Eurographics 2015
The 36th Annual Conference of the
European Association for Computer Graphics

SVEn

Shared Virtual Environment

Tobias Manroth, Nils Pospischil, Philipp Schoemacker, Arnulph Fuhrmann

Cologne University of Applied Sciences

Fachhochschule Köln
Cologne University of Applied Sciences

1. Introduction

- Scope
  - Module in a Media Technology Master‘s degree
  - Group project (3 students)
  - One year
  - 12 ECTS per student
- Objective
  - Development of an interactive graphical system

1. Introduction

- Key factors to foster creativity
  - project definition up to the students
  - design of a complex technical system
  - working on emerging technologies

2. Similar projects

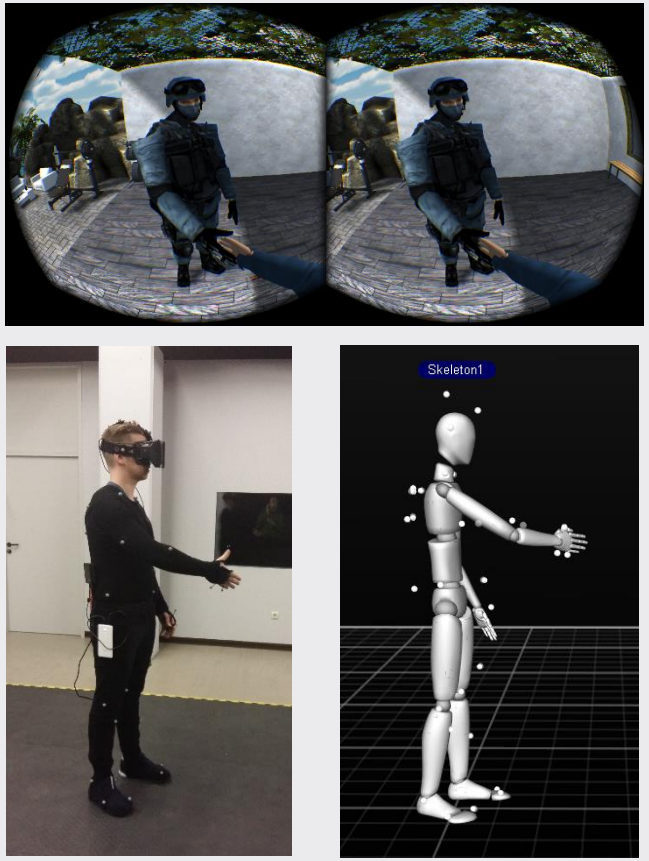
Giant vs Horde

Xsens – Multi-person full-body immersive VR

Virtsim - Military

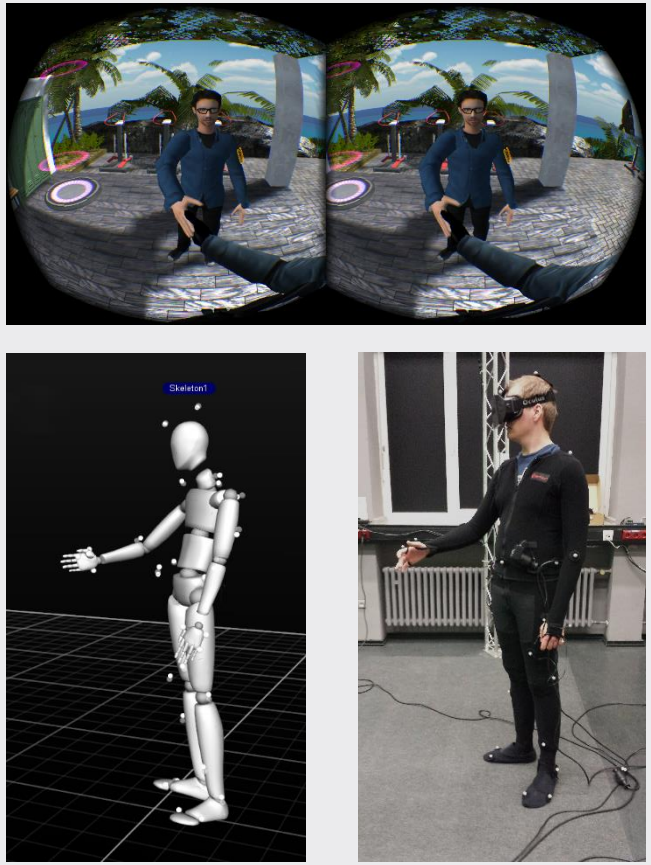
VIVE – Very Immersive Virtual Experience

What is SVEn?



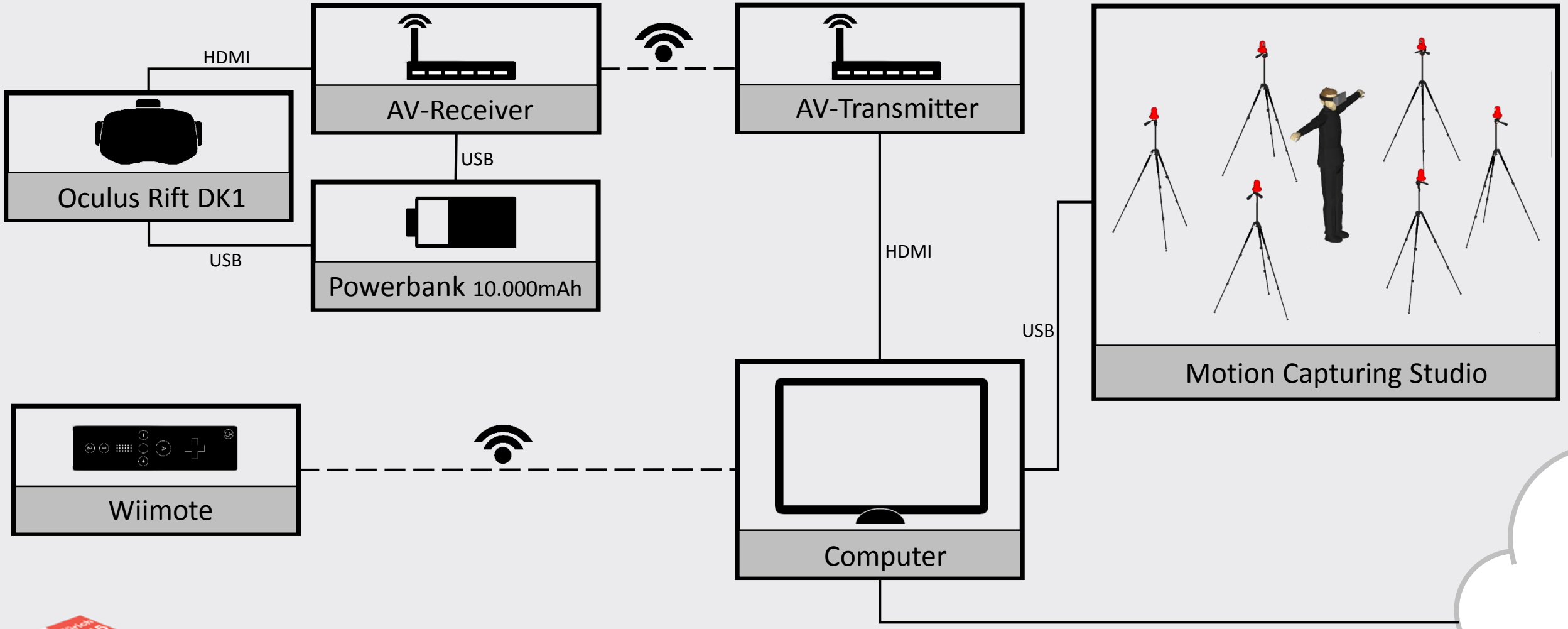
Motion Capturing Studio 1

Shared **V**irtual **En**vironment

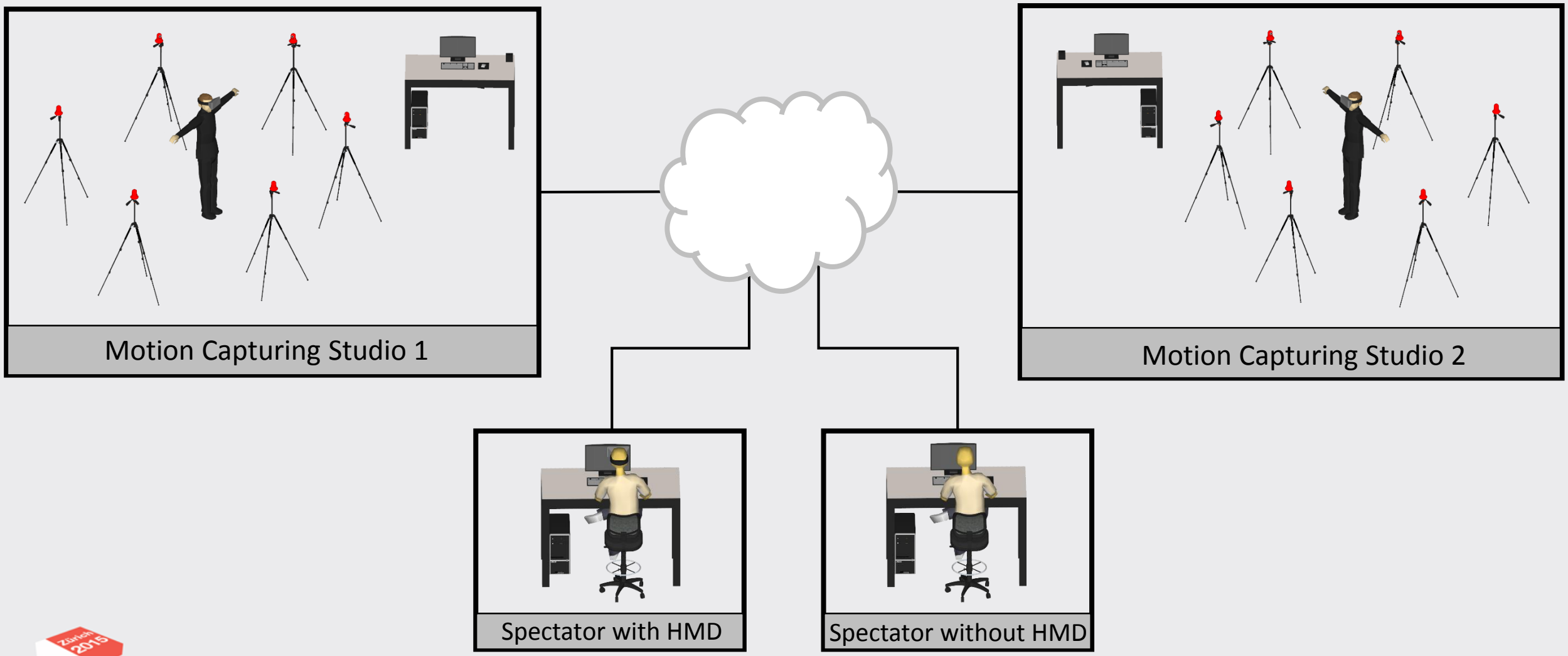


Motion Capturing Studio 2

3. Hard- and Software



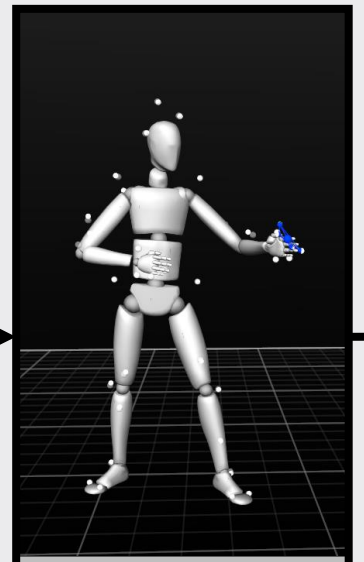
3. Hard- and Software



3. Hard- and Software

- Local data streaming

Motion Capturing



Optitrack Motive

C++ → C#

NatNet SDK Wrapper

Unity3D

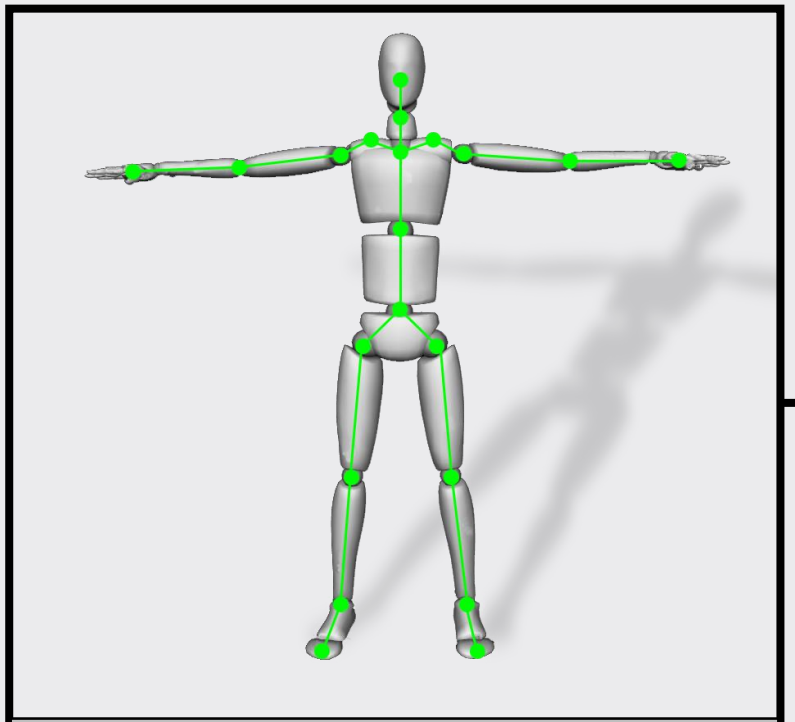
3. Hard- and Software

- Costs:

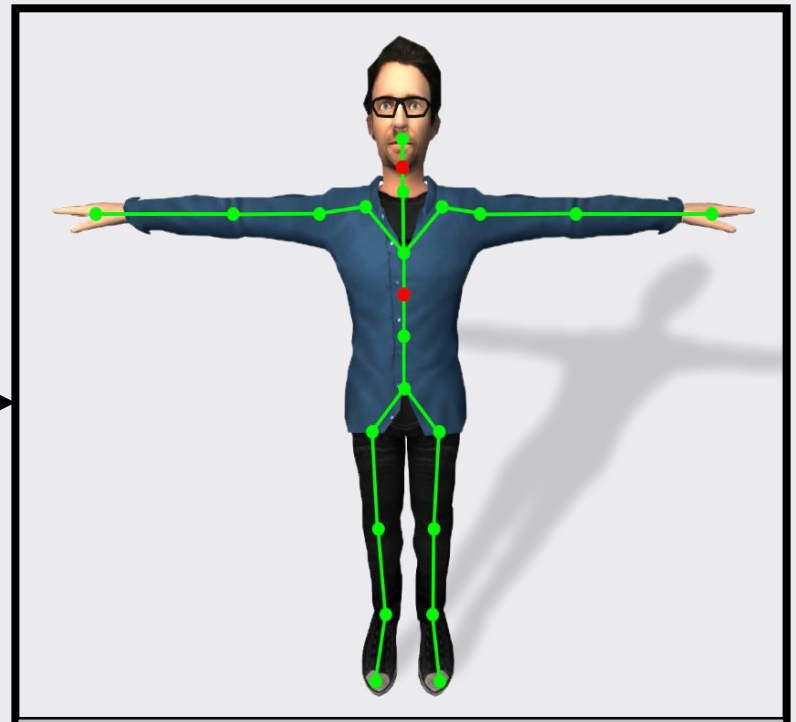
Hard- and Software	Costs [€]
Unity	0 €
2x Wiimote	100 €
Powerbank, Bluetooth-Stick …	100 €
2x Peerless HDMI-Transmitter/Receiver	600 €
2x Oculus Rift DK1	640 €
Total:	1.440 €
MoCap Studio 1 (Optitrack Flex13 Bundle 12 Cameras)	18.000 €
MoCap Studio 2 (Optitrack Bundle 24 S250e Cameras)	65.000 €
Total:	84.440 €

4. Implementation

- Data streaming



Optitrack Motive

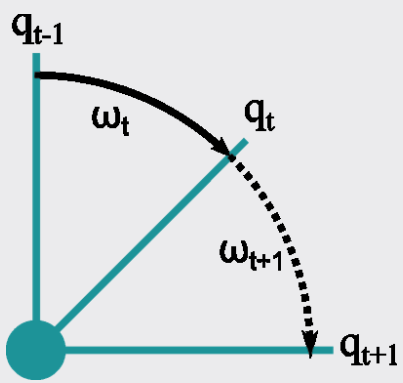


Unity3D

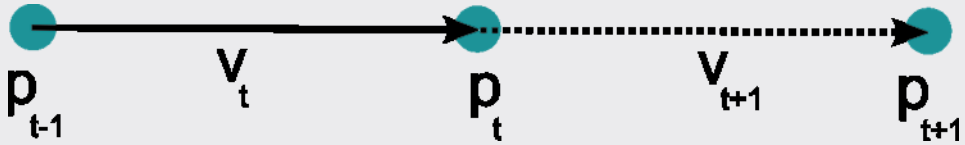
4. Implementation

- Prediction
  - Reduce system related latency
  - Oculus tracking and latency compensation is not used
  - Our implementation based on “Head Tracking for the Oculus Rift” [LYKA14]

Angular extrapolation



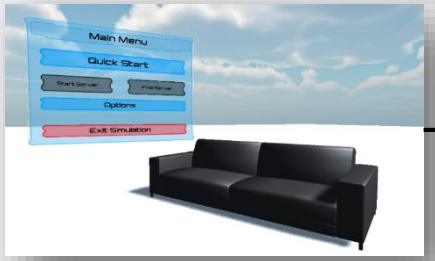
Positional extrapolation

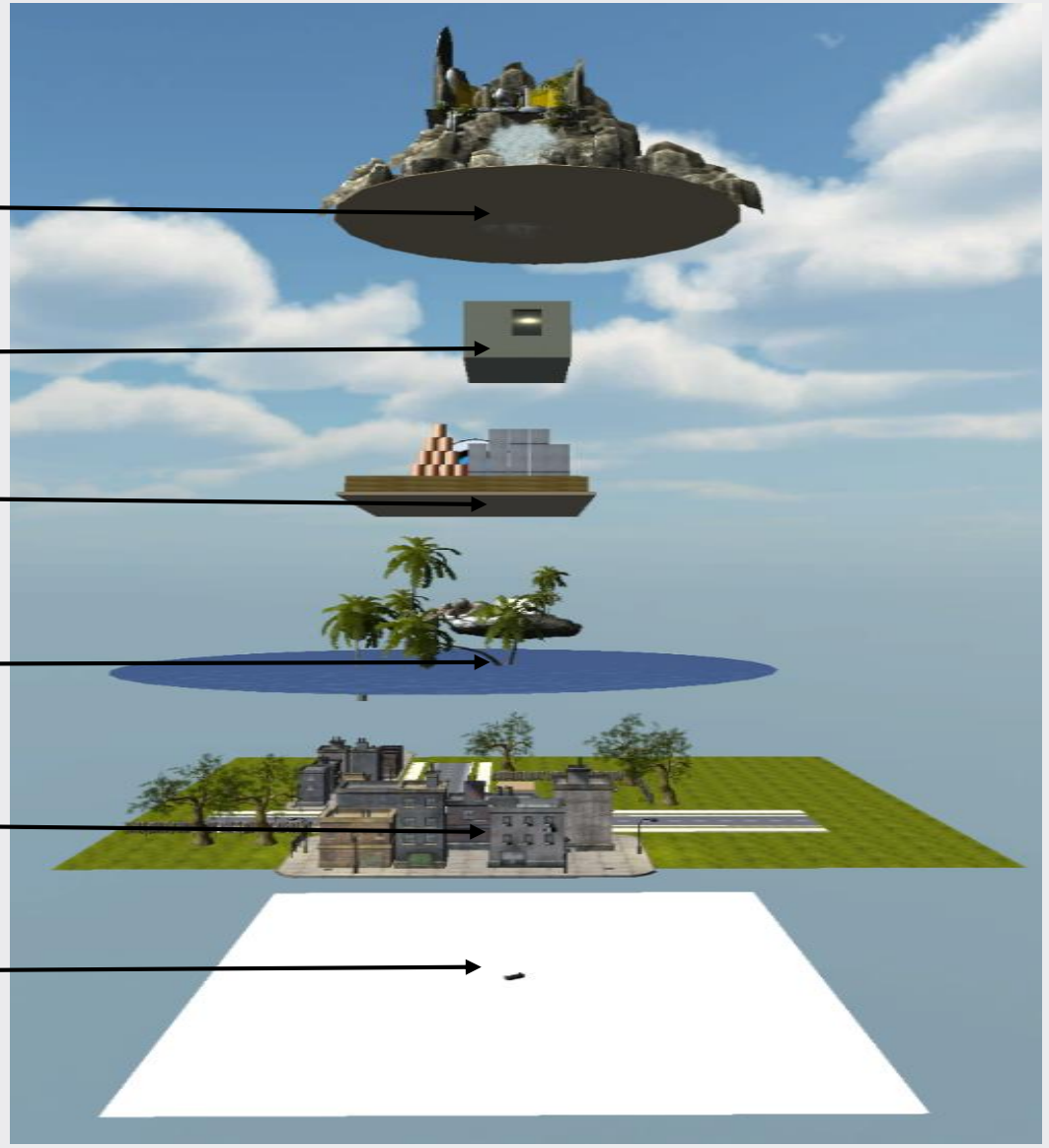


4. Implementation

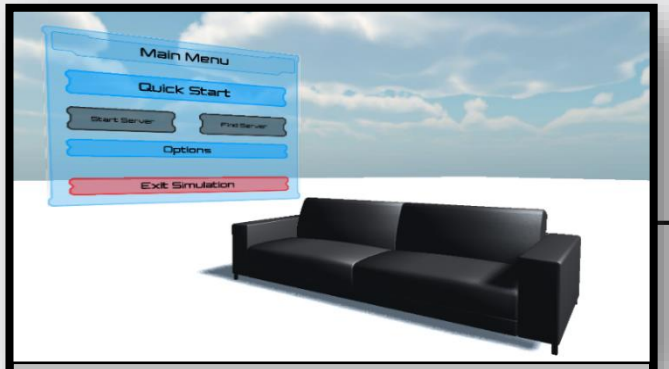
- Online Connectivity

5. Virtual Environment





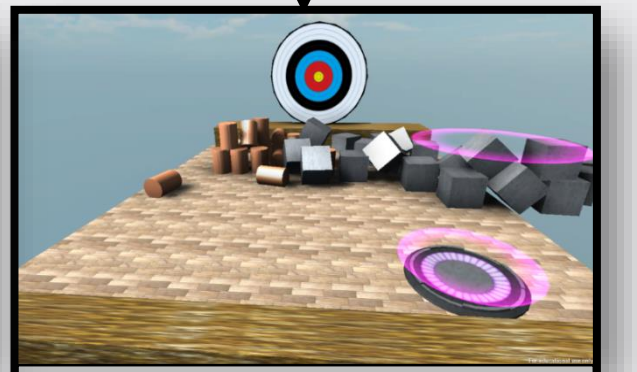
5. Virtual Environment



Start

Character Choosing Room

Shooter Game



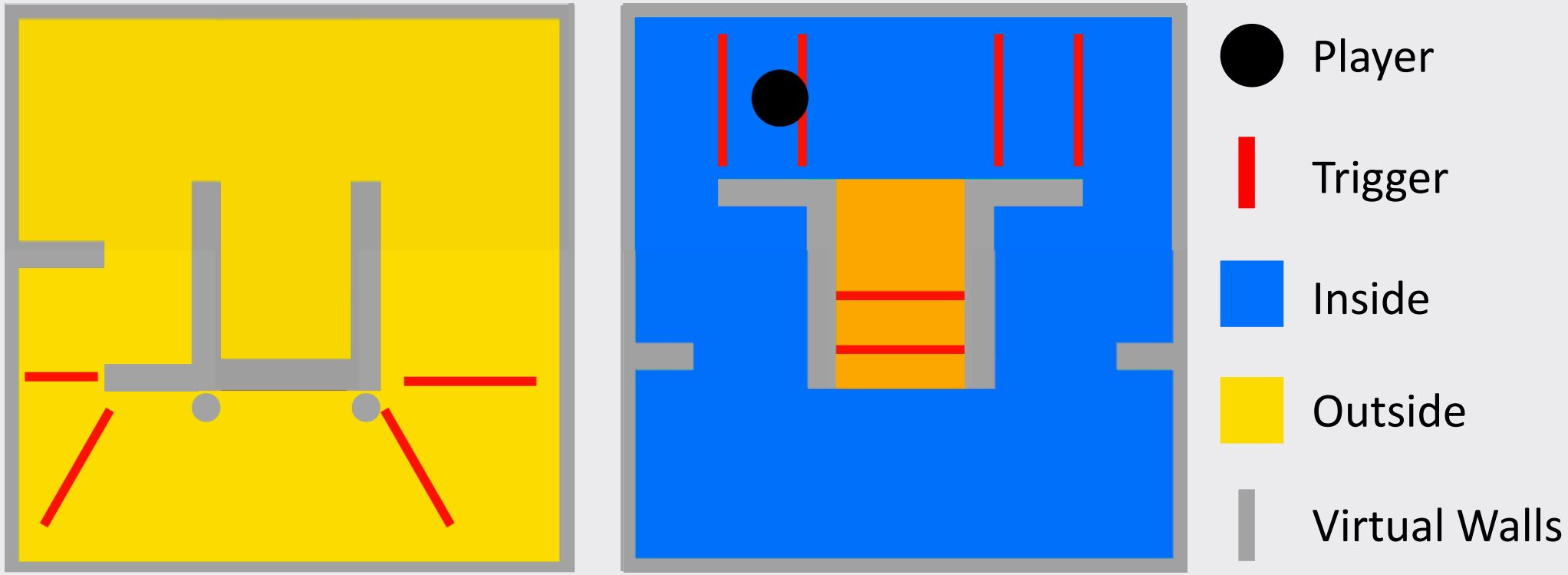
Physics Demo

Gym

Teaching Room

5. Virtual Environment

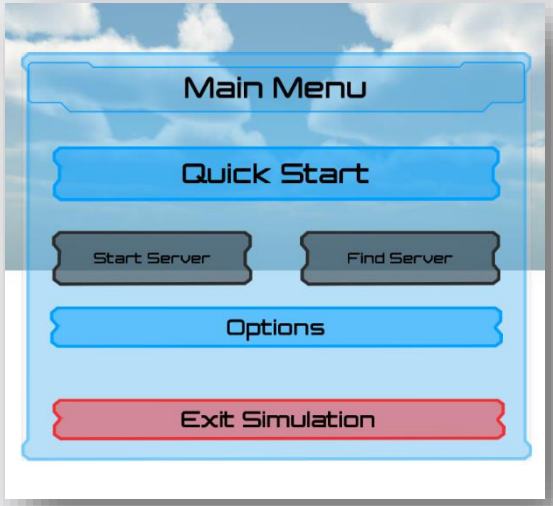
- Shooter Game is similar to Flexible Spaces [VKBS13]

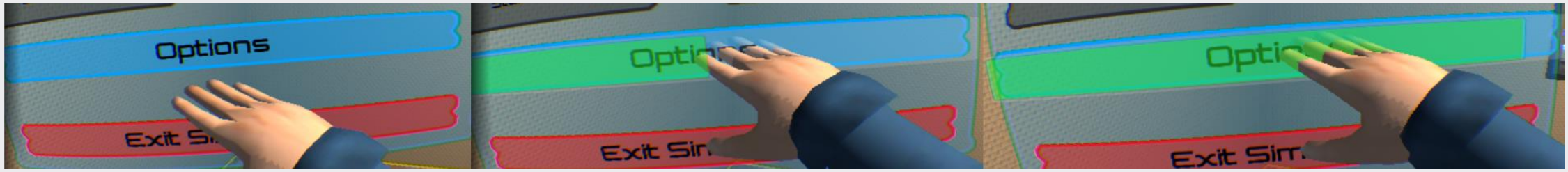


5. Virtual Environment

- **User Interface in VR:**
  - Only Input device: Your own body
  - No haptic feedback
- **Oculus Rift DK1**
  1. Limited resolution → Large UI elements

Main Menu:





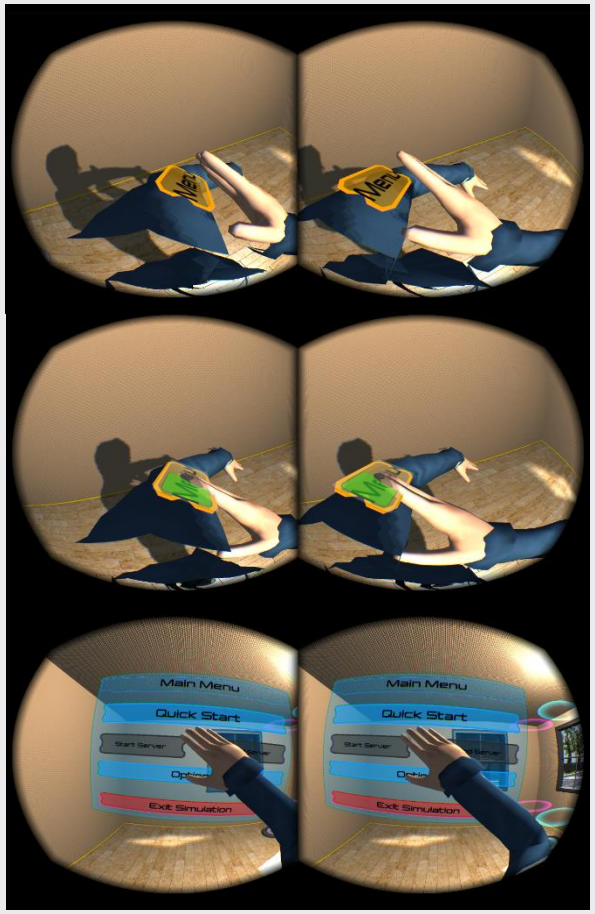
Button not touched | Button touched: Delay time | Button event fired

5. Virtual Environment

- Ingame HUD:

- Ingame Buttons:

- Ingame Menu:



6. Results & Benefit

- Feedback from users:
  - Highly immersive
  - Strong feeling of presence
  - Low Latency

- Beneficial for
  - Gaming
  - Remote training
  - Vertigo therapy
  - Future student projects

7. Future Work

- Assessing presence
- Measuring latency
- Oculus Rift DK2 / Samsung Gear VR
- Finger tracking
- Voice streaming

References

- [LYKA14] –LaValle S., Yershova A., Katsev M., Antonov M.: Head Tracking for the Oculus Rift. Robotics and Automation (ICRA), 2014 IEEE International Conference, Hong Kong, CN; 2014-05-31 – 2014-06-07
- [VKBS13] VASYLEVSKA K., KAUFMANN H., BOLAS M.,SUMA E. A.: Flexible spaces: A virtual step outside of reality.poster presentation: IEEE Virtual Reality, Orlando, FL (USA); 2013-03-18 – 2013-03-20, 2013.

- Credits
  - 3D model DeLorean: 'A certain DeLorean' from KuhnIndustries *www.blendswap.com* (20.02.2015)
  - 3D characters: www.mixamo.com