Fall 2020

Virtual Reality

071011-1
Fall 2020
9/2/2020

Kyoung Shin Park
Computer Engineering
Dankook University

Course Information

- Course
  - Virtual Reality (071011-1)
  - Fall 2020, 3 credits
  - Course hour: Wed 1:30-4:30 (2nd Engineering 420)
- Instructor
  - Kyoung Shin Park
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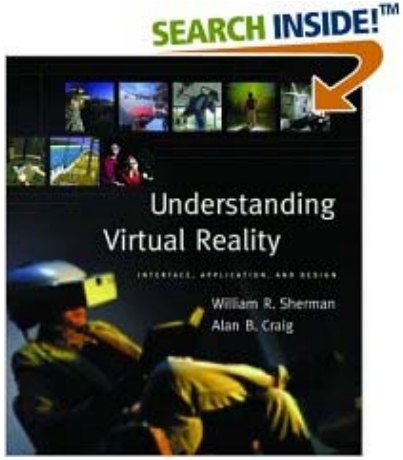
  - 031-8005-3161 (office) 010-8636-1960 (mobile)
  - 2nd Engineering Building, Room 512
  - Office hour: by appointment
- Prerequisites
  - C/C++ Programming & Computer Graphics
  - Previous experience in OpenGL or Unity3D will be beneficial

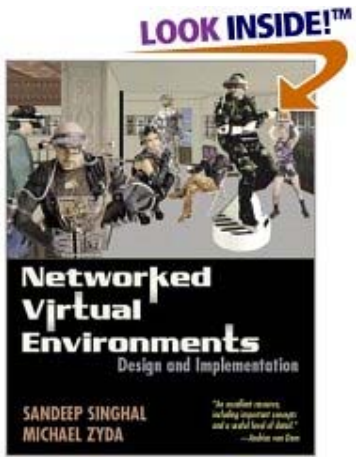
Purpose

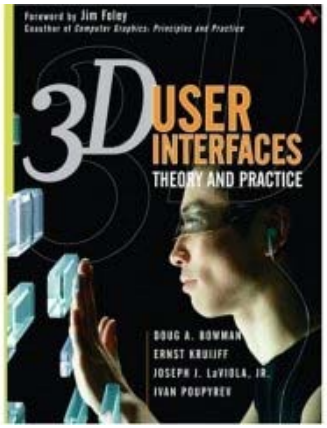
- This course is designed to cover principles of virtual reality and 3D user interfaces.
- Topics include hardware, software and design issues in presenting images and sounds in immersive environments, input and control devices, computer graphics and animation, human-computer interaction, applications and quantitative assessment of virtual reality systems.
- Students will read and present research papers on specific areas, study various research topics. The course consists of lectures, guest lectures, screenings of videos, web-sites, and installations, group term projects, and field trips.

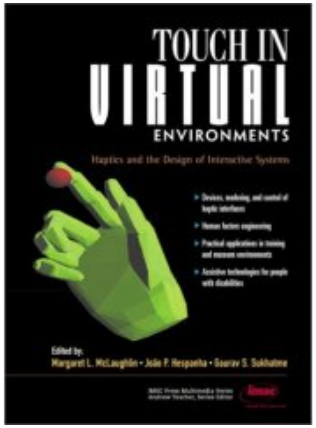
Text Book

- Text Book & Reference Book
  - Understanding Virtual Reality: Interface, Application, and Design (by W. Sherman and A. Criag), Morgan Kaufmann
  - Networked Virtual Environments: Design and Implementation (by S. Singhal and M. Zyda)
  - 3D User Interfaces: Theory and Practice (by D. Bowman, E. Kruijff, JJ. LaViola, I. Poupyrev)
  - Touch in Virtual Environments: Haptics and the Design of Interactive Systems (by Margaret L. McLaughlin, Joao P. Hespanha, Gaurav S. Sukhatme)









Topics

- VR Overview & History
- Input devices and tracking system
- Vision and Visuals
- Displays and Rendering
- Interface
- Applications
- VR Software
- Networked Virtual Environment
- Augmented Reality/Mixed Reality
- 3D User Interface Techniques
- Haptics
- 3D Display
- Presence

Schedule

1. Course Overview
2. Introduction to Virtual Reality
3. VR System Input & Tracking
4. Vision & Visuals
5. VR Displays & Rendering
6. VR Interaction
7. VR Applications
8. Term Project Midterm Presentation

Schedule

9. VR Application Development
10. Networked Virtual Environments
11. Augmented Reality/Mixed Reality
12. 3D User Interface
13. Haptics & Presence
14. New Trends
15. Term Project Final Presentation

Evaluation

- Attendance: 20%
  - A maximum of 2 absences are permitted. After that, 2% deduction is applied to the total score.
  - Missing more than 1/3 of a course will result in F.
- Final exam: 20%
  - Take-home exam covering the material presented in class
- Paper reading, presentation, discussion: 30 %
  - 10% for paper presentation
  - 10% for paper reading & summary report
  - 10% for discussion
- Term Project: 30%
  - 5% for term project proposal
  - 10% for progress report
  - 5% for project implementation
  - 10% for final demonstration & presentation

Paper Presentation

- Paper presentation: 10 %
  - The paper presentations will be done individually
  - 20 minutes for presentation & 10 minutes for questions at the end
  - Depending on the classroom size, students will present 2~5 papers
  - You can find a paper of your interest from the reading list or online resources
- Paper reading: 10 %
  - Every student is expected to read the paper before coming to class – *Submit the 1-page long paper summary report at the beginning of class*
- Discussion & participation: 10%
  - Every student bring at least one question so that we can have a good discussion on the material

Paper Presentation

- Preference will be given to more recent papers from:
  - Presence: Teleoperators and Virtual Environments
  - IEEE Computer Graphics and Applications
  - IEEE Virtual Reality conference
  - IEEE International Symposium on Mixed and Augmented Reality
  - ACM SIGGRAPH conference
  - ACM Symposium on Virtual Reality Software and Technology
  - International Journal of Virtual Reality
  - Computers & Graphics
  - Virtual Reality
  - …

Paper Presentation

- Topics of interest for readings:
  - 3D Display: holographic, autostereoscopic, parallax polarixer barrier
  - 3D Interface: multimodal input recognition, 3D touch interface, etc
  - VR applications: rehabilitation, education, tutor, etc
  - Augmented reality: AR outdoor applications, magic book, etc
  - VR hardware: next-generation VR systems, etc
  - Haptic: Air-jet force feedback, haptics for nanorobotics, etc
  - Input: bare-hand 3D gesture, 3D input device design issues, etc
  - Interaction: locomotion, multimodal menu,
  - Networked VR: DIS, HLA, tele-surgery, telesensation, etc
  - Presence & Evaluation
  - Vision: stereo-vision intelligent robot, VR object composition using stereo-vision
  - Education: ecosystem dynamics education

Tentative Paper Presentation Schedule

- 09/23 & Term Project Proposal Presentation –
- 09/30 –
- 10/07 –
- 10/14 & Term Project Midterm Presentation –
- 10/21 – Midterm Presentation
- 10/28 –
- 11/04 –
- 11/11 & Term Project Progress Presentation –
- 11/18 –
- 11/25 –
- 12/09 – Term Project Final Presentation

Term Project

- Topics: **AR/VR for Environmental Science Education**
- Students are encouraged to work on a project related to your own area of interest.
- Projects can be done as groups of 2~3 students.
- Project proposal (1-page report) (4^{th} week)
- Project midterm presentation (4-page report) (7^{th} week)
- Project progress report presentation (4-page report) (11^{th} week)
- Final term project report & presentation (10-page report) (15^{th} week)

Term Project

- Project proposal (4th week - 5%)
  - Project groups will form (2~3 students in each group) (2nd week)
  - Once a group is form, notify me by email
  - 1-page long report of single-spaced, 10-point font & 5-minute presentation
- Project midterm & progress report (7th week – 5%) & (11th week – 5%)
  - 5-10 minutes presentation
  - 4-page long progress report for the project & 10-minute presentation
- Project implementation (5%)
  - Groups will develop the interactive VR application, necessary on your chosen topic.
- Project final report (15th week – 10%)
  - 20~30 minutes in-class presentation & demo
  - 10-page long final report for the project will be in the style of a technical conference paper

Announcement

- Paper presentation schedule on 9/16
- Paper presentation start on 9/23
- Term project proposal(1-page) on 9/23
- Class blog: http://dis.dankook.ac.kr/lectures/vr20/