

# Intuitive HMI in Attentive Environments

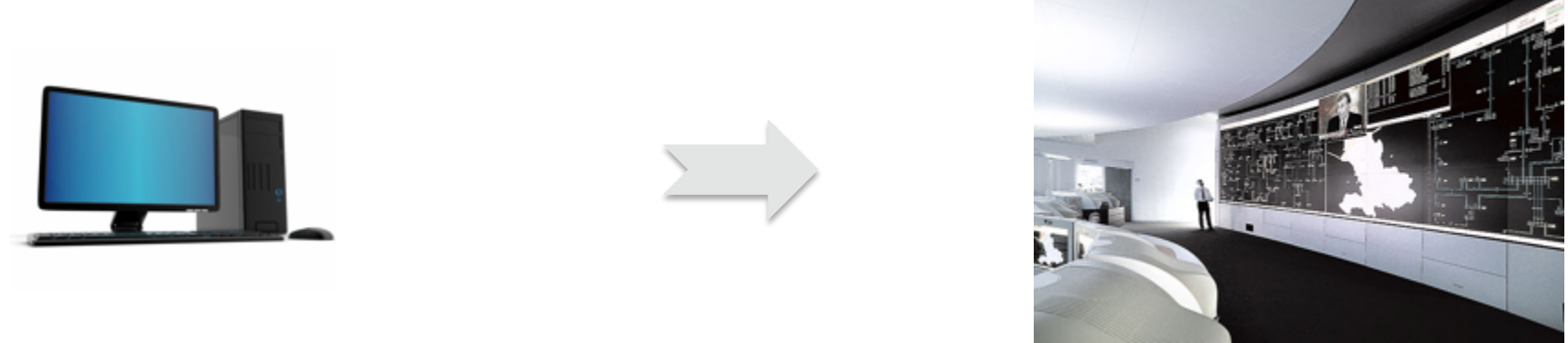
Workshop on Accelerator Operations 2014

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# Motivation

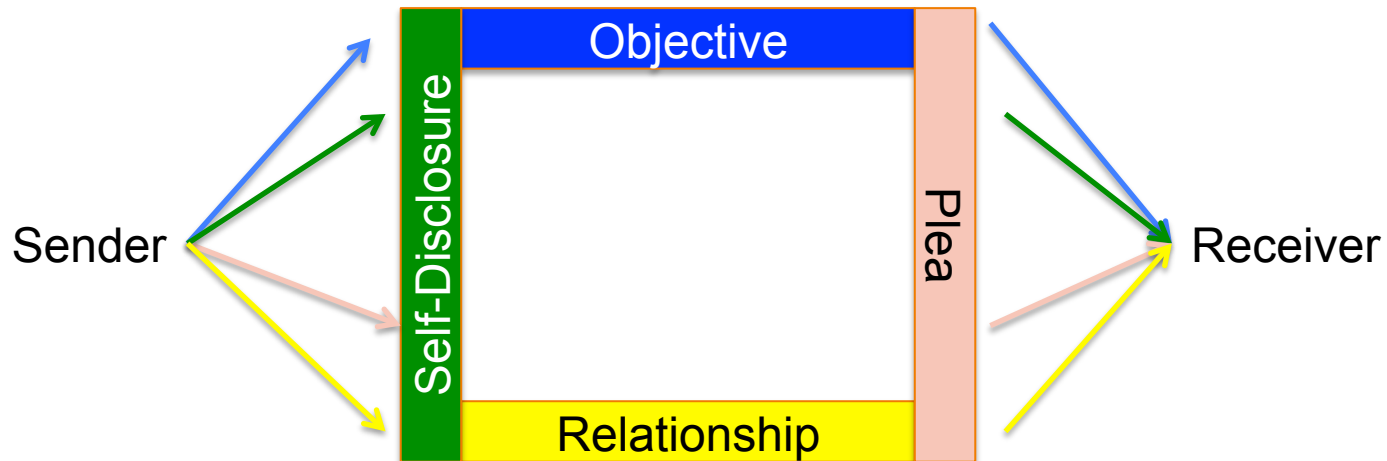


- Larger displays emerge in more and more places
- People expect to be able to interact with displays
- New display dimensions require new input modalities

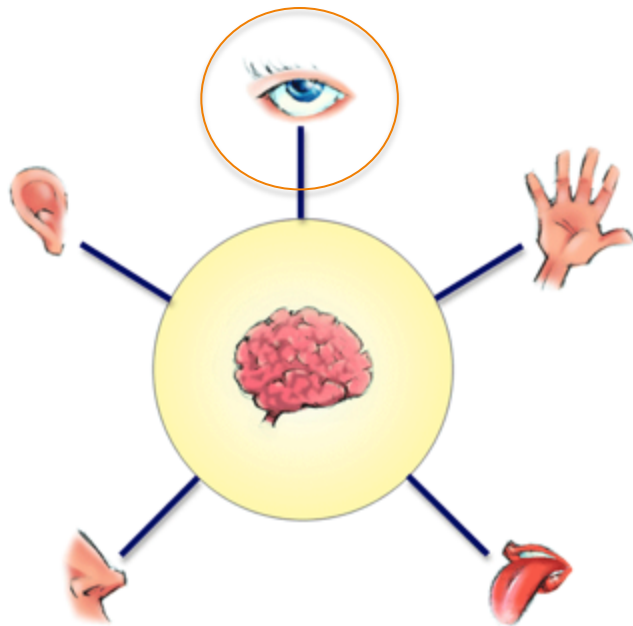
# Intuitive Interaction

**Intuition** is the ability to understand something instinctively, without the need for conscious reasoning.

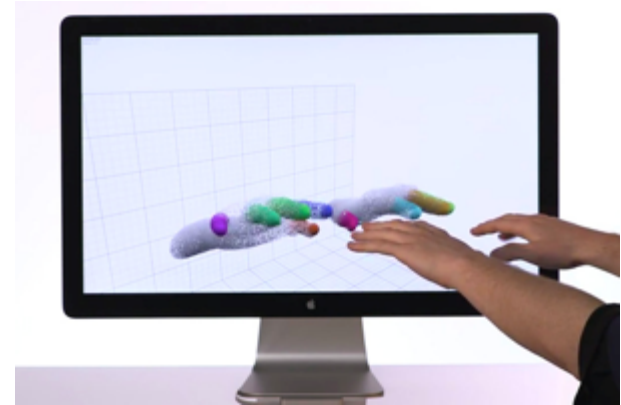
**Intuitive interaction** modalities adapt to the user's behaviour and perception.



# Computer Vision for Human Computer Interaction



The five Senses



Leap Motion

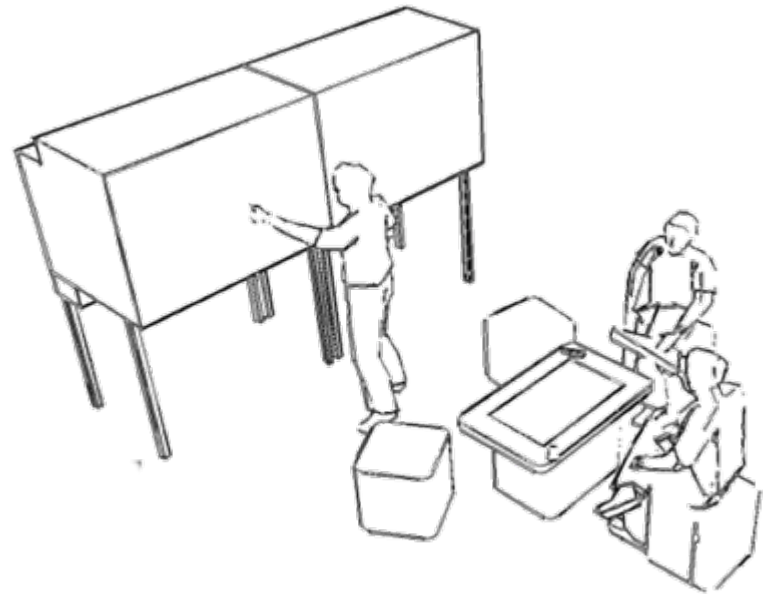


Microsoft Kinect

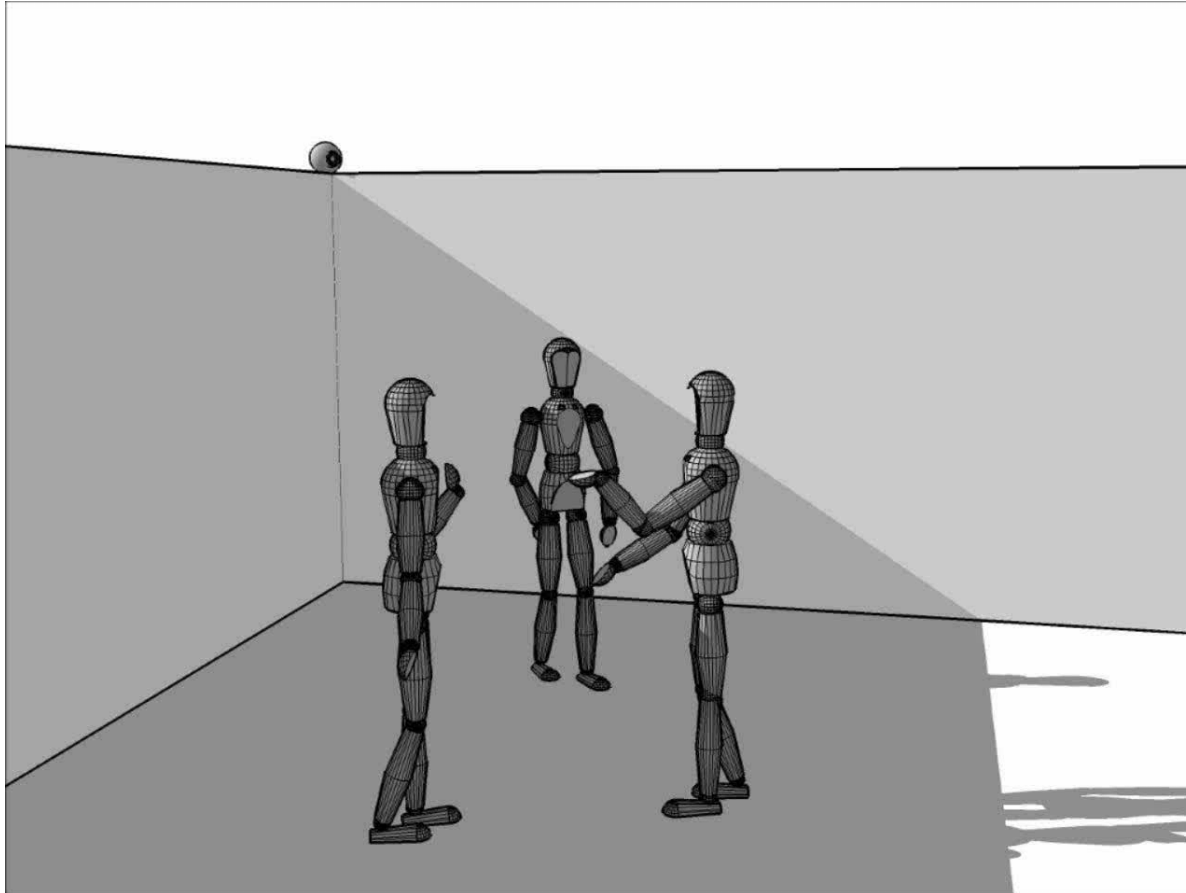


# Interaction Technology

- Intuitive, device free interaction requires user analysis
- Where are users ?
- What do they do ?
- What is their focus ?
- Who are they ?

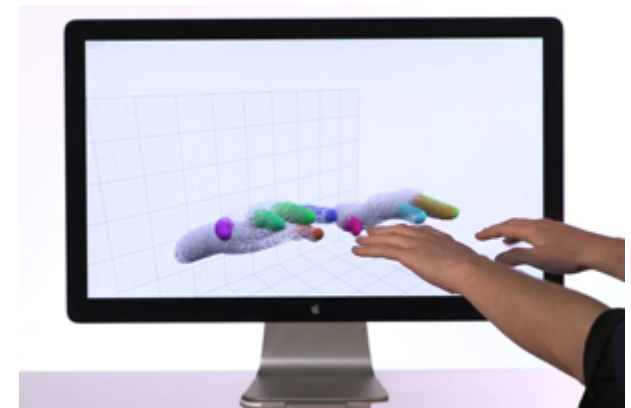


# Challenge: Unobtrusive Sensor Setup

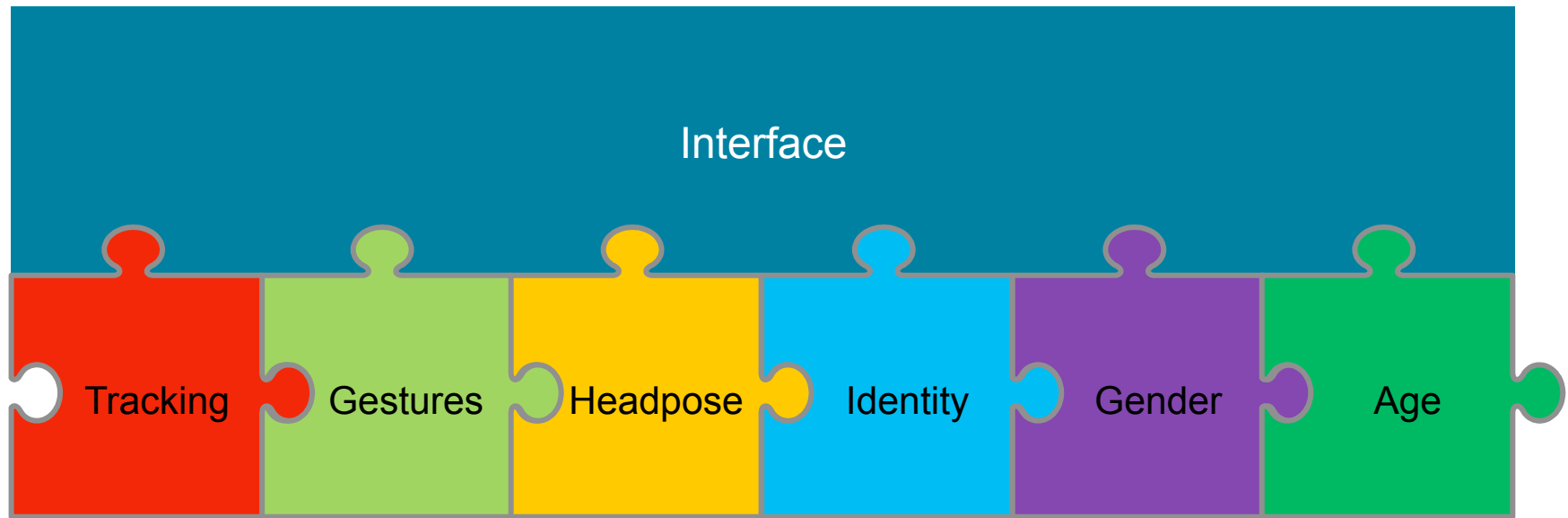


# Limits Of Kinect & Co

- Solutions for some modalities exist
- Variety of interfaces, integration up to the user
- Scenario focused and limited



# Perceptive Human-Machine-Interfaces



# Interaction Technology: Person Tracking

- Where are users ?
  - Use proximity to displays
  - Content follows user
  - Workspaces for single/multi user
  - Display adaptation based on distance



# Interaction Technology: Body Posture & Gestures

- What do they do ?
  - Pointing gestures
  - Dynamic gestures
  - Orientation to activate workspaces
  - Dynamic occlusion handling
  - React to pose, orientation and activity



# Distance-aware Interactive Information Terminal



# Defect Inspection in QM



(Bildquelle: BMW Group)

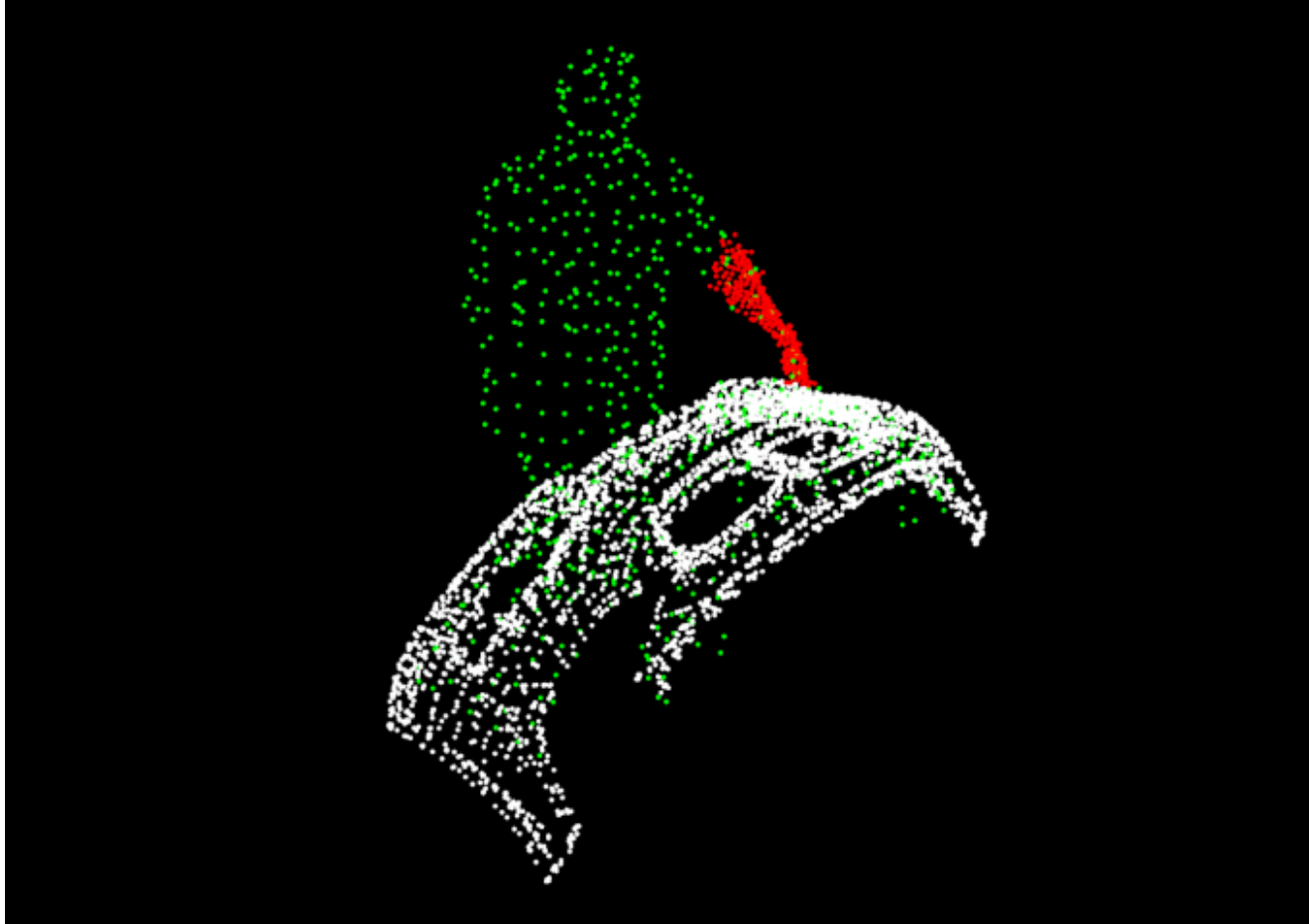


# Defect Inspection in QM



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# Defect Inspection in QM

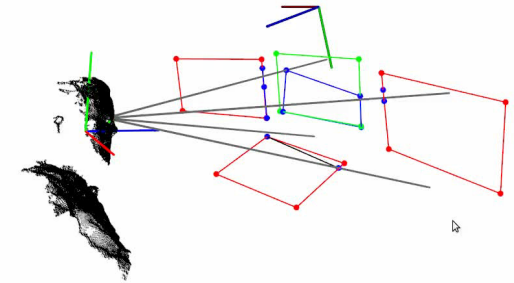
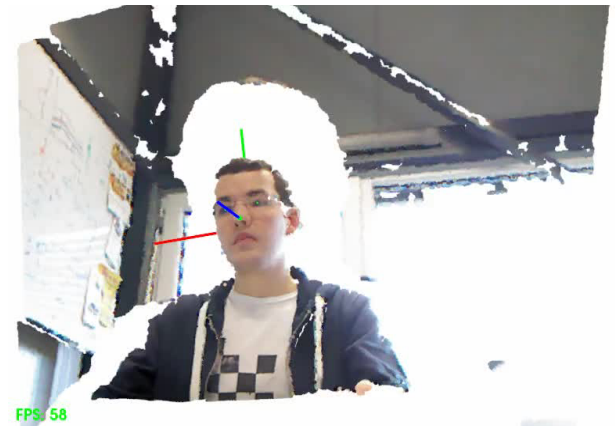


# Defect Inspection in QM



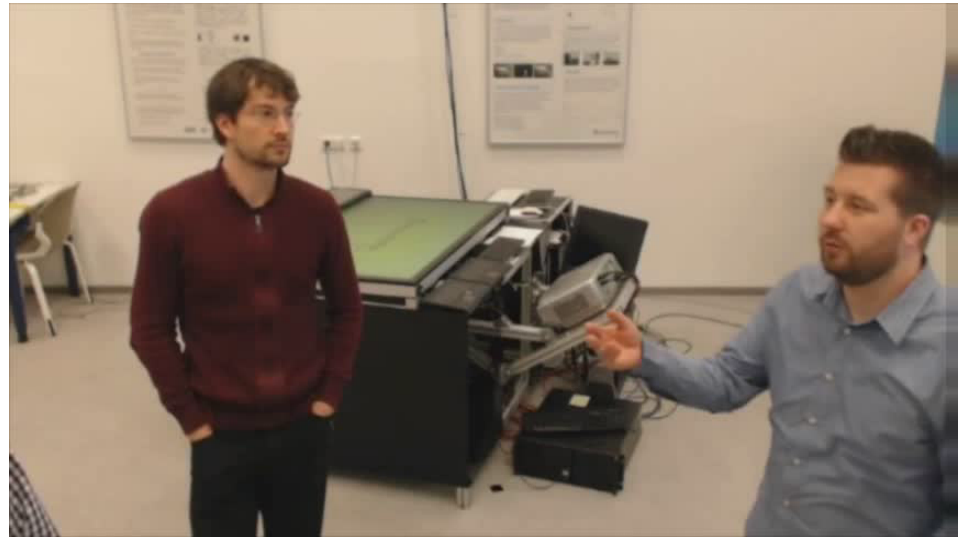
# Interaction Technology: Head Pose

- What is their focus ?
- Detect if user has seen alarm
- Display information at screen of focus
- Move cursor into users view
- Derive situation



# Interaction Technology: Face Identification

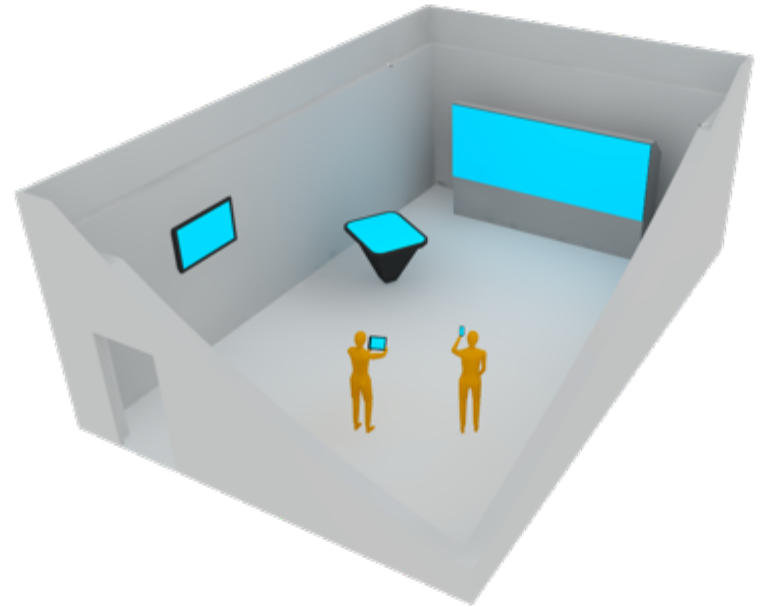
- Who are they ?
  - User specific interfaces
  - Role dependent rights
  - Monitor attention
  - Tailor interface to audience





# Applications For Novel Interaction Modalities

- New modalities provide very different data
- Integration is a major challenge
- There is, however, great benefit in combining modalities !



# Smart Control Room



# Out Of The Lab Into The Real World

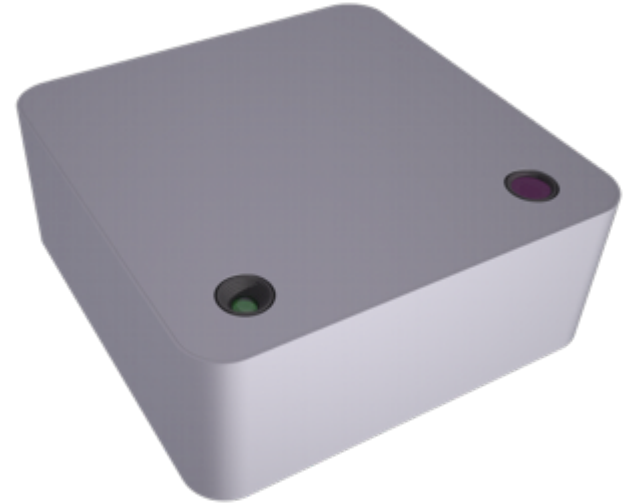
- Setup is often complex, requires expert knowledge
- Use should be easy, flexible and scalable





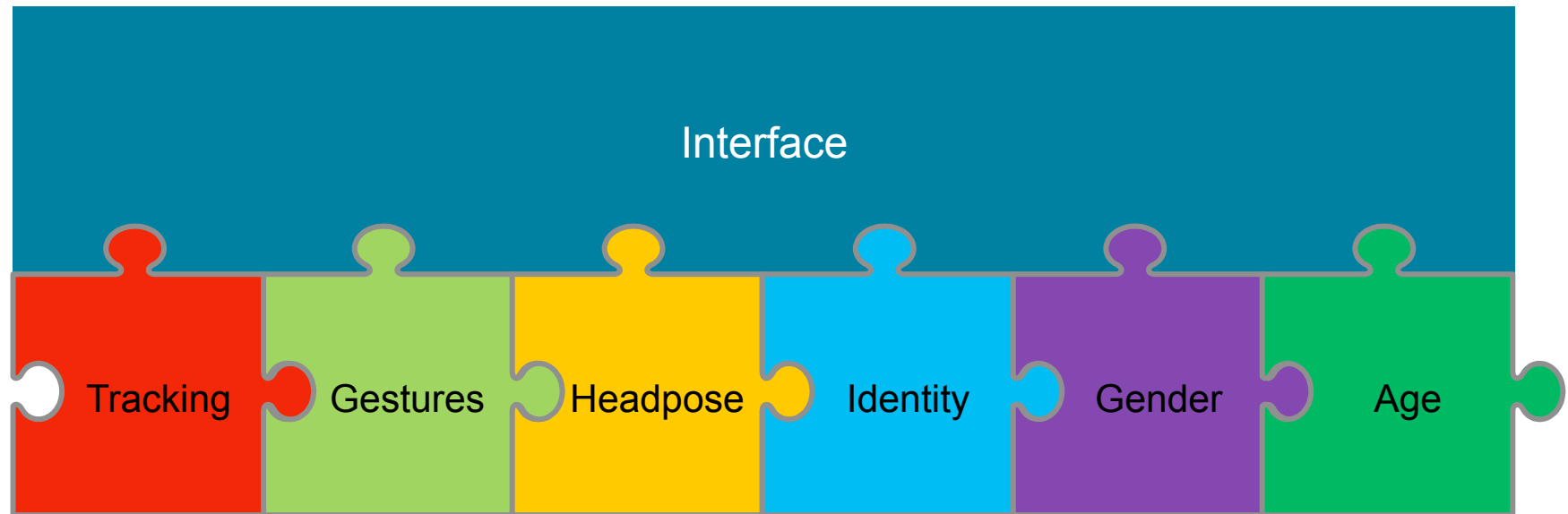
# Simple Installation Of Complex Technology

- Sensors and processing in a single box
- Results are streamed via network
- Multiple sensor variants possible



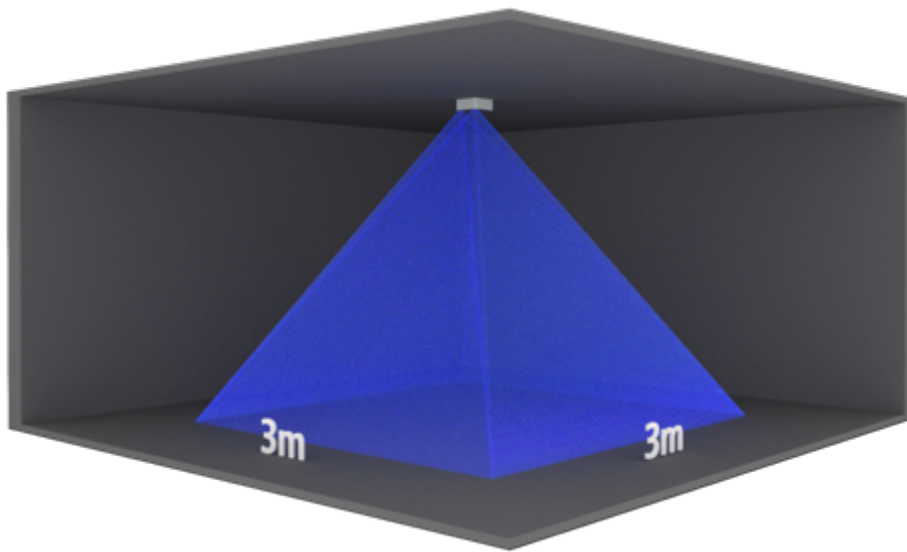
# Simple Installation Of Complex Technology

- Modular functionality
- Integrated results accessible via a single, coherent interface



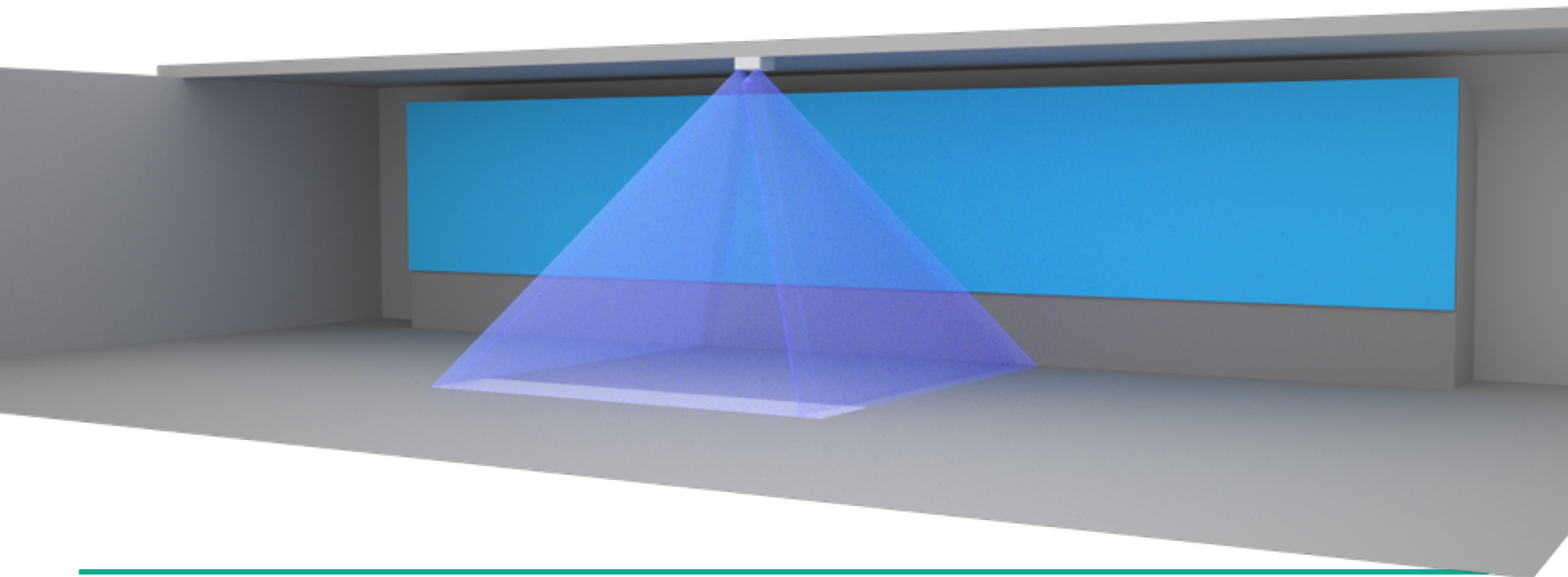
# Simple Installation Of Complex Technology

- Box has a clearly defined area of acquisition



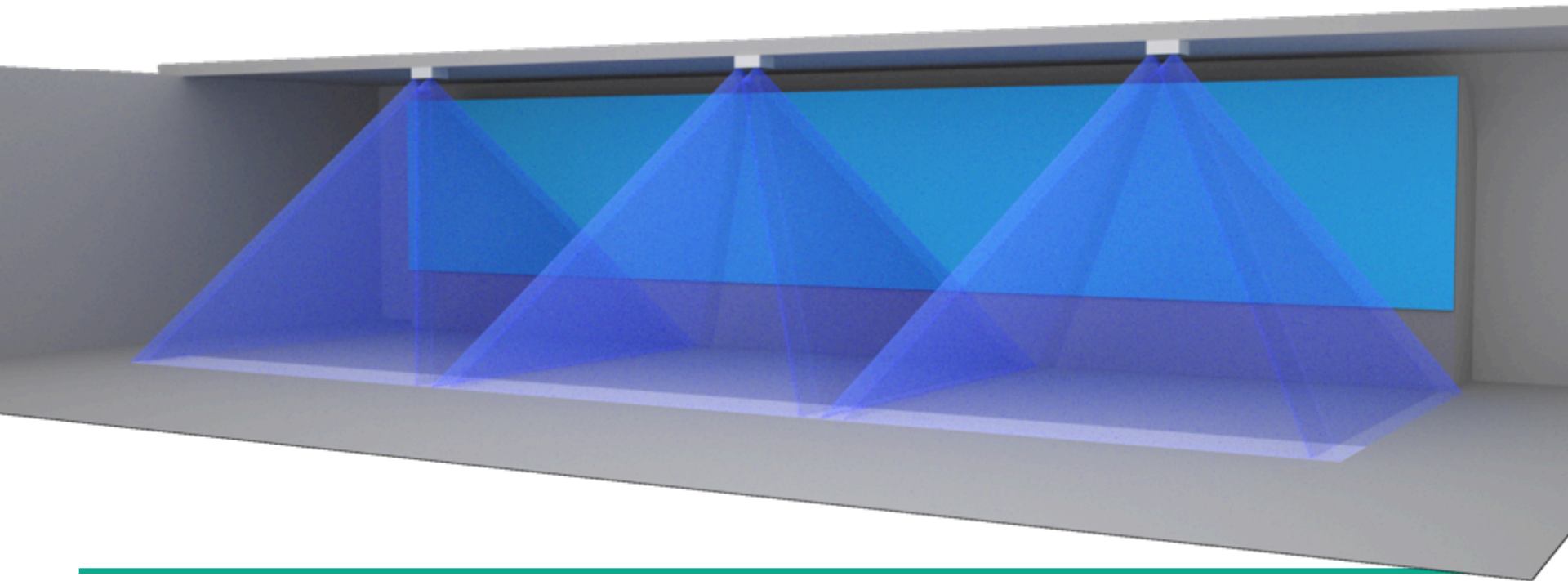
# Simple Installation Of Complex Technology

- Boxes can be combined to cover a larger area



# Simple Installation Of Complex Technology

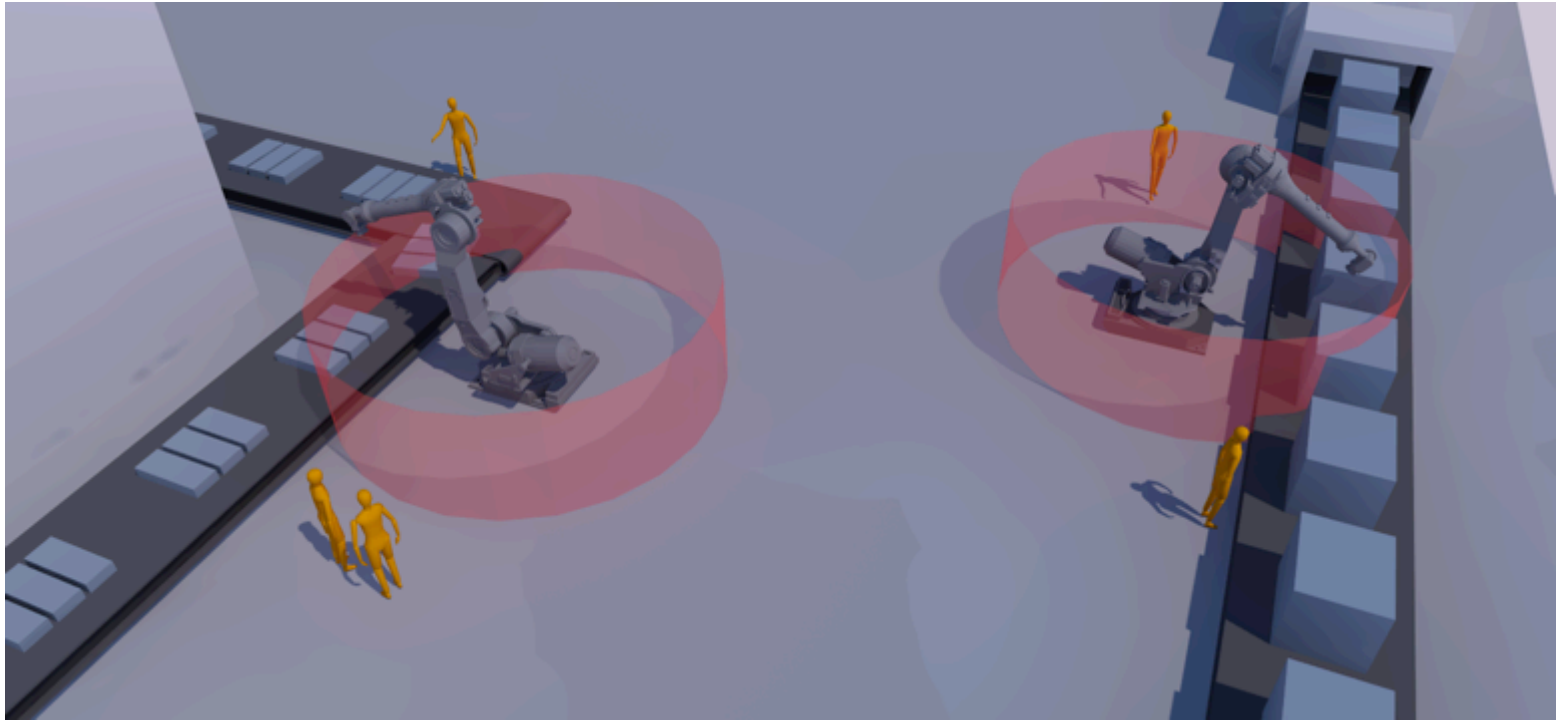
- Boxes can be combined to cover a larger area
- Interface for users remains the same



# Position-based context information



# Safety Measures





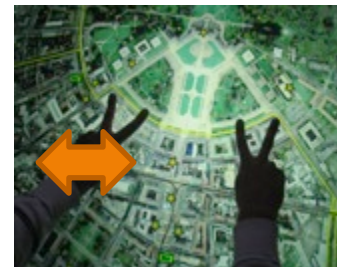
# DigLT



Shift Map



POI Selection



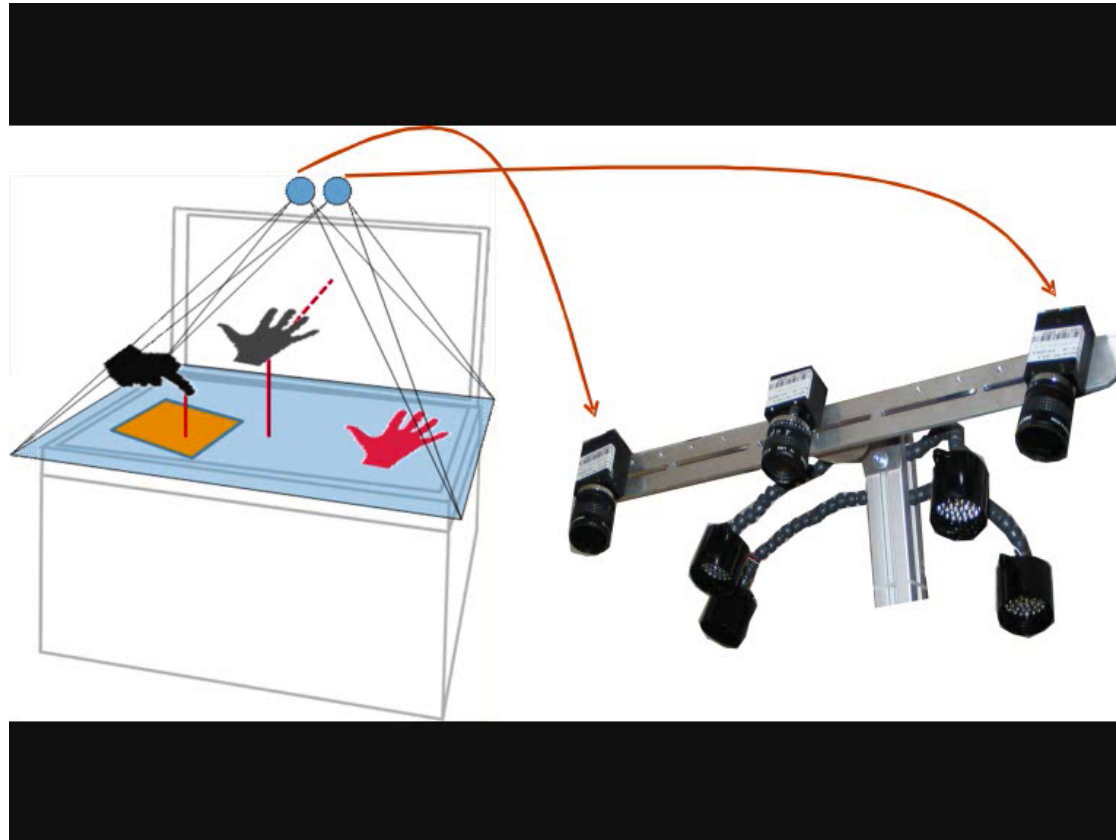
Zoom



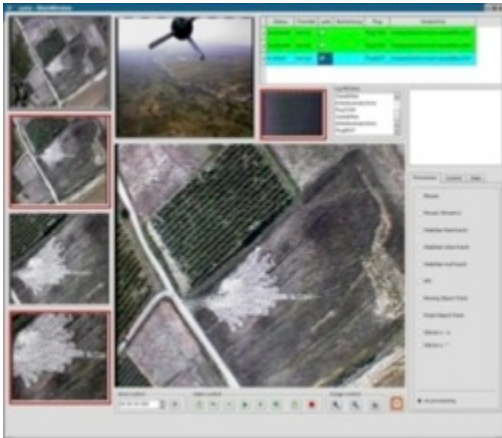
Rotate Display



## DigLT (2)



# Gaze-based Interaction



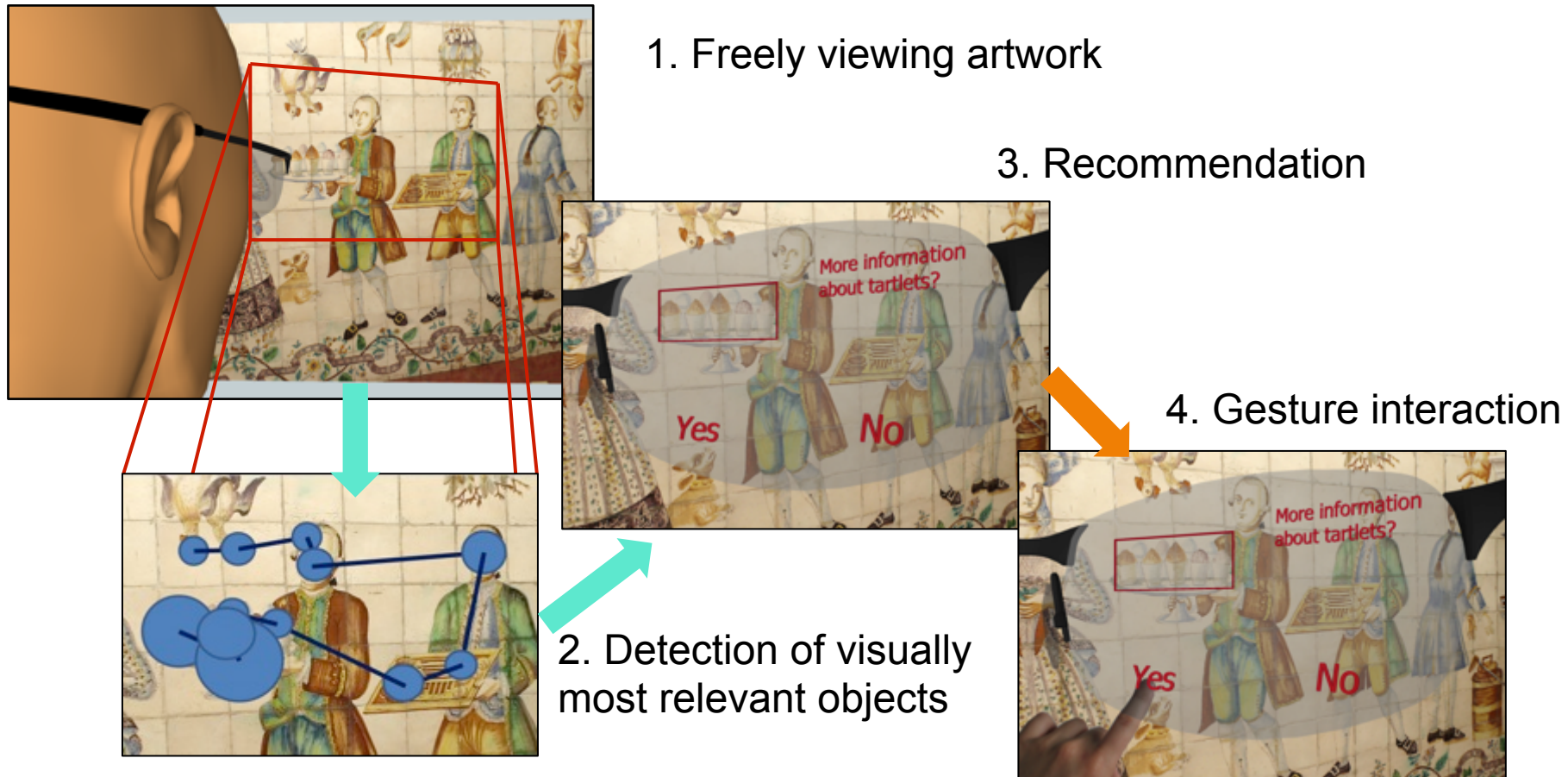
# Interactive See-Through Head-Mounted Device (HMD)

- Optical see-through Augmented-Reality (AR)
- Eye-Tracking



[www.interactive-see-through-hmd.de](http://www.interactive-see-through-hmd.de)

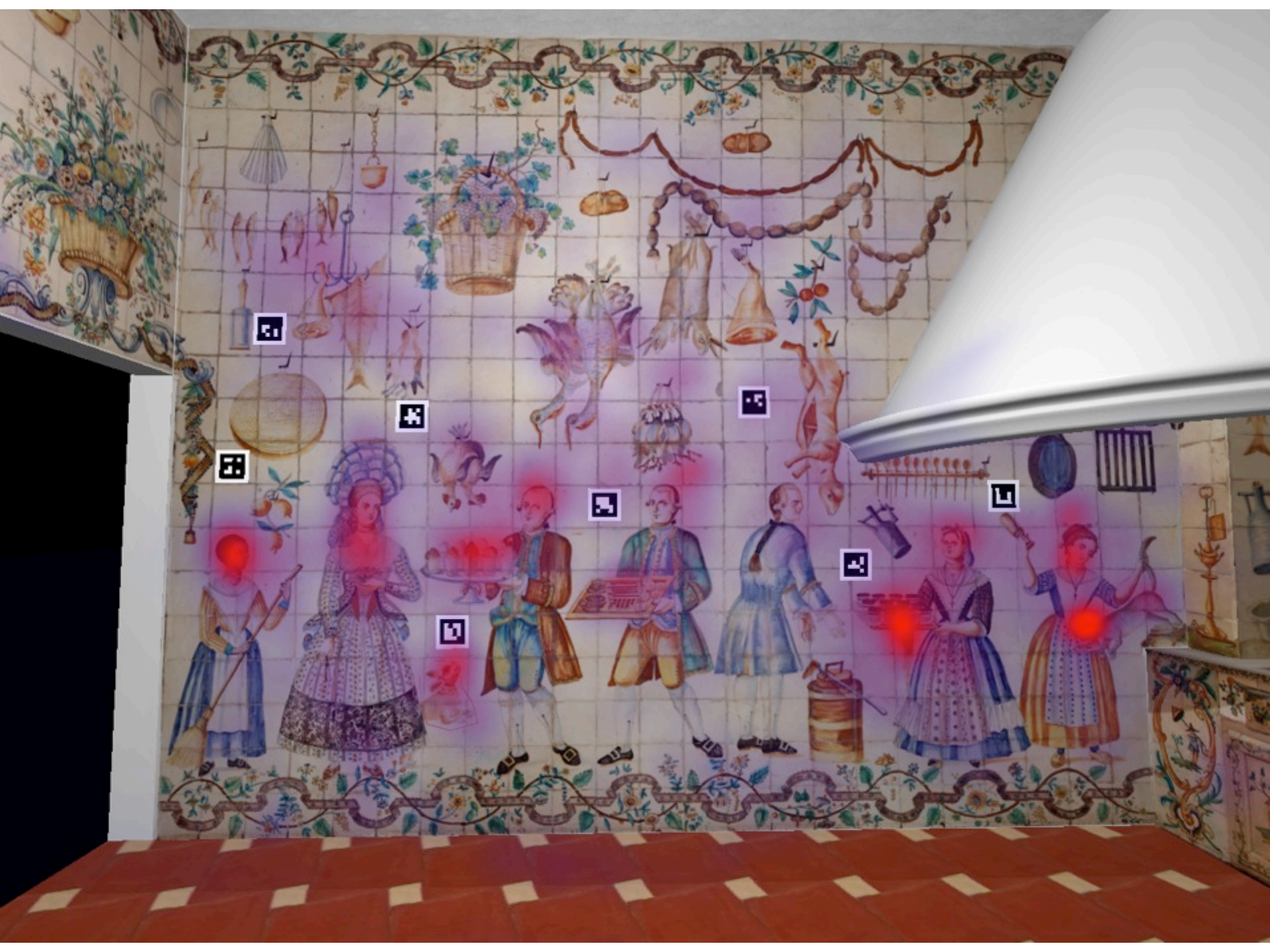
# Motivation: Adaptive AR Museum Guide



# Example

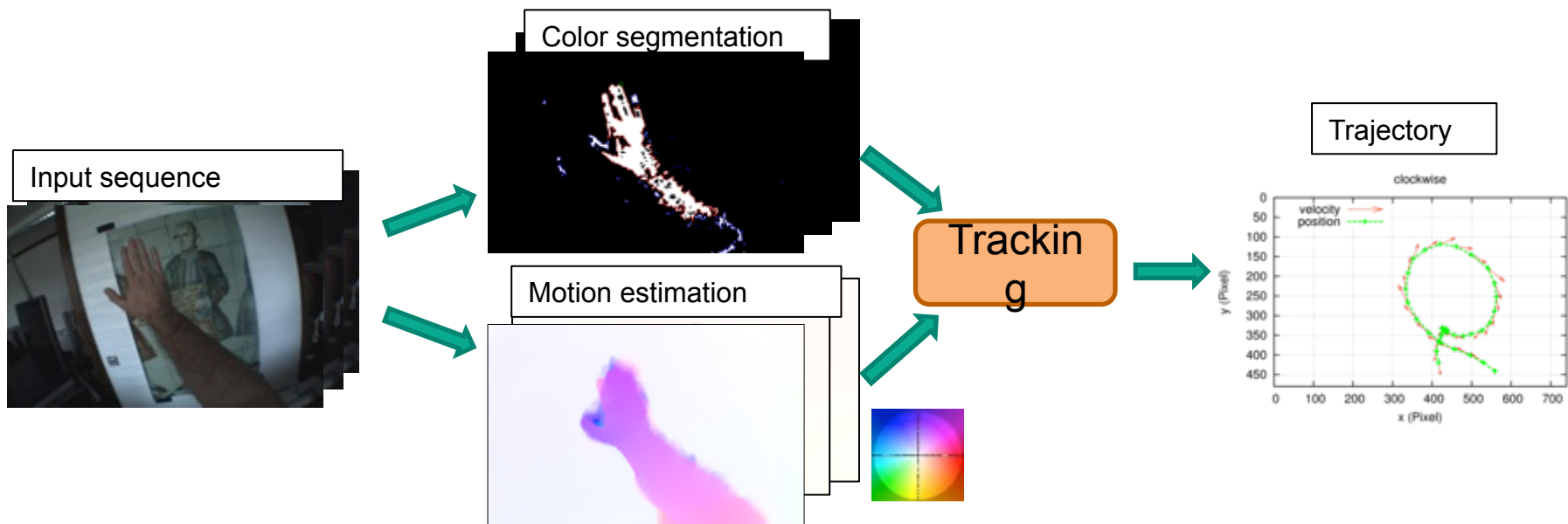




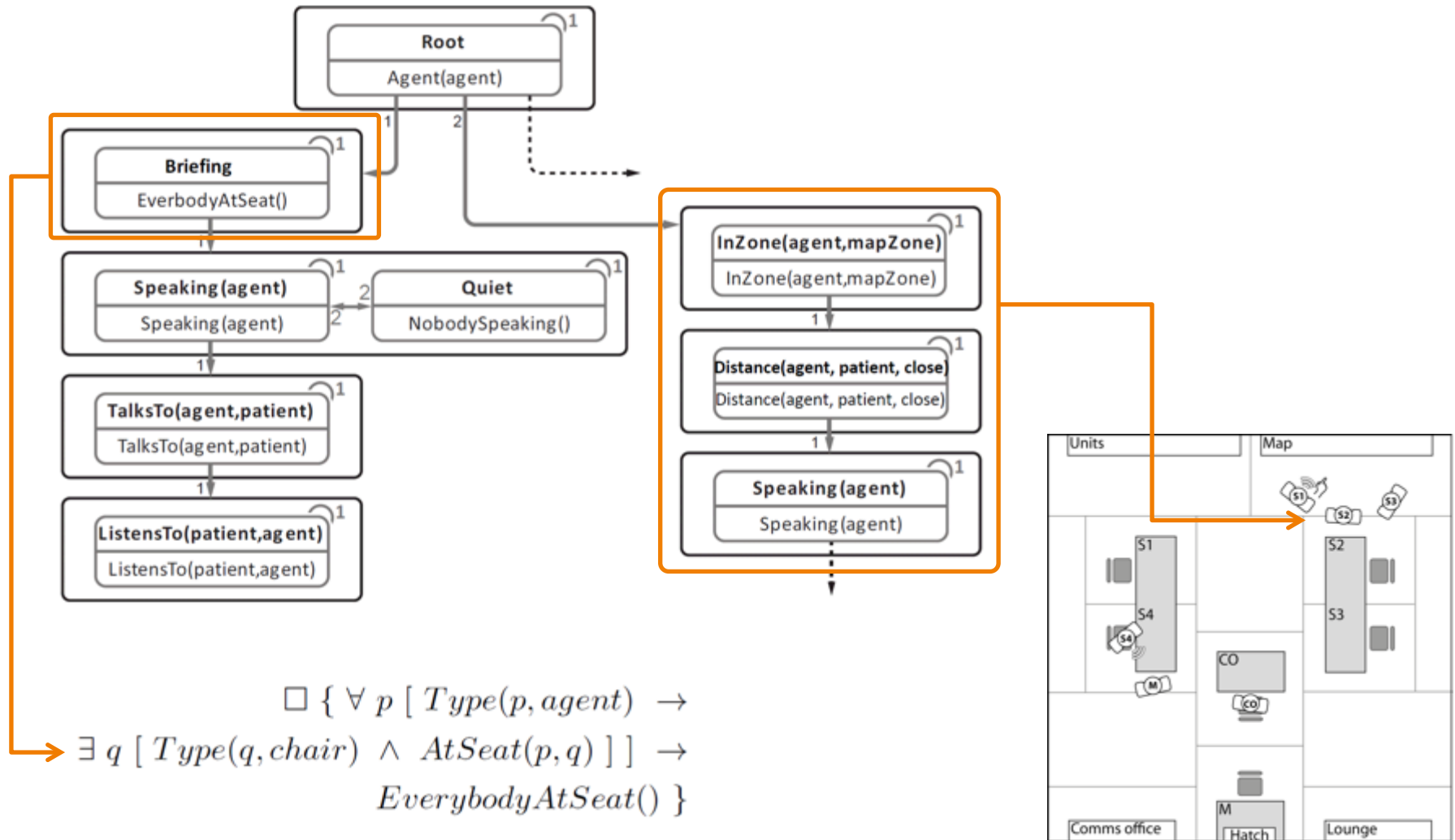


# Overview of Gesture Recognition

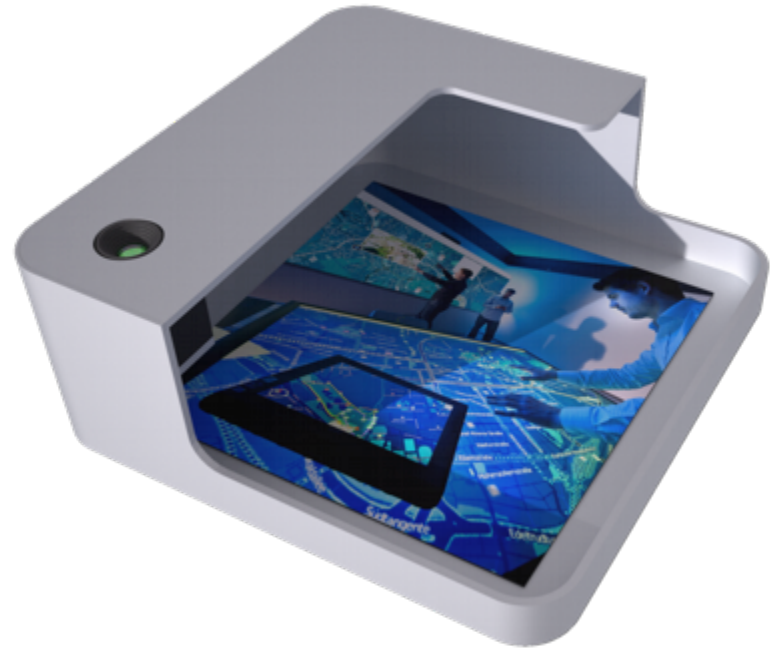
## ■ 1. Step: Hand Tracking



# Situation Awareness







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