

ARCH 599
REALTIME COMPUTATIONAL REPRESENTATION:
GAME ENGINES AND VIRTUAL REALITY
2 Units
SPRING 2019 USC

Instructor: Jose Sanchez
Assistant Professor of Architecture
jomasan@gmail.com
+1-213-880-3831
www.plethora-project.com

Keywords:

Real-time, game engines, virtual reality, interactive, programming, augmented reality, science fiction, speculative design



Louis Rosenberg Virtual Fixtures

Introduction

Computational systems have reached the speed of operations that allows simulating human perception in real-time. It is no longer necessary to wait for hours to obtain an accurate depiction of the interplay of light with materials or calculate the angle of a shadow. By exploring gaming technology, this class will invite students to re-consider architectural representation through the scope of a real-time medium, where the exploration of space can be performed at a simulated 1:1 scale.

Real-time technologies, as advanced by game engines, are not only a medium for architectural visualization, but also a medium for simulation, where data can be superimposed over architectural geometry, enabling an augmented perception of a digital project. By learning how to visualize and how to simulate data over pre-existing geometry, the class intends to give new tools of inquiry for mapping and framing architectural information.

This course will be structured as a technical introduction to real-time visualization and virtual reality, exploring the opportunities and challenges presented by the medium. The course will be taught using the game engine Unity and will make use of the USC VR sets to test students projects in virtual reality.

The objectives of the course is to challenge traditional conceptions of space and representation, generating conceptual simulations that develop insight into architecture's potential.



ICT USC

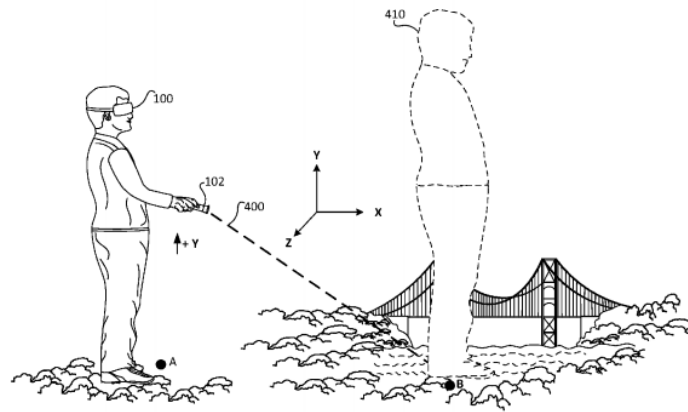
Brief

Each student will develop a standalone application using source material from studio projects. By visualizing content that has already been designed by the student, this course will support studio production with an emphasis on 21st-century technologies generating a new vantage point into the projects.

Students will be encouraged to use the representation technology to think speculatively around their projects, generating visualizations that might not always be accurate, but that can generate persuasive rhetorics of space.

To do this, each student will work with one science fiction novel, developing abstractions of spatial representations. Passages of the novels will be used to challenge the conventions of space perception, and will become the input for the speculative virtual reality simulations.

Students final report should include speculation of how architectural representation could be innovated using contemporary technology, developing a speculative patent for a new system.



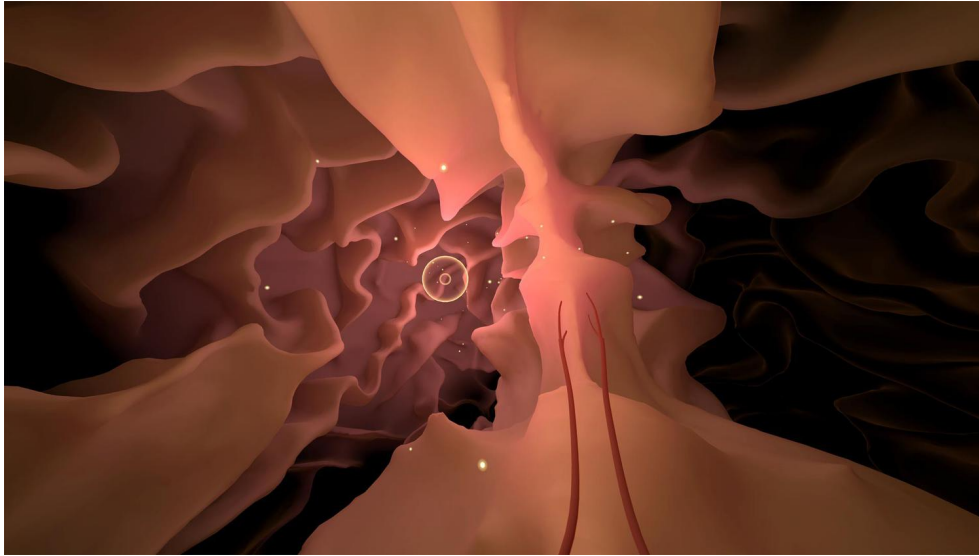
Google and IBM patent for teleportation.

Skills to be learned

The project will be developed individually throughout the semester, delivering milestones that will include:

- Walkthrough simulation over a virtual project
- Light studies (Day night cycles)
- Atmospheric effects and vision distortion
- Texturing and material properties
- Interactive elements
- Crowd simulations (occupation)
- Data overlay and User interface
- VR simulation
- Menu and presentation.

The skills to be learned will not only be technical; the student will need to demonstrate a personal take to forms of representation utilizing the medium. The references below demonstrate the work of artists and designers that have been able to generate a unique interpretation and representation of space using real-time technologies.



Sync – Rebecca Allen



In the eyes of the animals – Marshmallow Laser Feast

References / examples:

Rebecca Allen: <http://www.rebeccaallen.com/home>

Ivan Sutherland: <https://www.youtube.com/watch?v=DJwQ7GGRbUE>

Marshmallow Laser Feast: <http://marshmallowlaserfeast.com/>

Jon Rafman: http://jonrafman.com/?fbclid=IwAR3_W1-MAm-1psucwCsYBqW3z7mjgvozh6eT2oxhLW7g1vARBSfuHL44-g

Sketchpad, <https://www.youtube.com/watch?v=495nCzxM9PI>

Road to VR resources:

https://www.roadtovr.com/?fbclid=IwAR2tlR9YZDibk6HlpcT1Gg_eRjn3aP2JlJ2tgnM4BRpmSueq6SQg6QC9-as

Wisconsin's virtual reality CAVE : <https://www.youtube.com/watch?v=mBs-OGDoPDY>

Leviathan Project, World Building Lab: <http://worldbuilding.institute/events/leviathan>

Ian Cheng: <http://iancheng.com/>

Jose Sanchez, Block'hood VR https://store.steampowered.com/app/787720/Blockhood_VR/

Fologram: <https://fologram.com/>



Scanning – Rebecca Allen

Deliverable

Standalone Realtime application for PC or VR.
Speculative proposal of a VR / AR / MR application

Course Organization

The course will be organized in weekly tutorials that will teach the technical implementation of real-time technologies. The students will have assignments and homework every week showing the

progress in their individual projects. The course will operate more like a workshop session where the instructor will work together with the students, using the class time to develop the projects.

Goal / Objectives

The goal of this class is that students can deploy real-time interactive simulations of architecture projects, allowing for walkthroughs and a narrative that communicates a building. The course will also place special emphasis on the speculation and conceptualization of real-time applications that can have a strong impact in the practice of architecture.

Week 1

Introduction – Game engines

Week 2

Inhabiting virtual space – First person view

Week 3

Real time light and day-night cycles

Week 4

Atmospheric effects

Week 5

Materials

Week 6

Materials

Week 7

Introduction to VR

Week 8

VR development

Week 9

Midterm review – work in progress

Week 10

Simulations – Programming

Week 11

Interactive objects

Week 12

User interface (UI)

Week 13

Crowd simulations

Week 14

Project development

Week 15

Project development

Week 16

Project development

Week 17 – 12/12

FINAL REVIEWS

Readings

- Dawn of the New Everything: Encounters with Reality and Virtual Reality, Jaron Lanier
- Software Takes Command, Lev Manovich
- The Philosophy of Software: Code and Mediation in the Digital Age, David Berry
- Feminist in a Software Lab: Difference + Design, Tara McPherson
- Alien Phenomenology, or What It's Like to Be a Thing, Ian Bogost
- Racing the Beam, Ian Bogost
- The Stack: On Software and Sovereignty, Benjamin Bratton

Novels (Select 1 minimum)

- Rainbows End, Vernor Vinge
- Ubik, Phillip K. Dick
- The City and the City, China Mieville
- Crystal World, J.G.Ballard
- Drowned World, J.G.Ballard
- Neuromancer, William Gibson
- Snow Crash, Neil Stephenson
- Reamde, Neal Stephenson

-Ready Player One, Olive Cline

-Enders Game, Orson Scott Card

GRADING PROCEDURES

Criteria for the evaluation of student work:

I. General

1. Willingness to generate ideas
2. Willingness to develop ideas
3. Willingness to respond to criticism
4. Degree of participation (attendance, group discussion, etc.)
5. Seriousness of purpose as demonstrated by hard work

II. Methodology

1. Ability to generate relevant architectural ideas
2. Ability to develop ideas in a coherent fashion
3. Ability to express relevant ideas in a graphic format
4. Ability to articulate and present ideas verbally

III. Project evaluation

1. Quality of intentions

2. Quality of ideas
3. Quality of formal resolutions
4. Demonstrated technical awareness
5. Completeness of project
6. Quality of presentation

The following grade weights will apply to the semester:

Attendance / Participation	20%
Midterm development	30%
Final Project	40%
Final Digital Drop Box	10%

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

<https://engemannshc.usc.edu/counseling/>

National Suicide Prevention Lifeline - 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.

Provides overall safety to USC community. <http://dps.usc.edu>