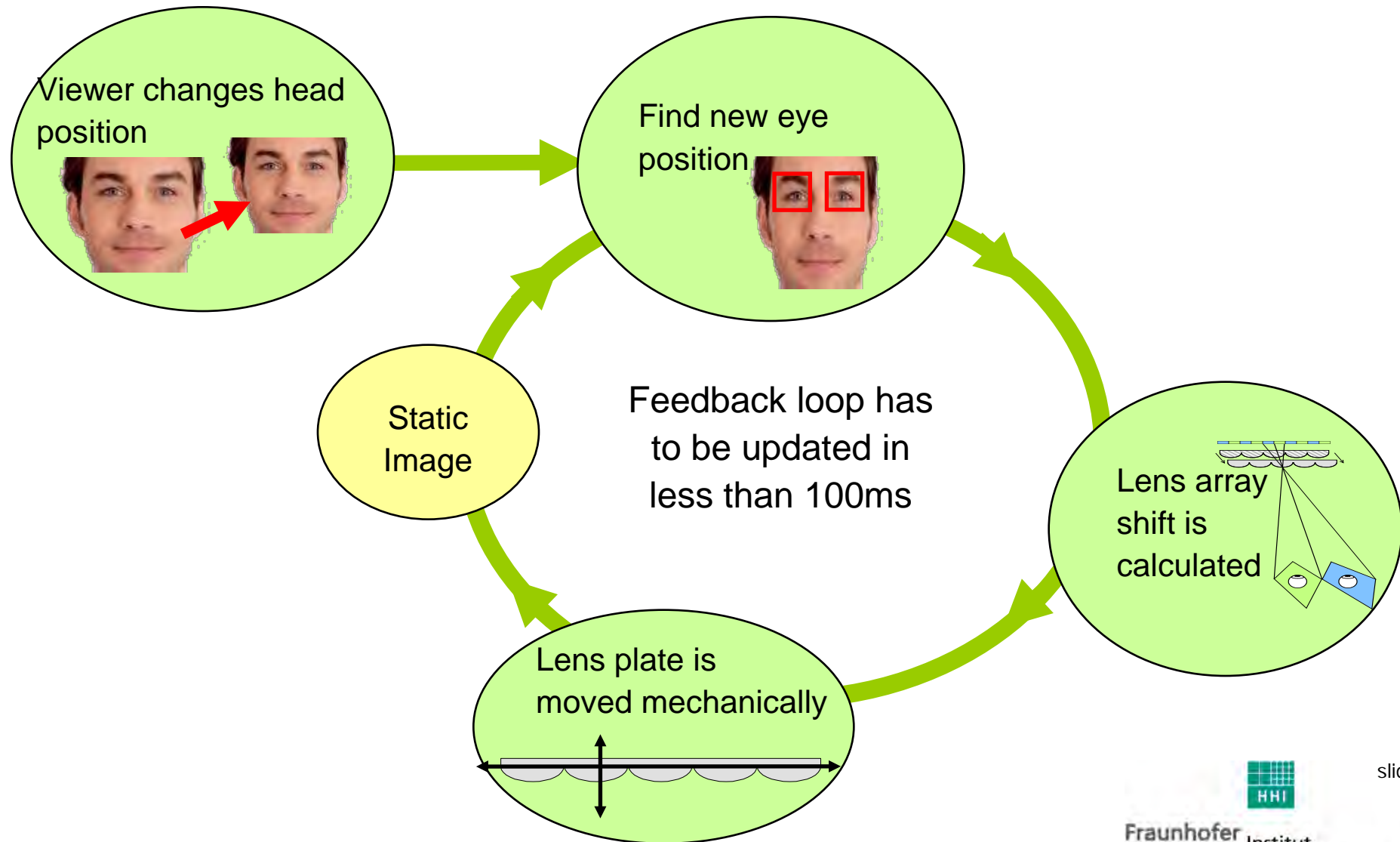


The lens array is continuously shifted to compensate head movement

The sweet spot is increased virtually without limits

Solution is limited to one viewer only

Adding Motion Parallax Compensation



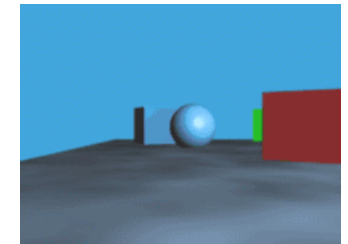
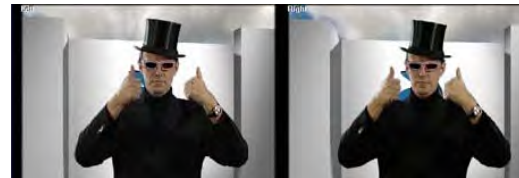
Strength – Weakness Analysis

- No glasses
- High resolution (up to 1920x1200 equals 1300x800 stereo)
- Broad sweet spot through tracking
- Very low cross talk

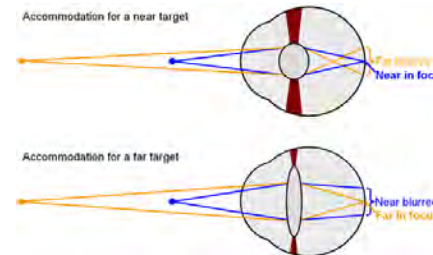


Supported depth cues

- ✓ Vergence
- ✓ Accommodation (limited)
- ✓ Disparity



Motion Parallax ????



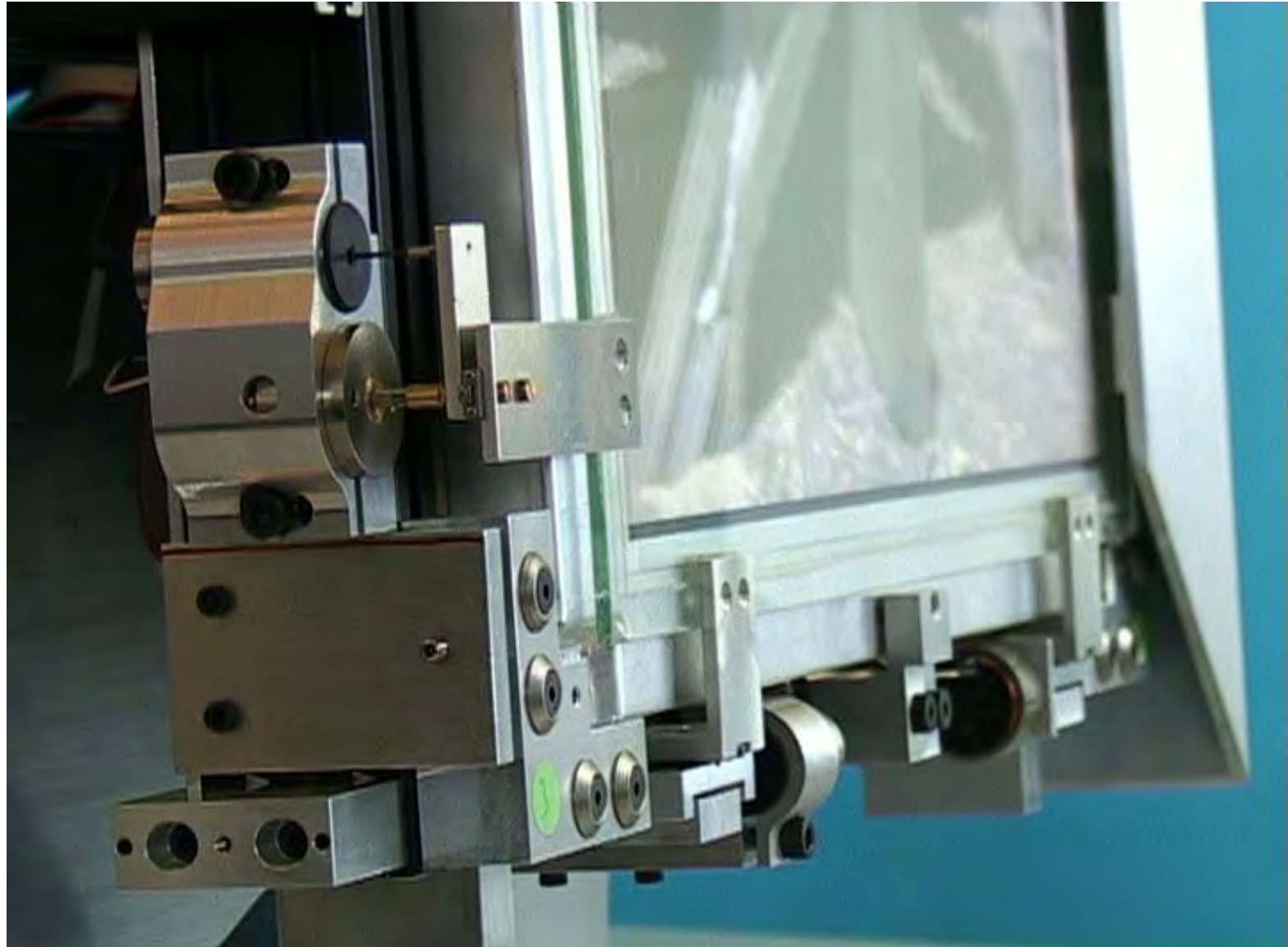
Head/Eye Tracker Video



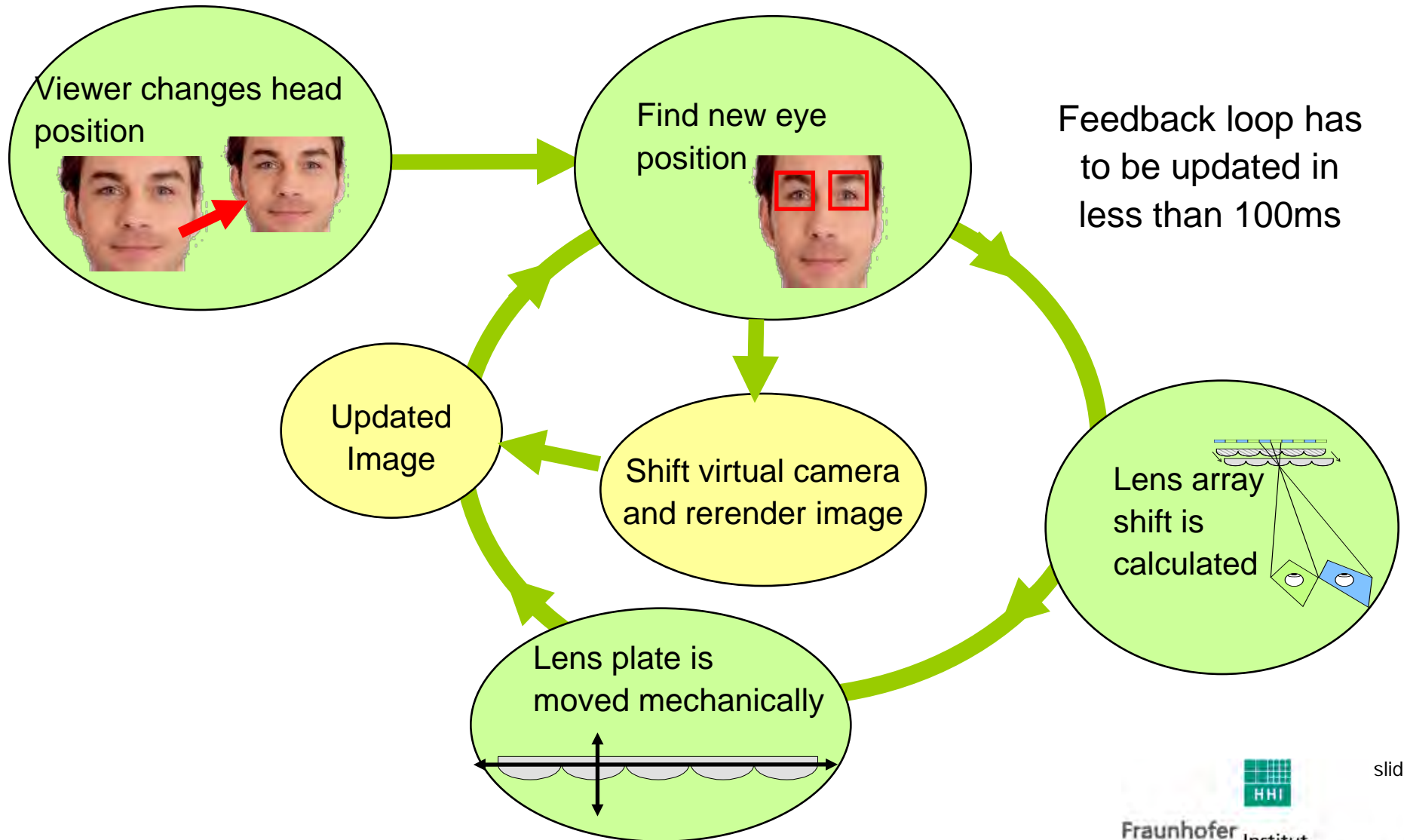
Pattern recognition and tracking

- Real time
- Robust against illumination changes
- Robust against glasses, skin color, beards, etc
- three-dimensional output data

Voice-Coil Motors to shift the Lens Plate



Adding Motion Parallax Compensation

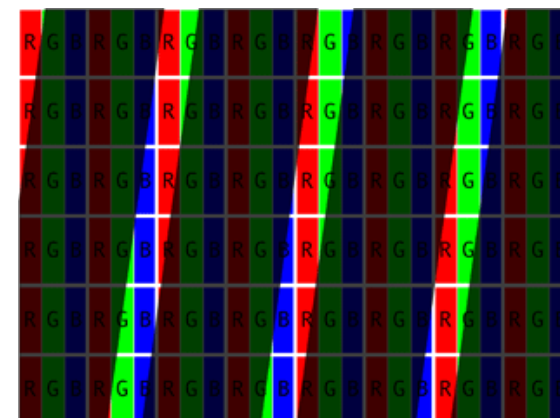
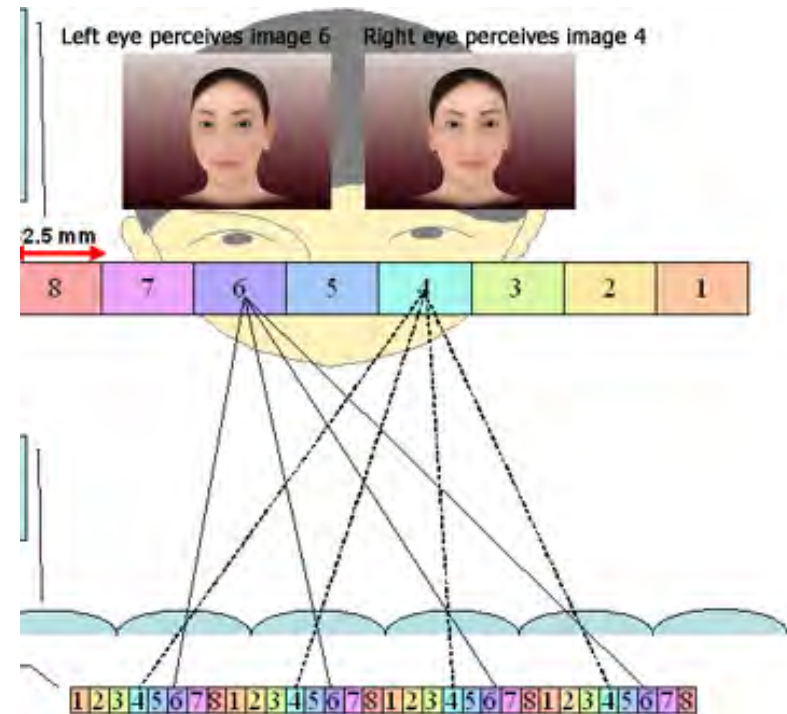


Motion Parallax Depending on Eye Position



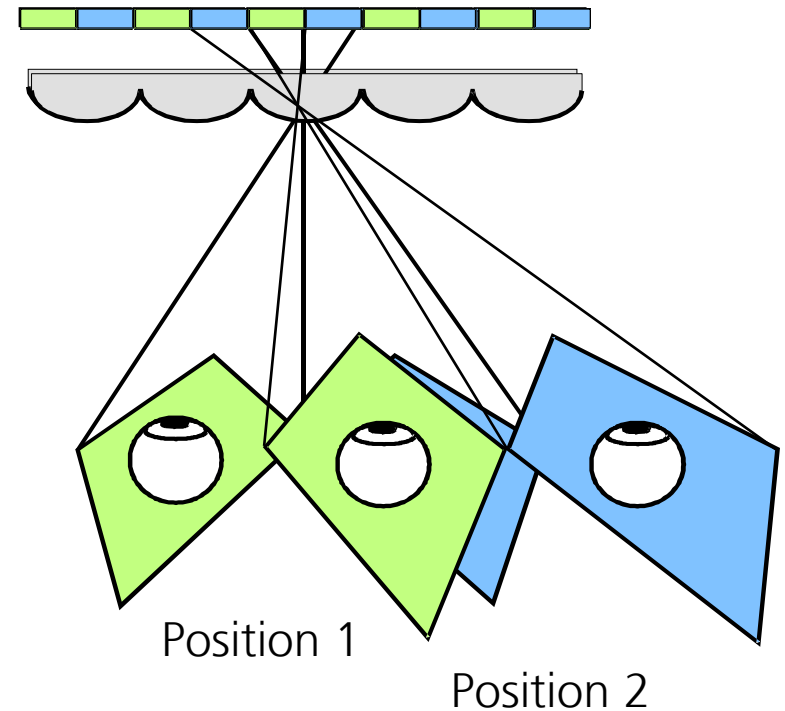
Autostereoscopic Multiview Displays

- Known concept of 5-46 “views”
- Slanted lenticular or parallax barrier
- Several viewing zones, multi user enabled
- But blurring transitions between zones
- New idea: Insert stereo content in a multiview display and add eye tracking in x-y-z direction



Functional Principle

- Real time head tracking in X – Y - Z
- Bundle viewing zones e.g. 1-4: left image, 6-9 right image
- Blacken zone 5 to improve channel separation, reduce crosstalk
- Dynamically shift pixels left/right according to viewer's position
- Dynamically spread pixels to compensate viewer's eye distance
- Several patents filed



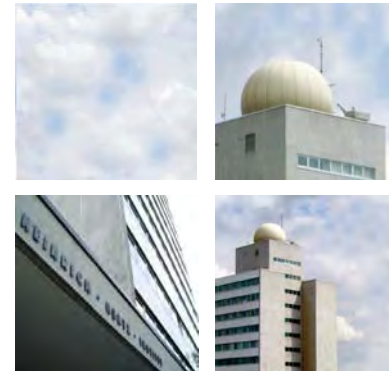
Potential Benefits of Tracked Multiview

- Continuous viewing zone for single user mode
- No zone transitions
- Free distance towards screen
- Free lateral positioning
- Low crosstalk

- Switch back to “standard multiview” if more than one person looking



**8 compelling 3D-exhibits are
waiting in our Media Lab,
room 811**



**Way more info at
www.hhi.fraunhofer.de/im**