Virtual Reality
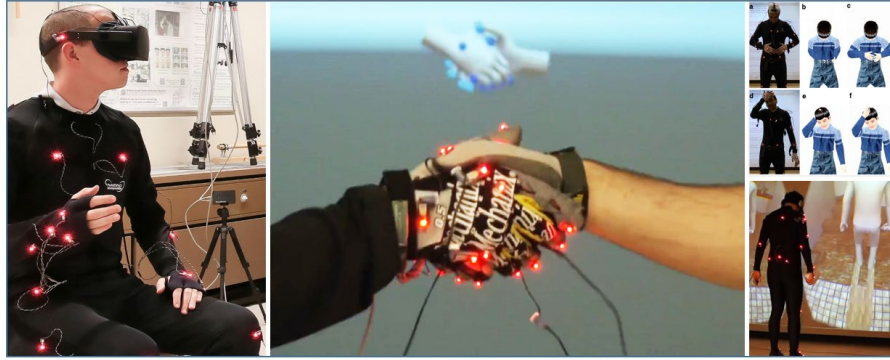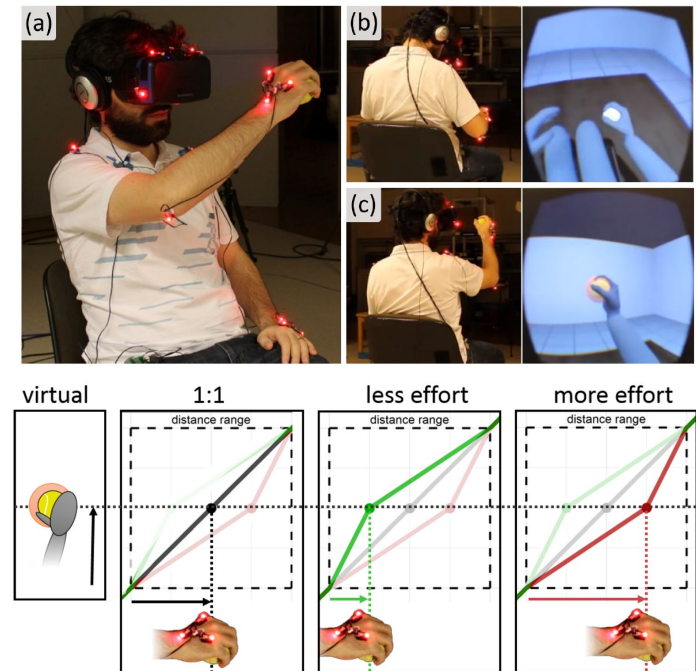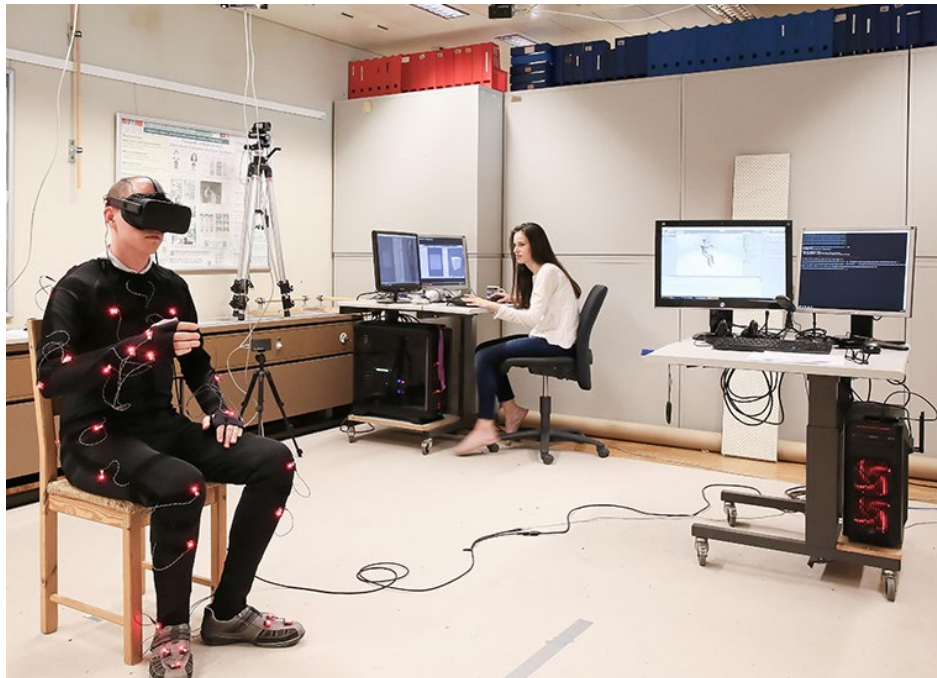
- Lecturers and Teaching Assistants
- Course goals
- Course map
- Grading scheme
- Assignments structure
- Required prior knowledge
- References
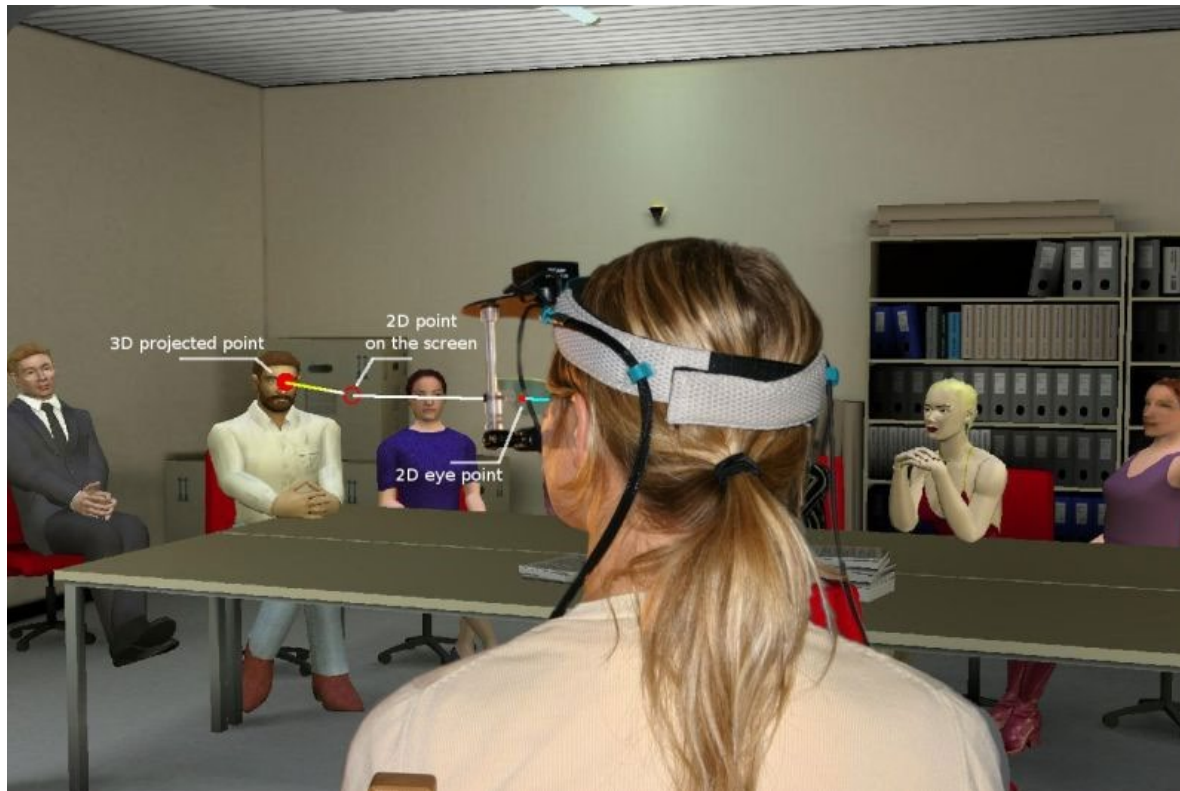
Lecturers

Dr Ronan Boulic
Senior scientist / MER
Leader of the Immersive Interaction
research group (IIG)

Lecturers

Dr Bruno Herbelin
Deputy Director LNCO
Cognitive Neuroscience Laboratory

Teaching & HW Assistants

Phil Lopes
Postdoc in IIG

Mathias Delahaye
PhD student in IIG

Nana Tian
PhD student in IIG

& 2 students-assistants : David Resin & Hugo Hueber

4

Course Goals

Introduction to the field of VR

concepts & technologies of immersive real-time interaction

Background in human perception-action

ensure the users are able to react as if the virtual environment were real, even if it is not "realistic"

Cover some key interface modalities:

visual, haptic, movement

Present various applications

5

Course Map *to be updated*

R. Boulic
1 VR concepts
2 Presence
3   3D Interaction /
4   display
5 Action
6 Action
7 Haptic
8 Haptic
9 Believability
10 Full-body Int.
11
12 *project time*
13 *project demo*
14 *final oral*

Mathias Delahaye
Nana Tian

Phil Lopes
1 Game design
2 VR Systems
3 Play testing
4
5
6
7
8
9
10
11
12
13
14

Hands-on TP

Project period

B. Herbelin

11 VR & NeuroSc.

6

Course Map

week	10h15-11h00	11h15-12h	12h15-13h
1	Course presentation	R. Boulic Embodied VR	Phil Lopes intro to Game design
2	R. Boulic	R. Boulic Vision & Stereo	Mathias/Nana VR System
3	R. Boulic	R. Boulic Cybersickness	Phil Lopes Play Testing
4	R. Boulic	INTRO UNITY laptop + groups	INTRO UNITY laptop + groups
5	R. Boulic **Paper Study Deadline**	Intro Oculus Quest – INF 213 Project start	Intro Oculus Quest – INF 213 Project start
6	R. Boulic	TP - INF 213	TP – INF 213
7	**Quizz1** - R. Boulic	TP – INF 213	TP – INF 213
8	R. Boulic	TP - INJ 118 – INF 213 + project pitch	TP - INJ 118 – INF 213 + project pitch
9	R. Boulic	R. Boulic	project
10	R. Boulic	R. Boulic	project
11	B. Herbelin	B. Herbelin	project
12	project	project	project
13	**Quizz2** – project demos	Project demos	Project demos
14	final oral(s)	final oral(s)	final oral(s)

Grading Scheme

Exam form: during the semester
4 components:

- 16%: 1 article study and citation analysis [weeks **2 – 4**]

- 10%: 2 quizzes on weeks **7** & **13**

- 4% : 5 x 2h TP hands-on [weeks **4 – 8**]

- 40%: 3 persons groups project [weeks **5-12,+13/14**]

- 30%: short theoretical oral control on the chosen article, one random topic among the hands-on topics and general VR concepts [week 14]

16 % Individual article study [weeks 2-4] :

Provide a short report on week 5 (the chosen article is the starting point of the final oral exam):

- highligthing the key contributions of the paper.
  -> one page including paper title & your name

- presenting how that topic is still evolving through a short survey of the articles who cited it (use **google scholars** citation list): one page

- list of key references & citing articles: one page

- One page = [2'400-3'000] char including spaces

Assignment structure

Assignment structure

VR Hands-on in INF 213 & INJ 118 (5 weeks: 4-8)

Phil Lopes

Nana Tian and Mathias Delahaye

Week4 (2h) : Unity Game Basis

Overview

Laptop with Unity3D platform
Animation/Navigation/Sound

Goals

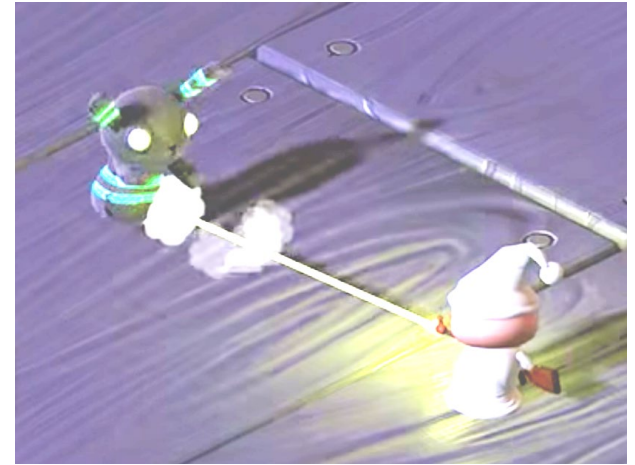Discover the main modules of Unity (Sound Mixer, Animator, Particle effect, UI..)

First Scripting Approach (C#)

Organize a full project

Make your first 3D game with Unity

Resources

https://unity3d.com/pt/learn/tutorials/s/survival-shooter-tutorial

Week5 (2h): Oculus Quest

Overview

Group list finished (3 by group)

Unity3D, Visual Studio, ABD installed

Goals

Build, Push and Run an application on the Oculus Quest

Using the ADB to debug an application to the Quest

Getting autonomous for the development on the Quest

Resources

Android build : https://docs.unity3d.com/2018.4/Documentation/Manual/android-BuildProcess.html

Debugging : https://developer.oculus.com/documentation/native/android/book-anddebug

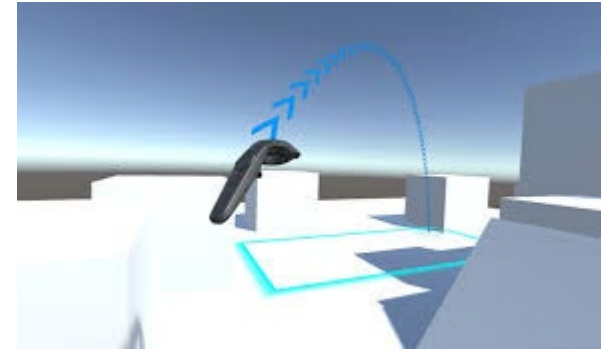# Week 6 (2h): Basic Interactions and Locomotion

Assignment structure

Overview

groups of 3 persons per HMD

Laptop with Unity3D platform

Goals

Discover different grabbing interactions(basic grabbing, advance grabbing etc.)

Discover different locomotion methods(stearing, teleportation etc.)

Able to create your own innovative interactions and locomotion method.

Week 7 (2h): Finger Interactions

Assignment structure

Overview

    groups of 3 persons per HMD

    Laptop with Unity3D platform

Goals

    Use the Quest API to animate virtual hands

    Create an interaction with fingers (such as magic)

Resources

    Quest API : https://developer.oculus.com/documentation/unity/book-unity-gsg

Week8 (2h): VR Buffet
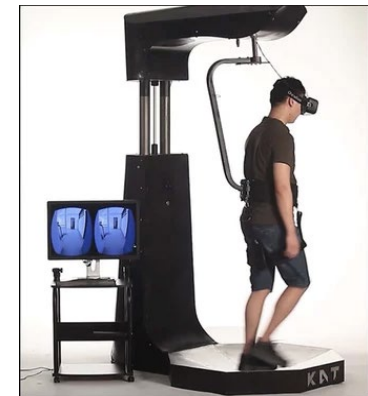
Overview

    HTC vive pro **eye**

    Katwalk

    Hololens

    Valve index controller

    Phasespace

Goals

    Discover different technologies   (eye tracking, locomotion, visualization..)

    Play with the key parameters to understand user-centered design.

Assignment structure

Graded 4%: active participation [weeks 4-8]

- the final TP selection will be based on the final course registration

- group registration on moodle.

- *topics may be adjusted until week 5*

Assignment structure

40%: 3 person group projects [5-12, +13/14]:

- Topic: **Build a 3D VR Game** using **Unity 3D** and the **Oculus Quest**.
- **Project Guidelines**: Details on Moodle.
  - **Please Read Them!**

- Group Registration on Moodle

- **Project Pitch** -> April 1st
- **Pitch Feedback** -> April 6th

- Deadline: **May 13th** (@23:55)
  - **Fully Playable Build**, Report and Code.

- Project Presentation: **May 18th**
- Oral Presentation: **May 25th**

Required prior knowledge

Requested background in Computer Graphics:

- Introduction to Computer Graphics

  perspective transf., modelling hierarchy, orientation
  coordinate system transformations, rigid body movt.
  Rendering: mesh, material, texture, light

- Programming: C# (UNITY 3D)

Recommended EPFL course
- Introduction to Visual Computing

  elements of Computer graphics, Computer Vision, Human-Computer
  Interaction, game design, interaction project

References

J. Jerald, The VR Book, ACM Press 2016

T. Parisi, Learning Virtual Reality, O'Reilly 2015

D. Bowman, E. Kruijff, J. Laviola, I. Poupirev, *3D user Interface*, 2nd edition Addison Wesley 2017

Philippe Fuchs, Guillaume Moreau, Pascal Guitton, *Virtual Reality: Concepts and Technologies*, July 27, 2011 by CRC Press, 432 Pages
ISBN 9780415684712 - CAT# K13701

Bruno Arnaldi, Pascal Guitton and Guillaume Moreau, Réalité virtuelle et réalité augmentée, Mythes et réalités, ISTE 2018

Questions ?

moodle.epfl.ch

Course 6841