

Virtual Reality

Lecturer

Gauthier LAFRUIT (Coordinator)

Course mnemonic

INFO-H502

ECTS credits

5 credits

Language(s) of instruction

English

Course period

First term

Campus

Solbosch

Course content

Nowadays, virtual reality (VR) is no longer limited to a projection of synthetic 3D content (aka OpenGL = Open Graphics Library, cf. 3D games) in a stereoscopic head mounted display. Indeed, the future of VR lies rather in the holographic projection of real/natural content (e.g. Google Starline), previously captured by conventional cameras (360 video) possibly augmented with depth estimation or sensing in order to obtain a totally immersive video at 6 Degrees of Freedom (6DoF). Theoretical concepts like the 3D graphics pipeline on a GPU (Graphical Processing Unit) with its 3D content (3D meshes made of triangles), camera, projection and lighting models, as well as 3D capture and rendering technologies will be presented.

Objectives (and/or specific learning outcomes)

The student will learn the main aspects of OpenGL/WebGL (practical part; there are no exercises on Unity or Unreal), as well as multi-camera capture and rendering methods in immersive 6DoF video (theoretical part) which are partially based on concepts of OpenGL.

Pre-requisites and co-requisites

Required knowledge and skills

C/C++ programming skills are strongly recommended (medium level).

Teaching method and learning activities

The exercises will help the student to develop a 3D game in OpenGL/WebGL with shaders in GLSL (Graphics Library Shader Language), while the theory will give the student all the skills required to understand a scientific article on immersive video in depth.

Contribution to the teaching profile

3D next-generation capturing and rendering techniques for multimedia engineers.

References, bibliography and recommended reading

JungHyun Han, "Introduction to Computer Graphics with OpenGL ES," CRC Press, 31 March 2021, 978-0367781187

Joey de Vries, "Learn OpenGL: Learn modern OpenGL graphics programming in a step-by-step fashion," Kendall & Wells, 17 June 2020, ISBN: 978-9090332567

Gauthier Lafruit, Mehrdad Teratani, "Virtual Reality and Light Field Immersive Video Technologies for Real-World Applications," Institution of Engineering and Technology, 1 December 2021, ISBN: 978-1785615788

Course notes

Syllabus, Université virtuelle and Podcast

Other information

Place(s) of teaching

Solbosch

Contact(s)

Office ULB-Solbosch UD5.007

Phone: 02/650 30 82

Email: gauthier.lafruit@ulb.be

Evaluation method(s)

Oral examination and Project

Evaluation method(s) (additional information)

OpenGL/WebGL project + open book exam for the theoretical part (6DoF immersive video, mainly).

Determination of the mark (including the weighting of partial marks)

The score is built for 50% on the OpenGL/WebGL project, and for 50% on the theoretical exam (open book) where the student will have to present a scientific concept covered by one of the chapters and/or scientific articles presented (sometimes only partially) during the theoretical sessions of the course.

Main language(s) of evaluation

English

Other language(s) of evaluation, if applicable

French

Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IRCB | **Master of science in Biomedical Engineering** | finalité Professional/unit 2, MA-IREL | **Master of science in Electrical Engineering** | finalité electronics and information technologies/unit 2 and MA-IRIF | **Master of science in Computer Science and Engineering** | finalité Professional/unit 1 and finalité Professional/unit 2

