



澳門大學

UNIVERSIDADE DE MACAU

Course Code: **SFTW 454 (Special Topics in CIS II)**

Course Title: **Virtual Reality and Digital Entertainment** (虚拟现实与数字娱乐)

Lecture Hours: 2 hours / week

Practice Hours: 1 hour / week

Credits: 3

Prerequisite: SFTW111(C/C++), SFTW210(Data Structure), SFTW301(including those who are taking the CG course at the same time)

Potential Instructor: Prof. Wu, Enhua

Course Description:

Virtual Reality(VR), as an advanced technology newly developed in the information technology field, has found its wide range of applications in scientific and industrial areas such as system simulation, scientific exploration, engineering design, digital entertainment etc. In particular, variety of digital entertainment formats have gradually immersed into people's daily life nowadays.

Students will gain an understanding of the basic concepts, principles and technology of virtual reality. The main topic of this course is to study the components and environment modeling, the visual/auditory/haptic computing and user interactions in virtual reality. The techniques on various user interactions based on vision, audio and haptics will be introduced, and various applications in system simulation, engineering design, scientific exploration and digital entertainment will be also introduced, with large number of application samples in various formats of media formats such as video, film, development system etc demonstrated. In particular, the techniques related to VR in the digital entertainment field will be given in more detail.

Brief Syllabus

1. Introduction of Virtual Reality
 - Fundamental Concept and Components of Virtual Reality
 - Primary Features and Present Development on Virtual Reality
2. Multiple Modals of Input and Output Interface in Virtual Reality
 - Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc.
 - Output -- Visual / Auditory / Haptic Devices
3. Visual Computation in Virtual Reality (1)
 - Fundamentals of Computer Graphics
 - Software and Hardware Technology on Stereoscopic Display
4. Environment Modeling in Virtual Reality
 - Geometric Modeling



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- Behavior Simulation
- Physically Based Simulation
- 5. Interactive Techniques in Virtual Reality
 - Body Track, Hand Gesture, 3D Manus, Object Grasp
- 6. Haptic and Mechanic Computation in Virtual Reality
 - Real Time Collision Detection
 - Haptic and Mechanic Computation
- 7. Auditory Computation in Virtual Reality
 - Fundamental of Auditory Computation
 - Applied Audio Implementation
- 8. Visual Computation in Virtual Reality (2)
 - Advanced Techniques in CG (i): Management of Large Scale Environments
 - Advanced Techniques in CG (ii): Real Time Rendering
- 9. Development Tools and Frameworks in Virtual Reality
 - Frameworks of Software Development Tools in VR
 - X3D Standard; Vega, MultiGen, Virtools etc
- 10. Introduction of Augmented Reality (AR)
 - System Structure of Augmented Reality
 - Key Technology in AR
- 11. Seminars on Digital Entertainment
 - Survey: Application of VR in Digital Entertainment
 - VR Technology in Film & TV Production
 - VR Technology in Physical Exercises and Games
 - Demonstration of Digital Entertainment by VR

Textbook

Burdea, G. C. and P. Coffet. *Virtual Reality Technology*, Second Edition.
Wiley-IEEE Press, 2003.

References

1. Sherman, William R. and Alan B. Craig. **Understanding Virtual Reality – Interface, Application, and Design**, Morgan Kaufmann, 2002.

Assessment

- Mid-term Exam: 30%
- Final Exam: 50%
- Assignments: 20%