

Intuitive HMI in Attentive Environments

Workshop on Accelerator Operations 2014

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Motivation

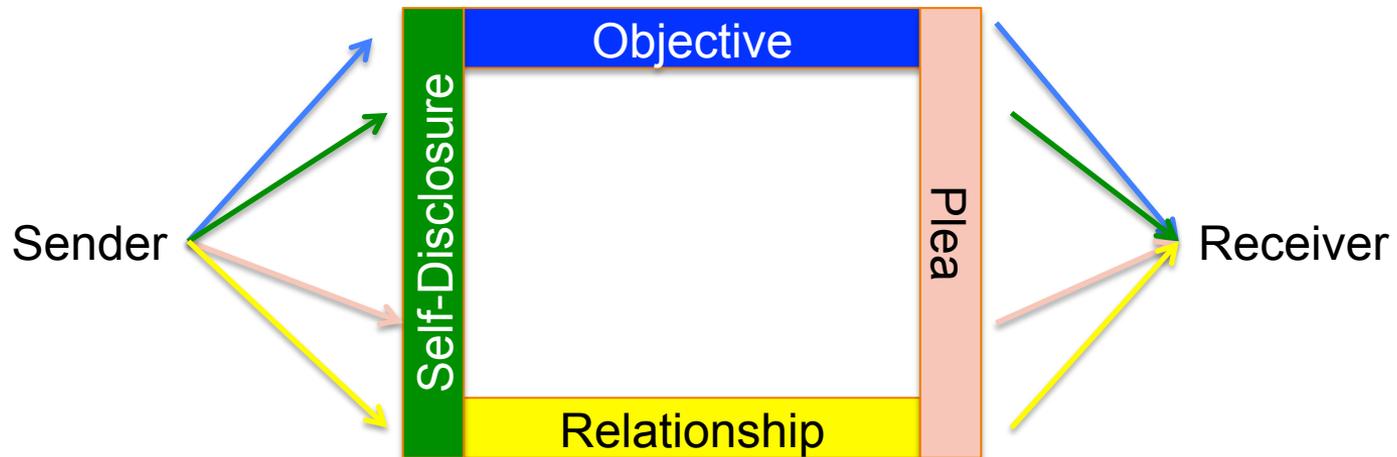


- Larger displays emerge in more and more places
- People expect to be able to interact with displays
- New display dimensions require new input modalities

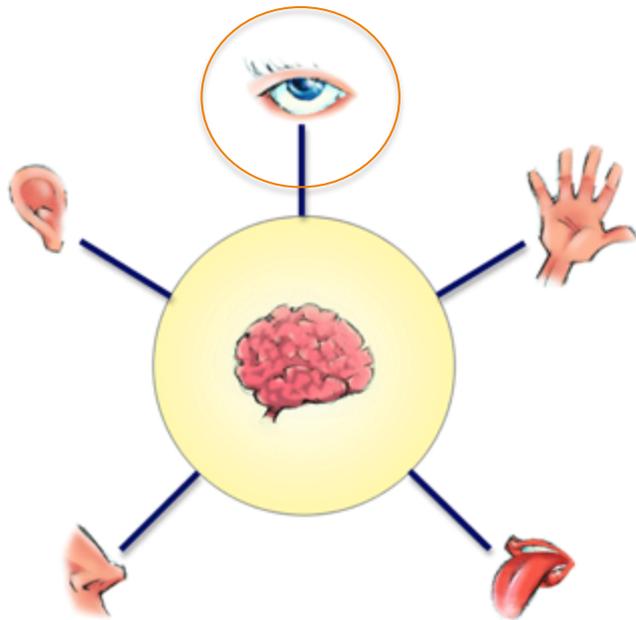
Intuitive Interaction

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

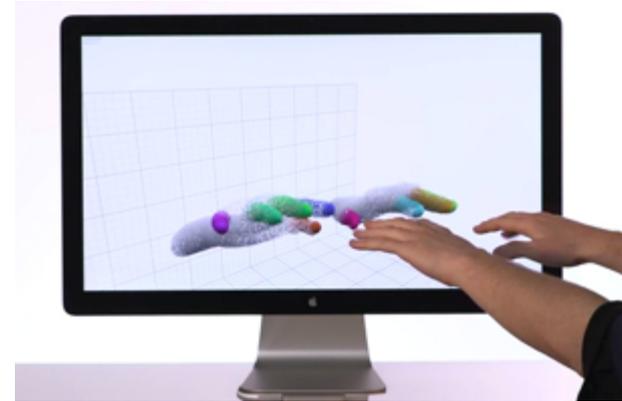
Intuitive interaction modalities adapt to the user's behaviour and perception.



Computer Vision for Human Computer Interaction



The five Senses



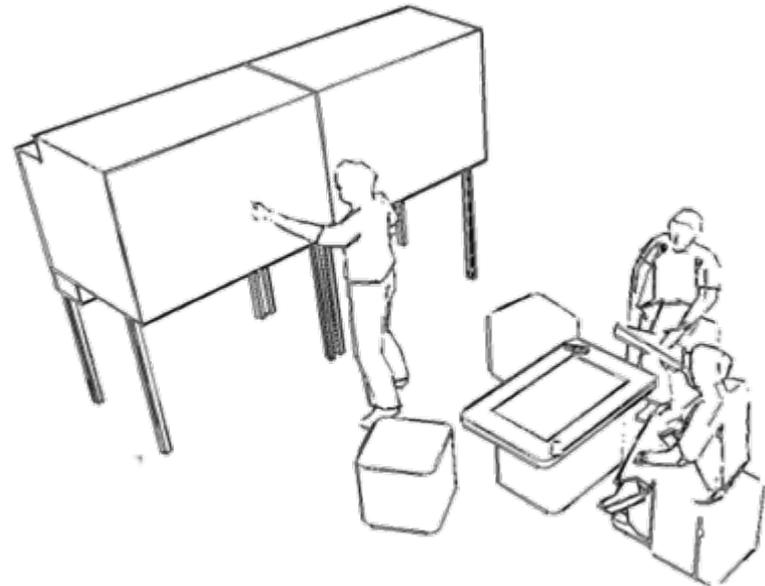
Leap Motion



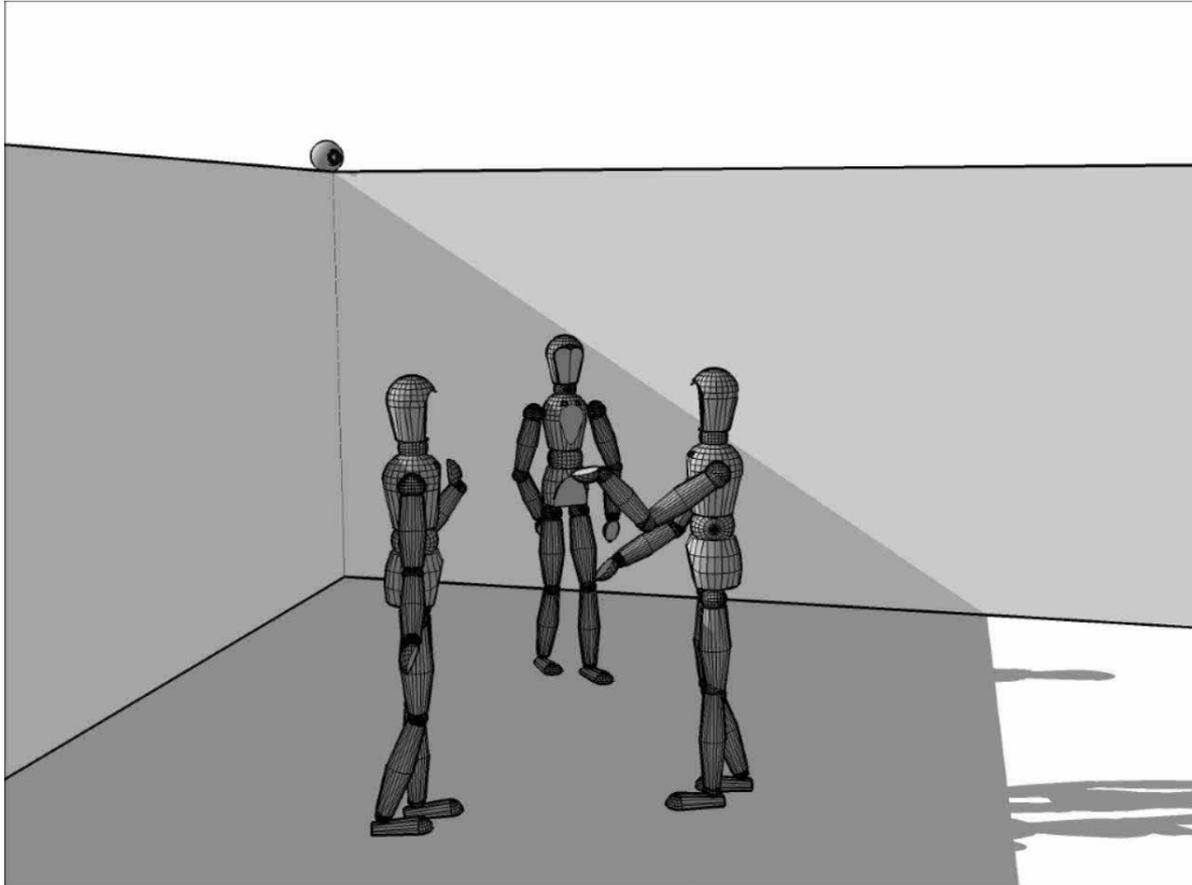
Microsoft Kinect

Interaction Technology

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

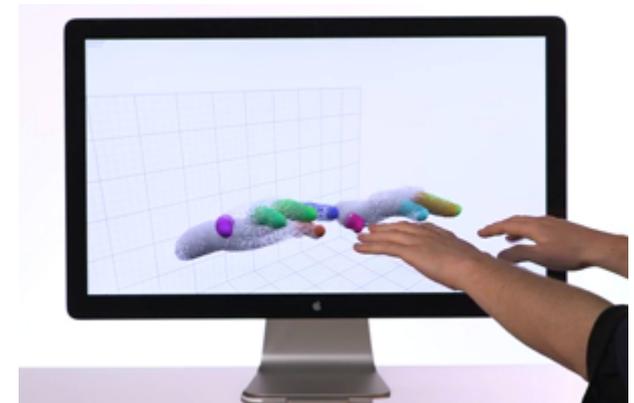


Challenge: Unobtrusive Sensor Setup

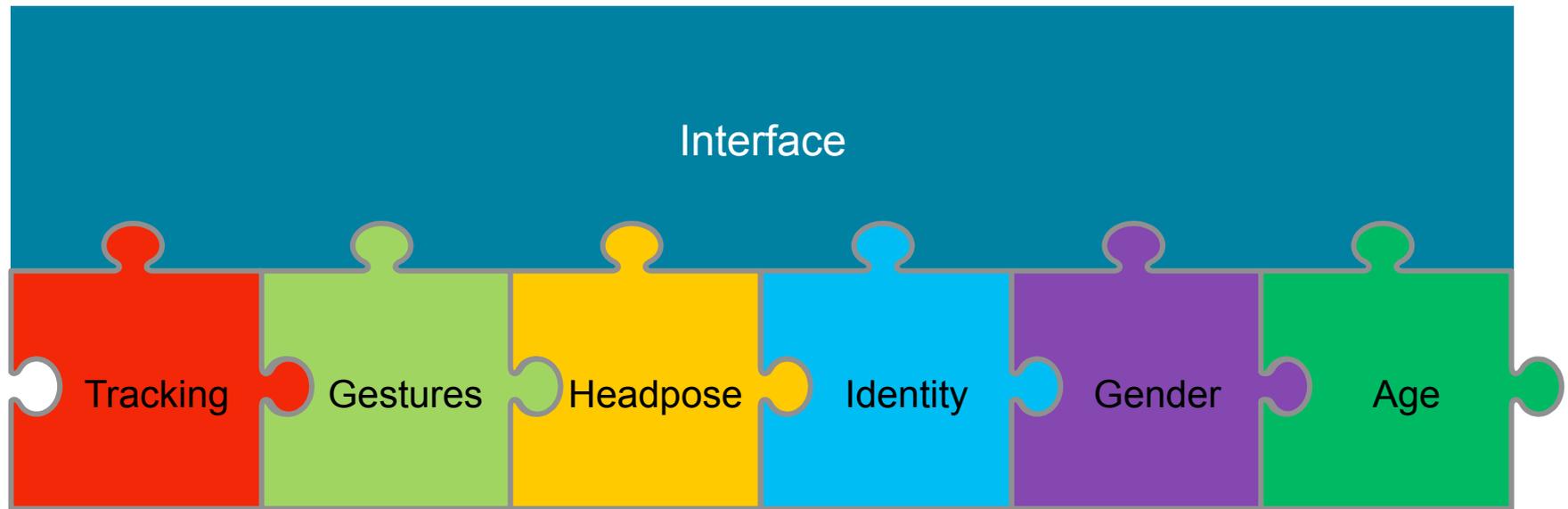


Limits Of Kinect & Co

- 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



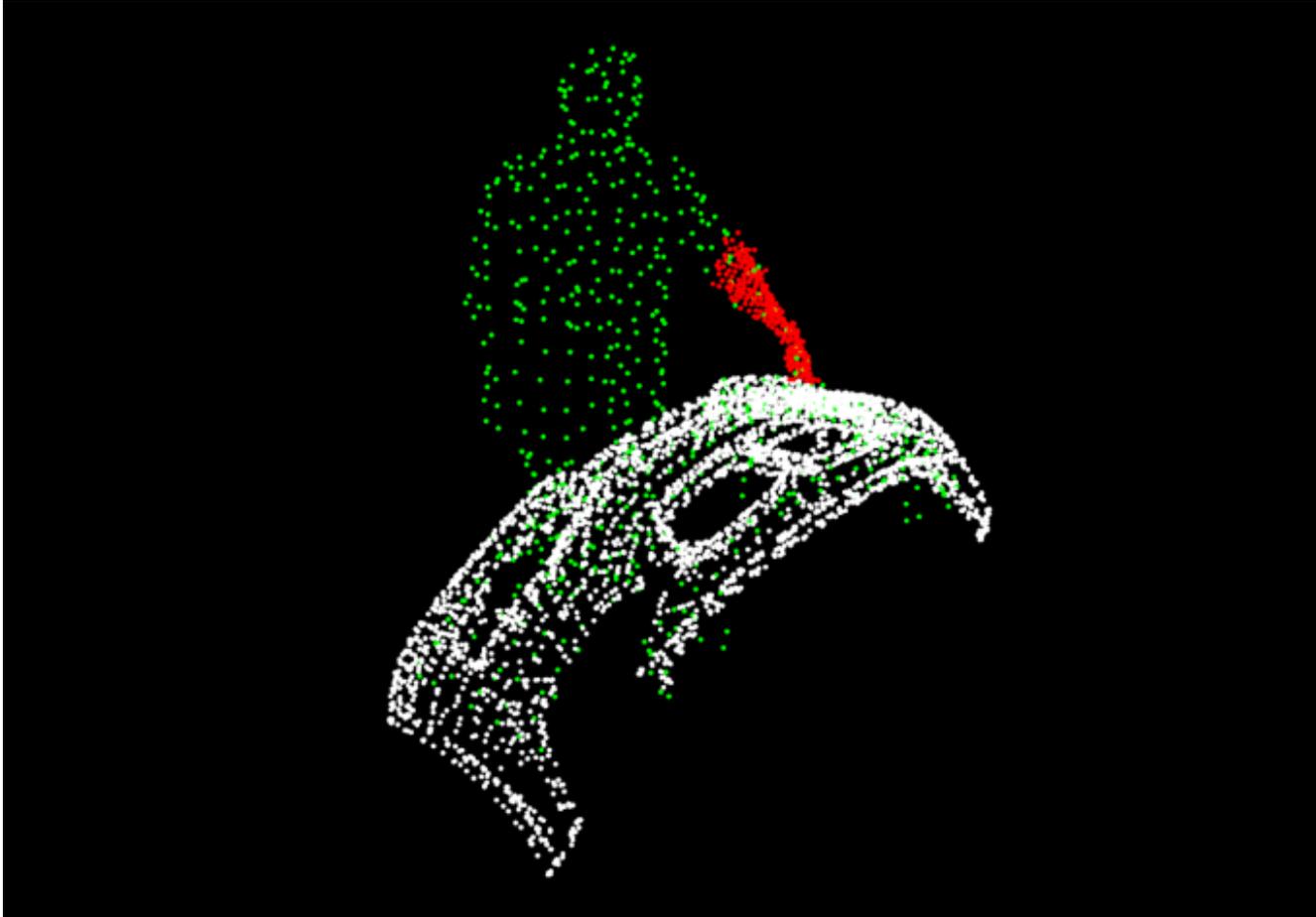
(Bildquelle: BMW Group)

Defect Inspection in QM



(Bildquelle: BMW Group)

Defect Inspection in QM

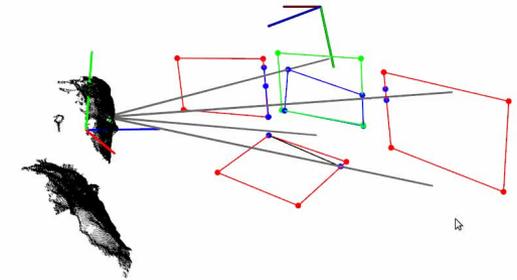
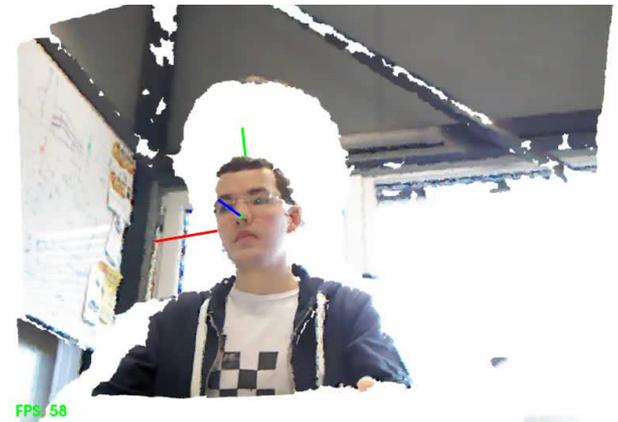


Defect Inspection in QM



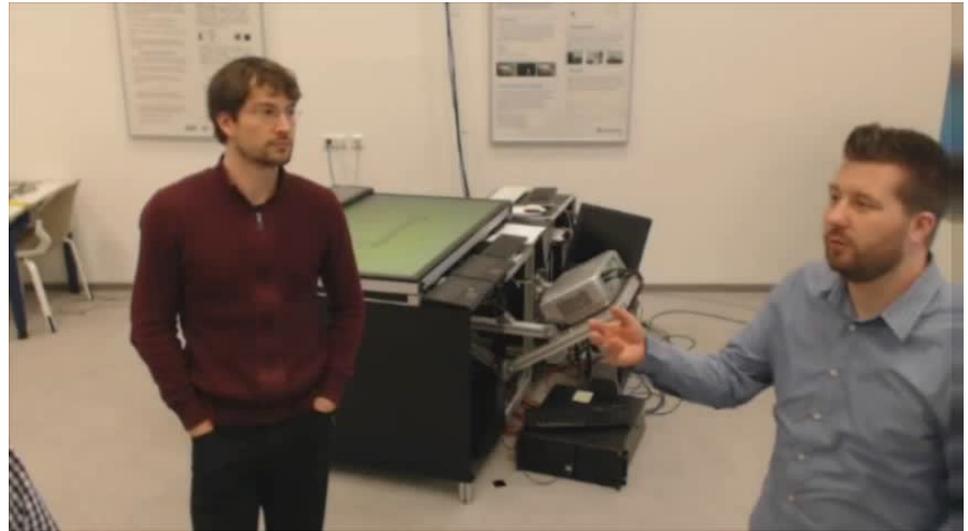
Interaction Technology: Head Pose

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



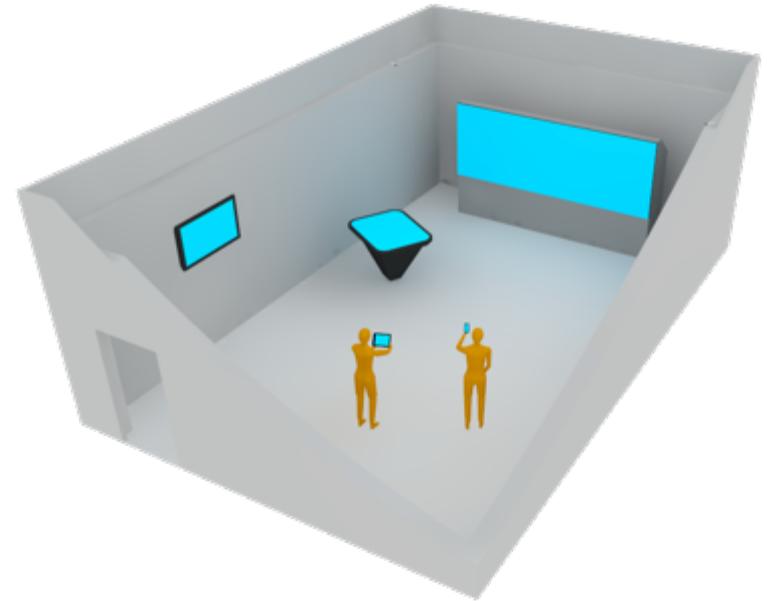
Interaction Technology: Face Identification

- 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 !

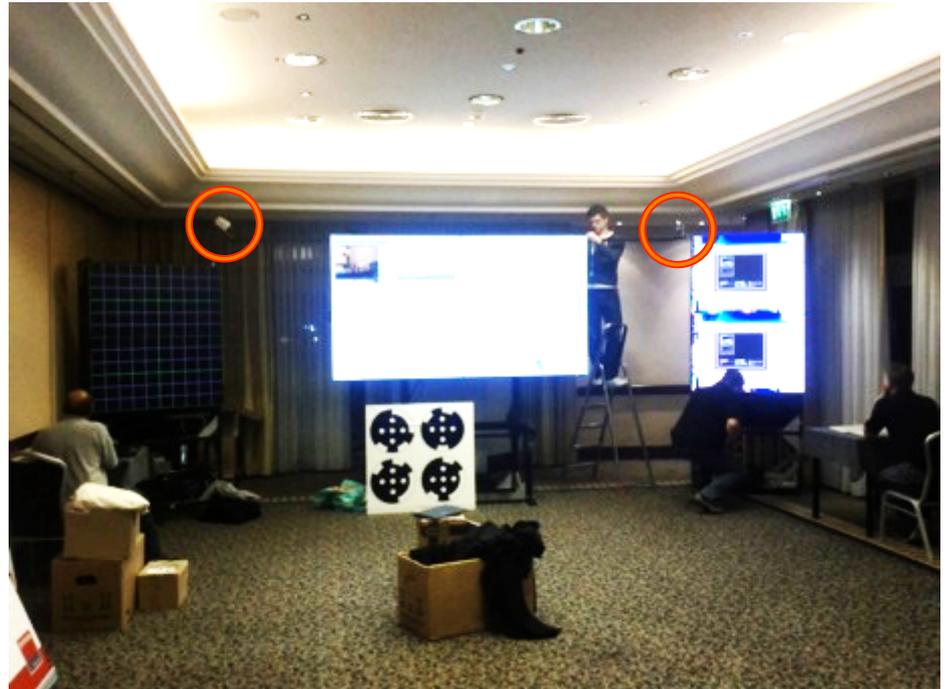


Smart Control Room



Out Of The Lab Into The Real World

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



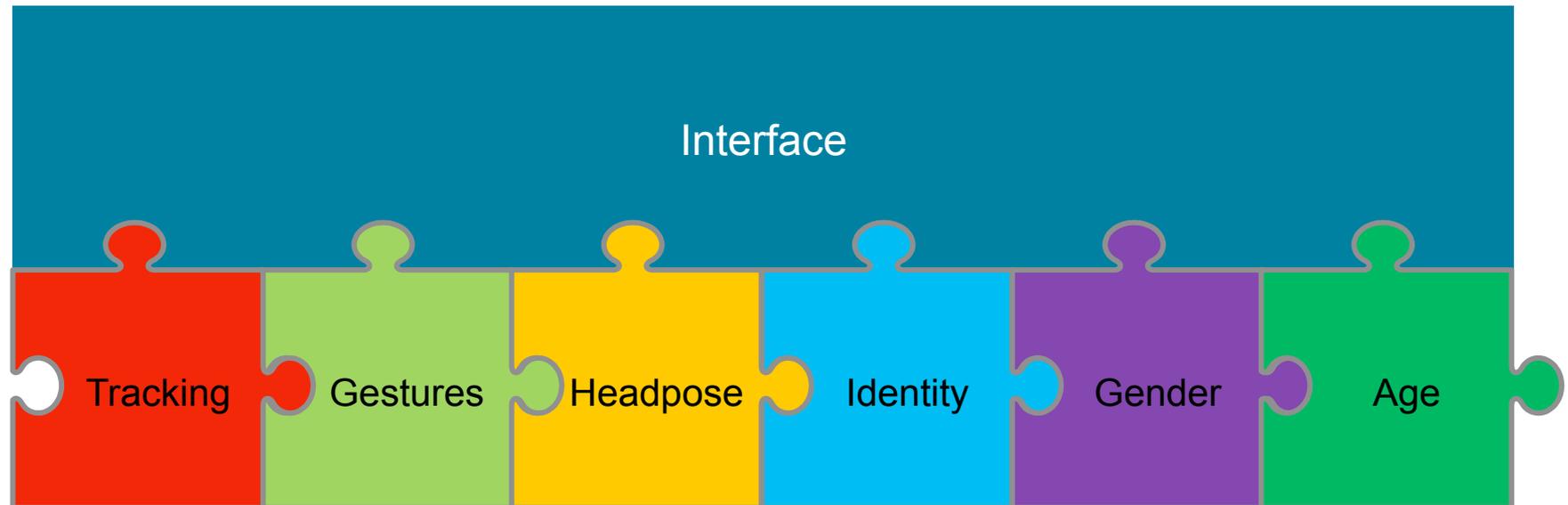
Simple Installation Of Complex Technology

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



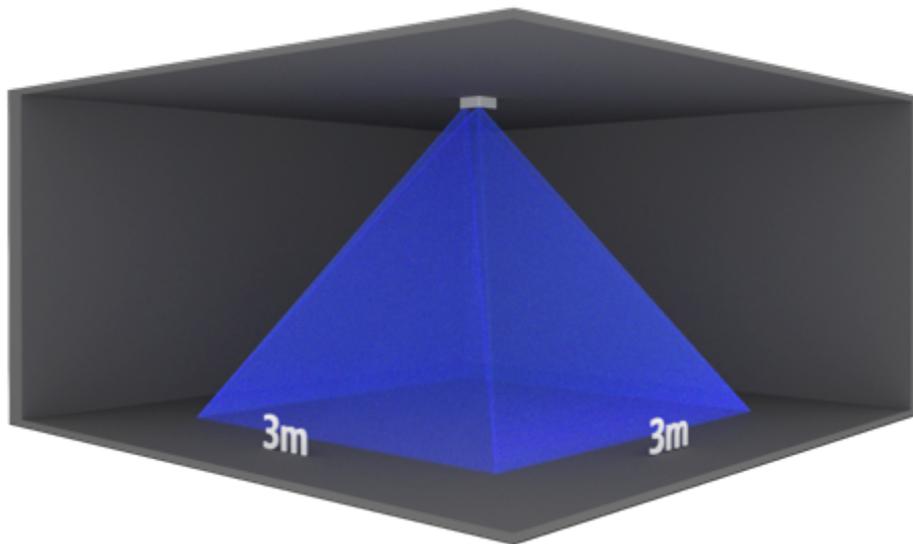
Simple Installation Of Complex Technology

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



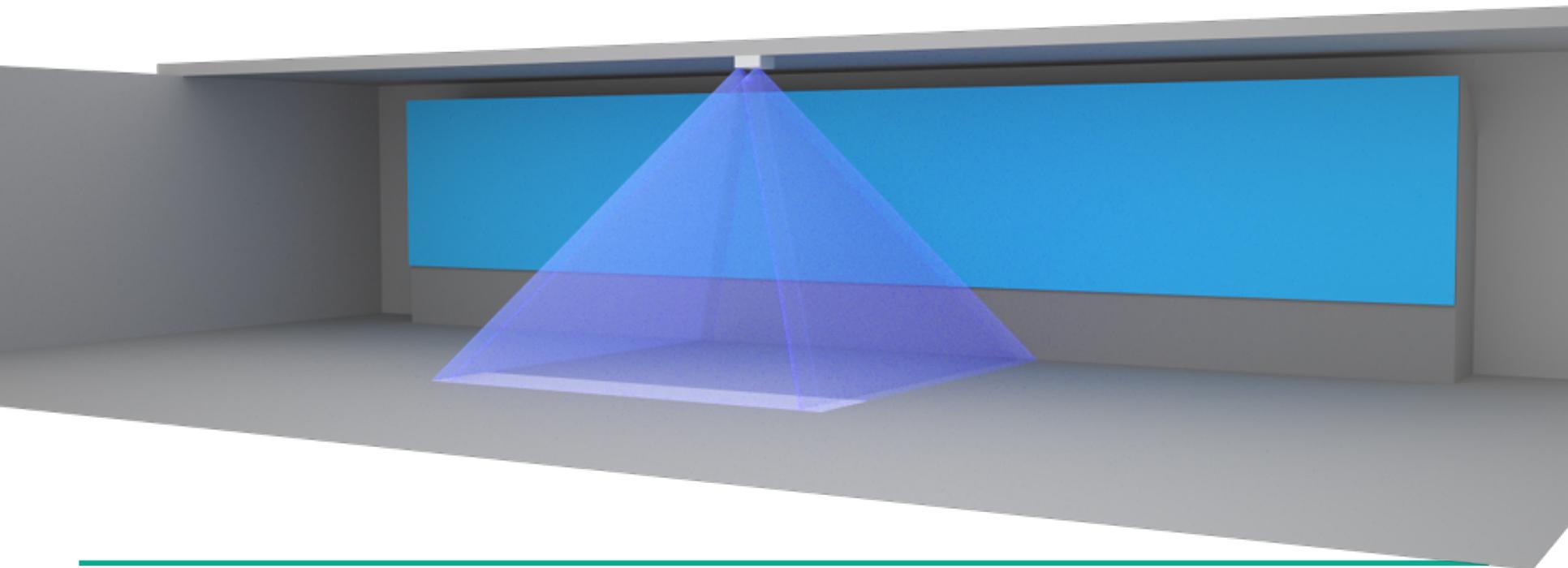
Simple Installation Of Complex Technology

- Box has a clearly defined area of acquisition



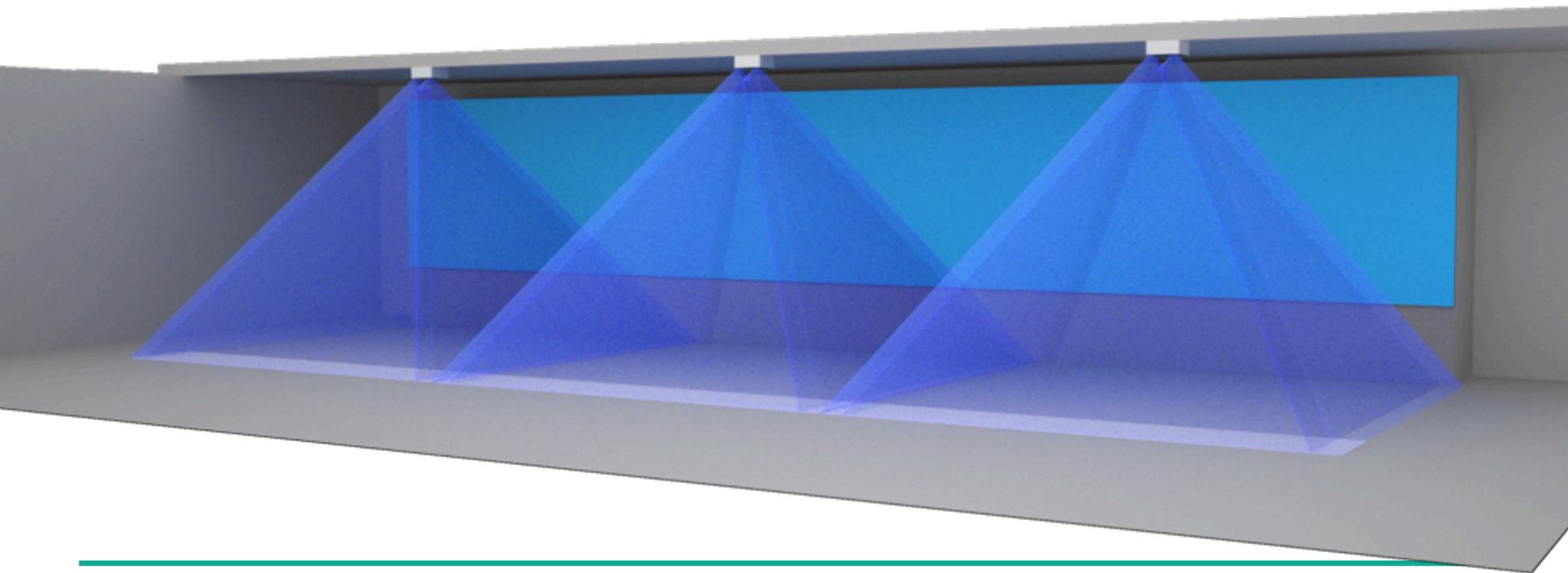
Simple Installation Of Complex Technology

- Boxes can be combined to cover a larger area

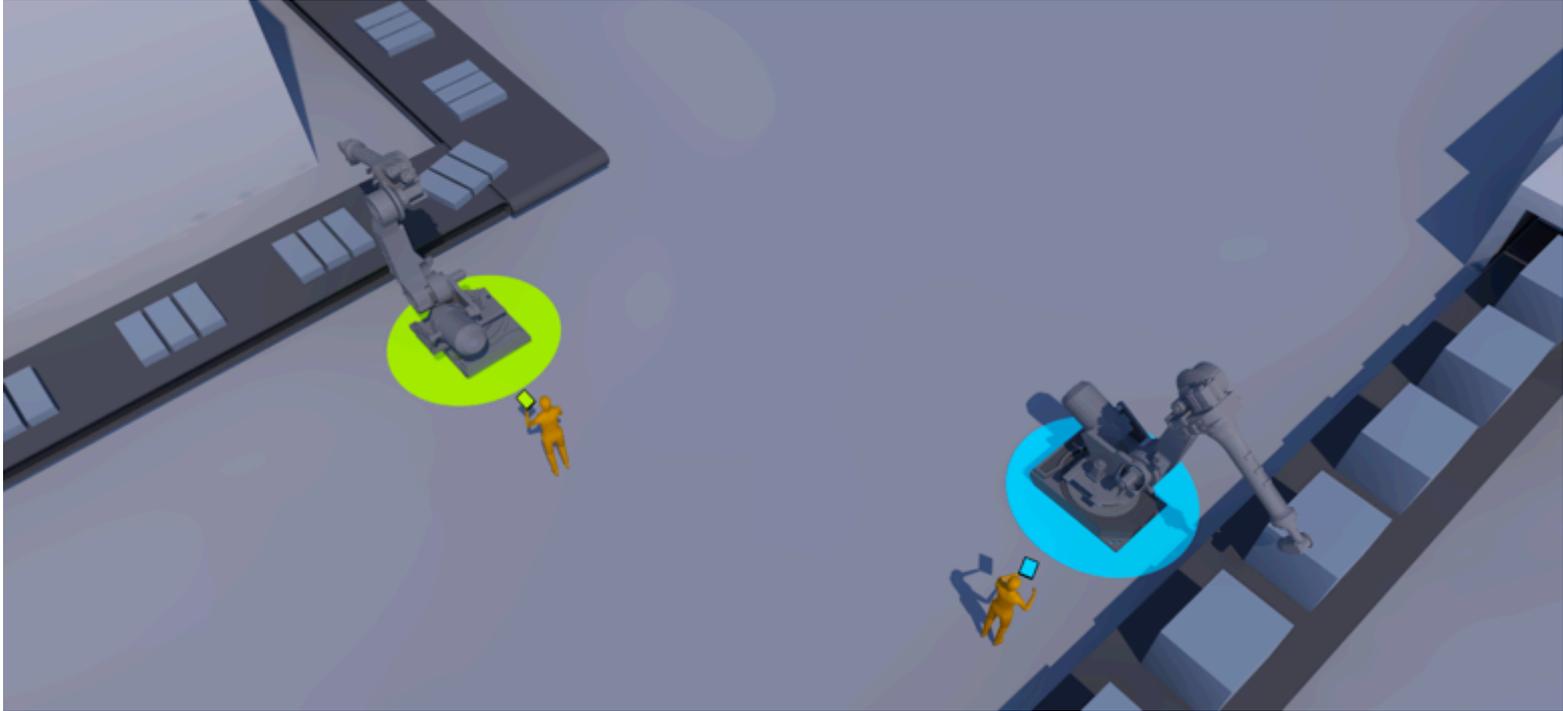


Simple Installation Of Complex Technology

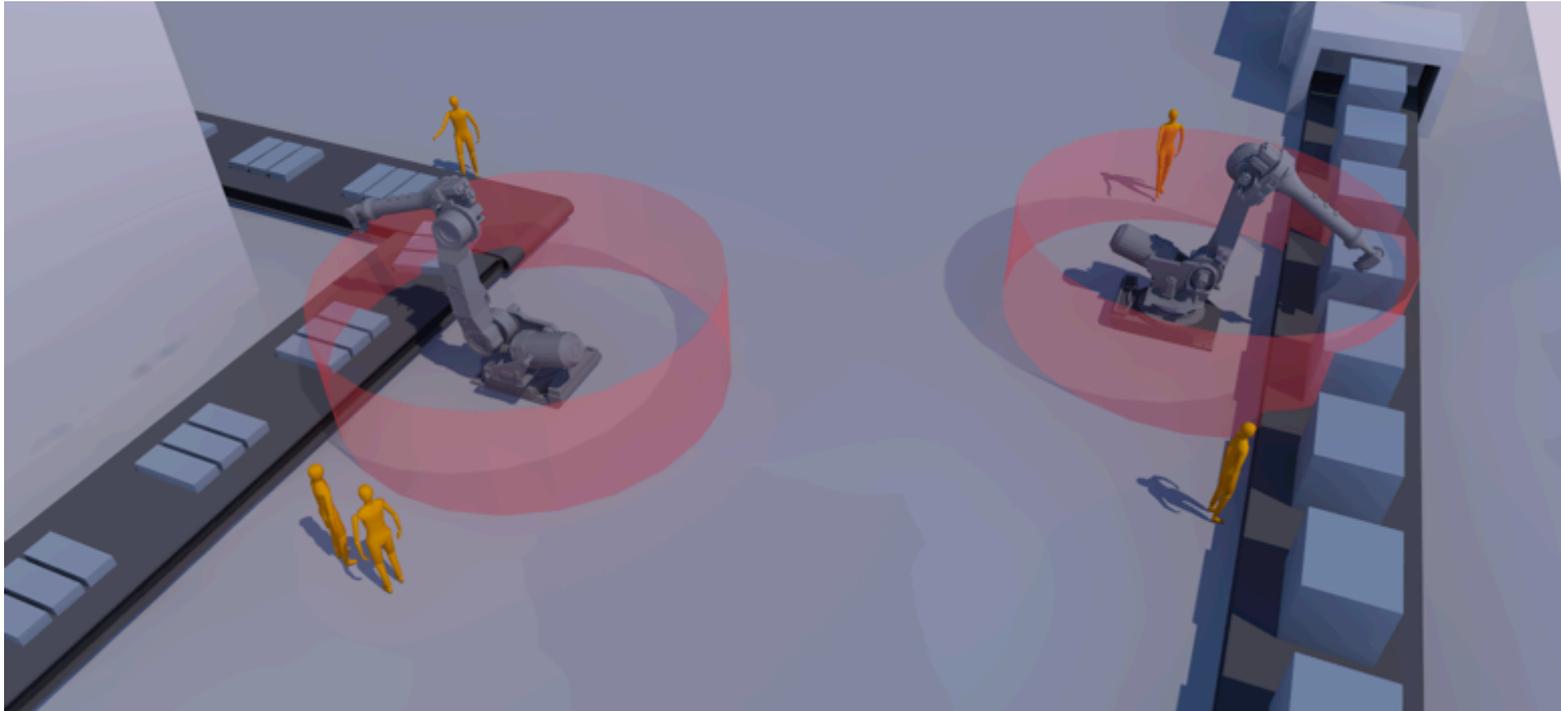
- Boxes can be combined to cover a larger area
- Interface for users remains the same



Position-based context information



Safety Measures



DigLT



Shift Map



POI Selection

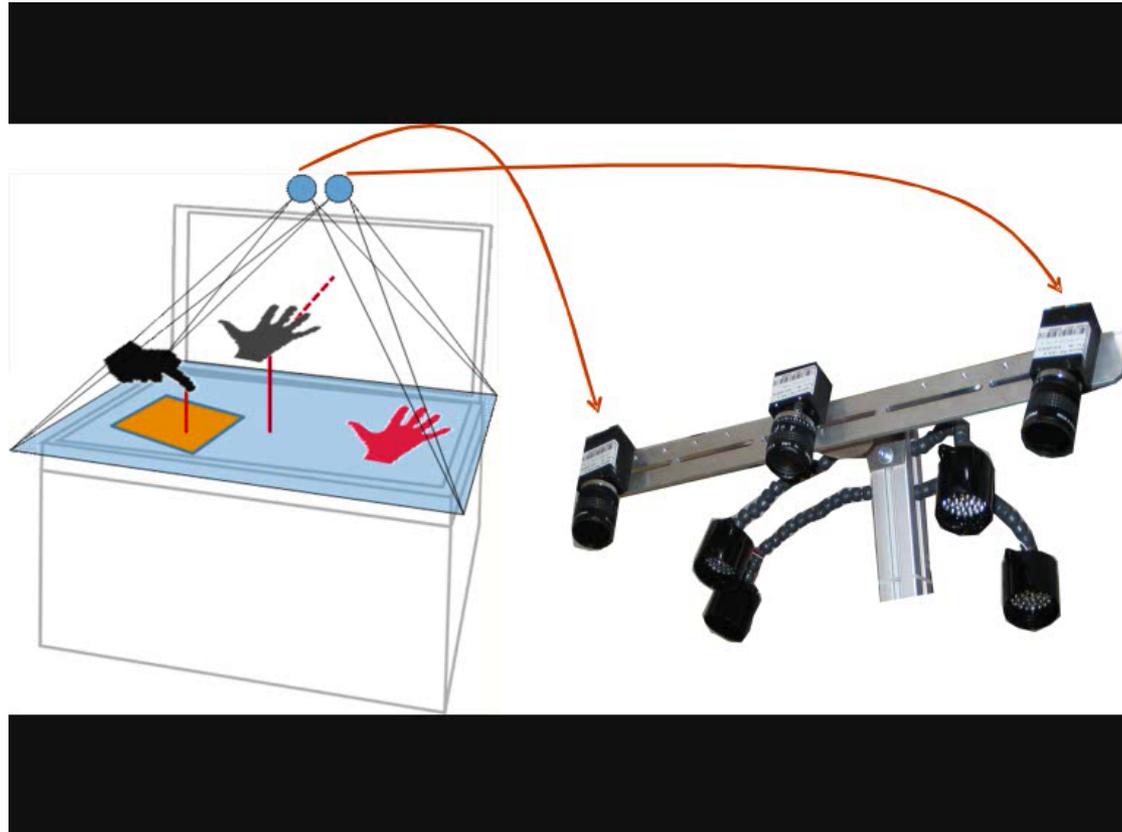


Zoom

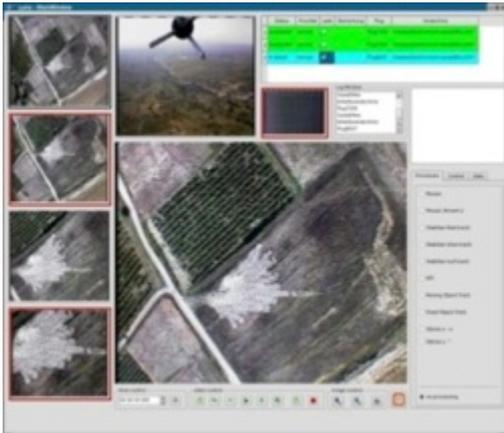


Rotate Display

DigLT (2)



Gaze-based Interaction



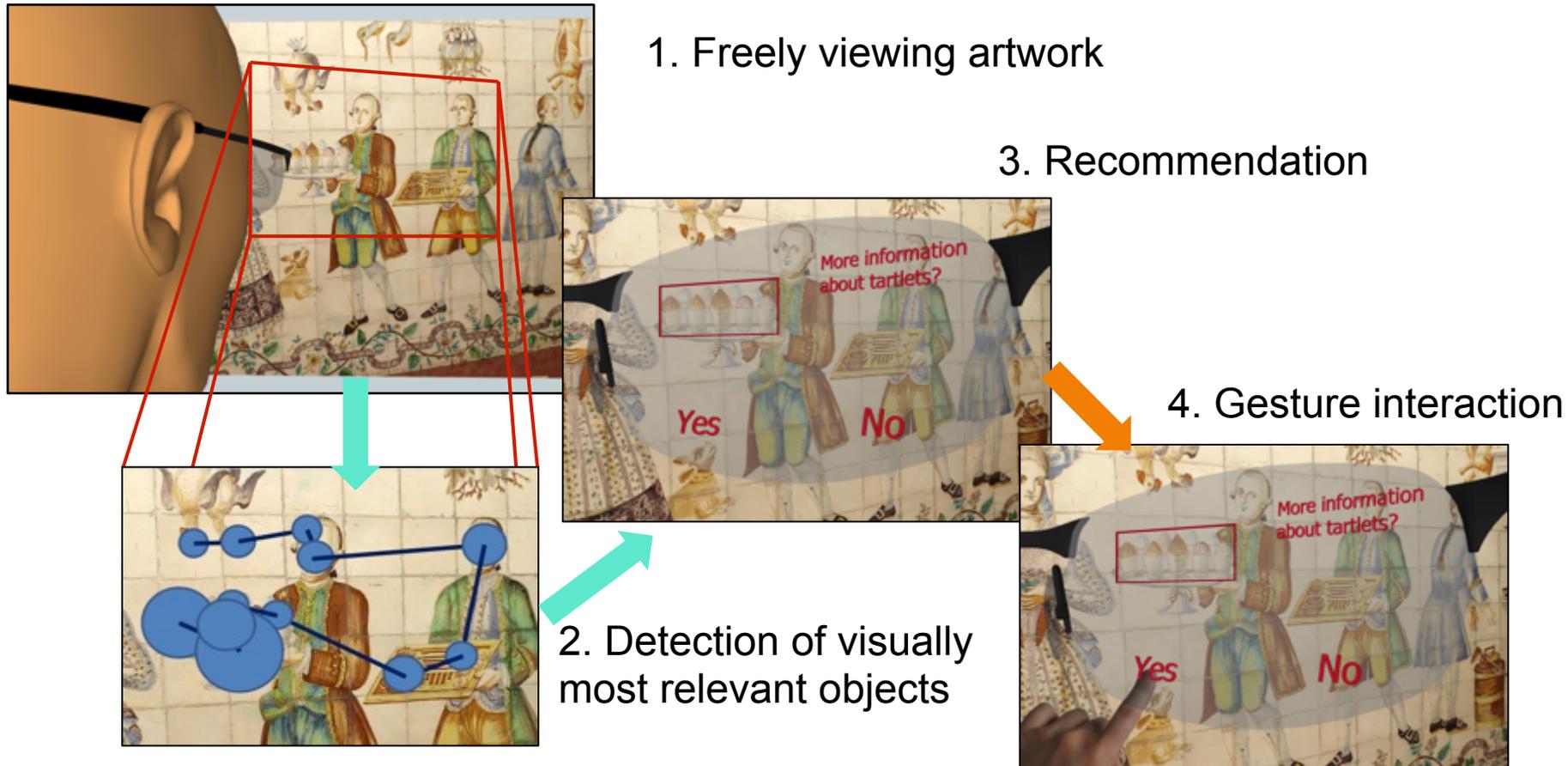
Interactive See-Through Head-Mounted Device (HMD)

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



www.interactive-see-through-hmd.de

Motivation: Adaptive AR Museum Guide



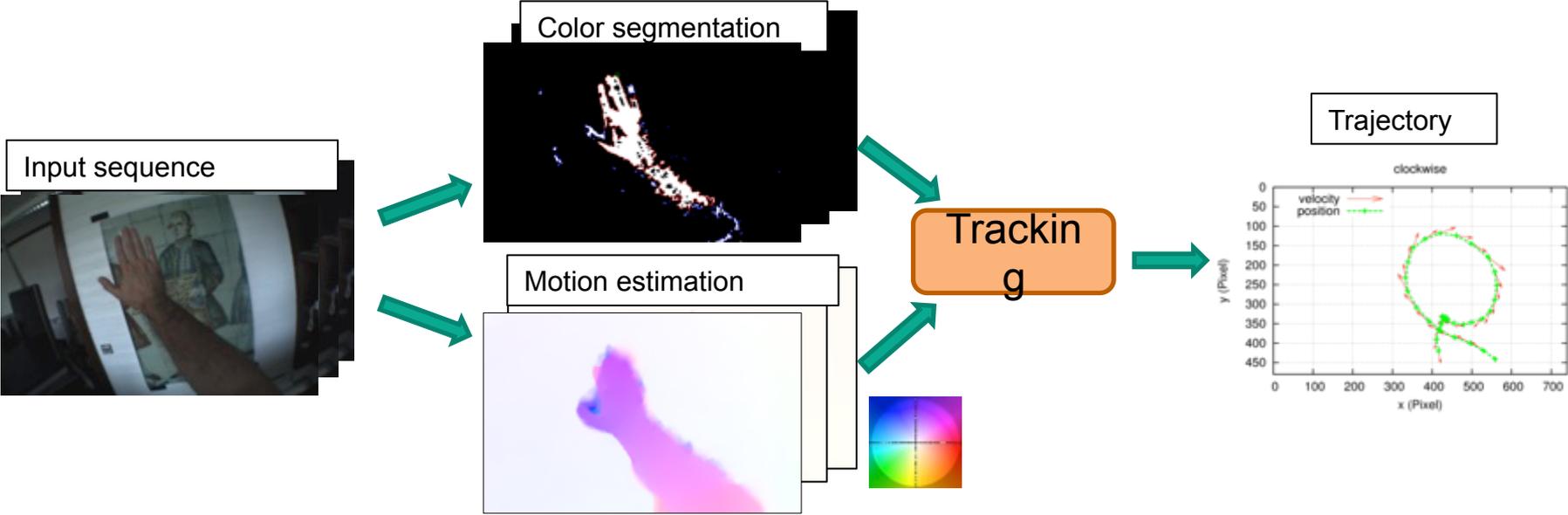
Example



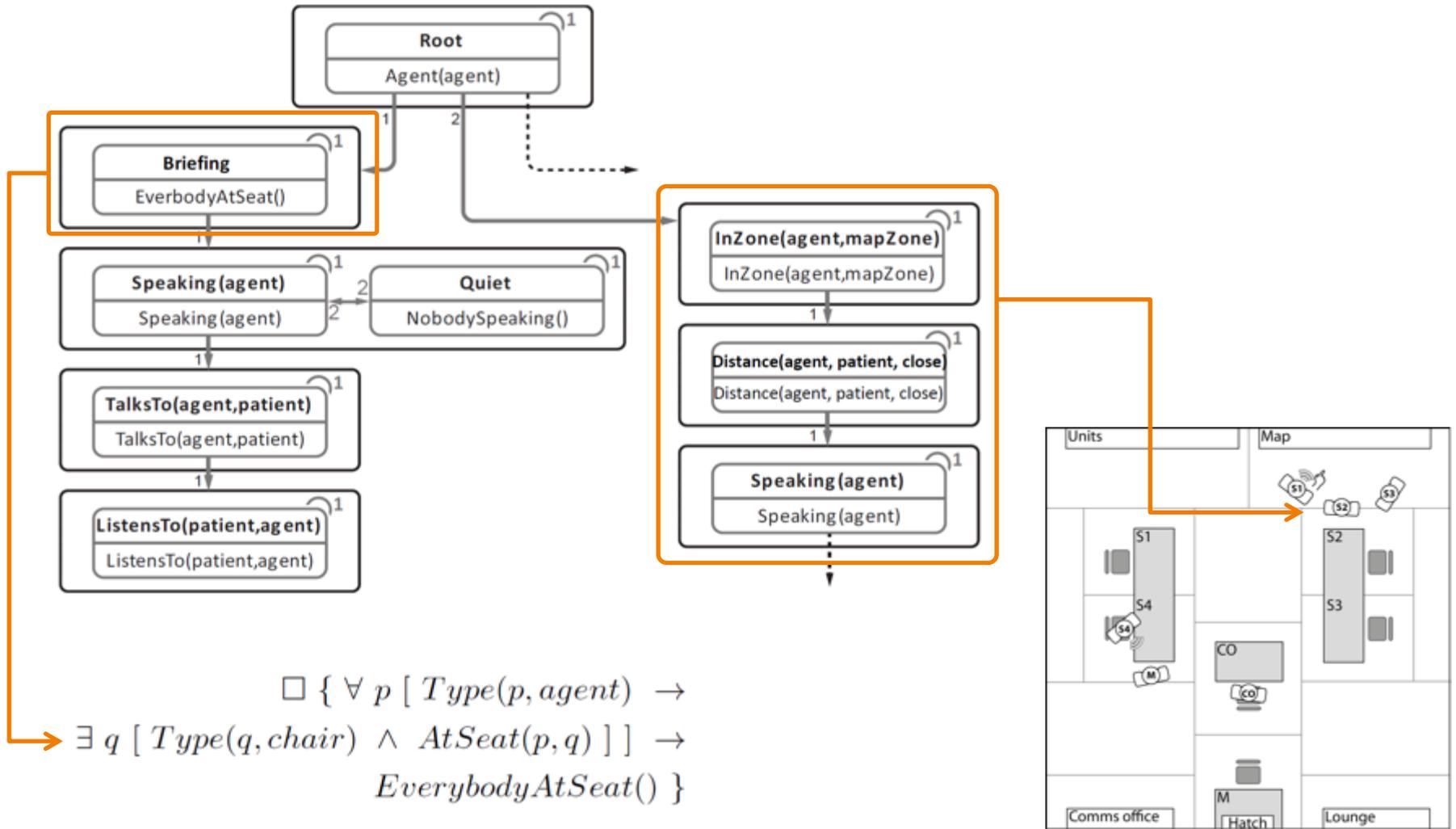


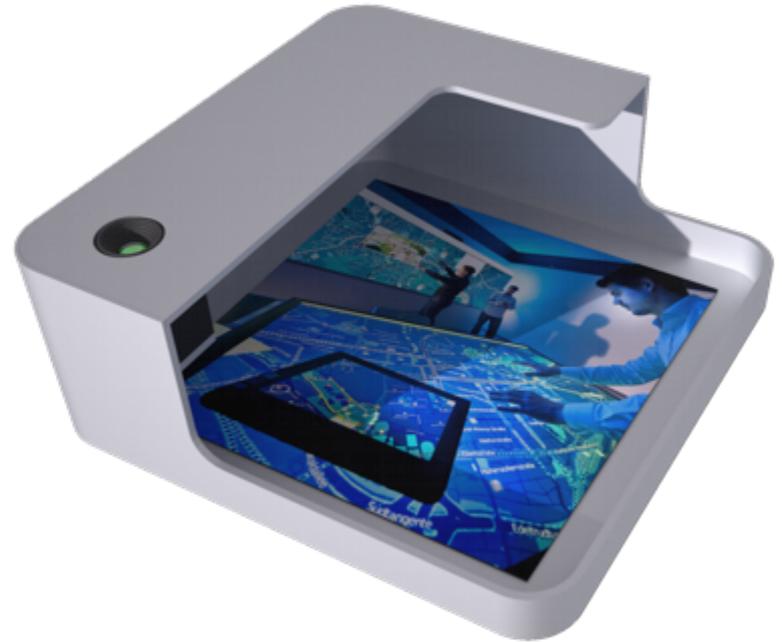
Overview of Gesture Recognition

1. Step: Hand Tracking



Situation Awareness





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