Virtual Reality (2017-18)
Final project assignment

General:
One of the tasks of the Virtual Reality course is to implement a real-time 3D interactive program. You can re-use material provided for the hands-on TP.

You are free to define your project group, latest on Monday April 18th 23h55. The max group size is 3. Please note that if you plan to use Unity or a similar engine (e.g. Unreal Engine, with physics already integrated and scene editing tools), we expect richer interactions\(^1\) than if you exploit a less complete tool (e.g. Ogre3d, OpenGL, Irrlicht).

The program should (requirements):
1) **track the head/face of the user** to determine the location of the viewport in a virtual scene. The virtual 3D scene will be changing according to this viewpoint as in the head-tracking TP.

2) **control the 3D movement of at least one virtual 3D object** in the scene: it could be through a fiducial marker such as the one provided by the ARToolkit or a 3D input device, a mobile phone, a Kinect, etc....

3) use a physics library for modeling interactions between the object(s) controlled by the user and other objects from the scene.

4) contain a virtual 3D scene.

The group is required to implement and present the project on their own computers and/or mobile devices. Mind that although EPFL does not provide VR hardware for your project, you are free to use whatever you have available, as long as you can bring it for the demo, such as Kinect, Wiimote and cellphones. We can lend some device (reply to the dedicated message from Thibault.Porssut@epfl.ch).

Libraries:
The group can choose the libraries that are used for each element freely. Here are some suggested libraries ; let us know in case a library is no more freely available:

Rendering 3D scene:
- OpenGL (http://www.opengl.org/)
- Ogre3D (http://www.ogre3d.org/)
- Irrlicht (http://irrlicht.sourceforge.net/) - Unity 3D (http://unity3d.com/)

Face tracking:
- OpenCV (http://opencv.org/)
- OpenCVSharp https://github.com/shimat/opencvsharp (head tracking TP)

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\(^1\) For example allowing for multi-player interactions.

- ARToolkit (http://www.hitl.washington.edu/artoolkit/)

- UART – Unity AR Toolkit (https://research.cc.gatech.edu/uart/)

- ArUco (http://www.uco.es/investiga/grupos/ava/node/26)


Kinect/Depth sensors:


Wiimote:

- Wiiuse (http://sourceforge.net/projects/wiiuse/)

- Wiiyourseelf (http://wiiyourself.gl.tter.org/)

Samples:
The following videos demonstrate past year projects; they illustrate the expected outcome of the assignment in terms of performances, usability and, in some case, fun:

- Bird flight simulator with Kinect: https://youtu.be/zi5aT8LMvx0?list=PLbrox1hcL-N7dq9XbAkAAMd09IQAZ1VIT
- Air Hockey game with 2 Leapmotions: https://youtu.be/oi_HMYvEalY?list=PLbrox1hcL-N7dq9XbAkAAMd09IQAZ1VIT
- Building/simulating a 3D structure: https://youtu.be/ny1llEITEHw?list=PLbrox1hcL-N7dq9XbAkAAMd09IQAZ1VIT

Schedule:
The deadline for submitting short proposals of the project is on April 11th (middle of week 8). Your proposal should briefly describe the idea you have and list the libraries you will be using (a sample will be published in the forum). In the introduction, the individual assessment about the potential of the interaction technique (advantages/drawbacks) written during the TP has to appear. During the same week, the teaching assistants may ask clarifications, and suggest modifications in order to approve your project. You can contact Thibault.Porssur@epfl.ch for reviewing for proposal before April 11th, as soon as you have uploaded it on moodle. In this way you will get a quicker feedback.

The deadline for submitting the final version of the program is on May 20st midnight. Each group should submit a compressed file containing the code, a report with brief explanations about the program and some conclusions regarding the coding and user experience. Your demo will be presented on May 21nd during the public demos session that will take place at INF 213 during class hours after the Quizz3. Each group should schedule a time for an oral presentation, which will be held from May 22 to 25. In the defense, each member of the group should be able to explain the flow of the program and its different components. The live demo should be working and all the source codes should be available. The video deadline is on the date of the oral presentation agreed with the TA and the lecturer. The video is max 2 minutes and must not contain copyrighted material unless you own the copyright and allow the VR course to display the video on the VR course Youtube channel.

Grading:
This assignment is 30% of the total course grade and it will be graded as follows: 20% report, 10% video, 40% working demo, 30% oral presentation. The maximum grade will be reduced by 25% for each non-respected requirement.

Contact: Thibault.Porssut@epfl.ch (Please start the subject with “VR Project”)