Mixed Realities: Histories, Theories & Practices

25 Word Description

A comprehensive orientation to Mixed Reality, delving into its theories and histories while grounding students in a hands-on introduction to current tools and techniques.

Course Description

"Mixed reality is the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time." (Wikipedia)

The last several years have seen an explosion of interest in immersive media, with corresponding leaps in the various technological components – both hardware and software – that are required to make these experiences possible. There is of course a long history and prehistory to our current moment; virtual reality (VR) has been the ‘next big thing’ for several decades now, careening between numerous episodes of breathless excitement and disenchanted dismissal. However, this time around, VR and its related/overlapping reality domains (augmented, mixed) seem to have finally reached critical mass, and despite the inevitable backlashes, health warnings, burst hype bubbles, etc, that are sure to materialize, there is every reason to expect that development and innovation will continue at breakneck pace for the foreseeable future.

Despite of all this excitement, there remain disagreements and controversies over fundamental aspects of the field: histories, definitions, descriptions, predictions and implications are all contested. For instance, there is disagreement over the primacy of “virtual”, “augmented” and “mixed” reality (VR, AR, MxR), as well as acceptance of terms such as “cinematic VR”.

This course will be a comprehensive orientation to this burgeoning field, delving into the various theories, prehistories and histories of immersive tech, while grounding students in a hands-on introduction to current tools and techniques. For the course, we are using the term “mixed reality” as the most inclusive category, while recognizing that any of the alternatives are at least mildly controversial (for instance, Microsoft has appropriated the term for their “Windows Mixed Reality” platform, creating no small amount of confusion).

The course explores the current state of Mixed Reality(MxR), its strengths, weaknesses, and possible trajectory in society. The class will be a combination of lecture, discussion, and hands-on experimentation, and will also compare and contrast with Virtual Reality (VR) and Augmented Reality (AR), to look at a range of possible Mixed Realities. Topics to be covered:

- History of AR, VR, and MxR
- Conceptual frameworks for MxR implementation
- Narrative vs. experience
- Explore/expand the “language” of AR and MxR
• Applications and implications, e.g. issues of privacy, presence, and reality.

Instructors

Scott Fisher is Professor in Media Arts + Practice, Founding Chair of the Interactive Media Division, and Director of the Mobile and Environmental Media Lab at USC’s School of Cinematic Arts. He is an artist and technologist who has worked extensively on virtual reality and augmented reality, including pioneering work at NASA, Atari Research Labs, MIT’s Architecture Machine Group (now the MIT Media Lab) and Keio University.

Perry Hoberman is Associate Research Professor in the Media Arts + Practice Division. He is also a media, installation and performance artist whose work has been presented widely throughout the United States and Europe. Hoberman works with a variety of technologies, ranging from the utterly obsolete to the seasonably state-of-the-art. Hoberman’s mixed reality installation “Suspensions” will open at Postmasters Gallery in New York in February.

Prerequisites

One or more of the following:
• programming/coding experience in any current language (Processing, Java, Javascript, Python, C, C++, C#, Ruby, Python, etc).
• basic facility in Unity, a cross-platform game and graphics engine
• basic facility in a 3D design program (Maya, 3DS Max, Cinema 4D, Blender, etc)

Intended Audience

This course is primarily designed for MA+P undergraduates, doctoral candidates (and hopefully eventually masters students). However, it should also appeal to students throughout SCA and across USC. The course should be an opportunity for interested and motivated students to get up to speed quickly, becoming knowledgeable and experienced MR/VR/AR creative producers over the course of a semester.

Texts

• Beginning Windows Mixed Reality Programming - For HoloLens and Mixed Reality Headsets
  o By Sean Ong
• Augmented Reality: Principles and Practice (Usability) 1st Edition
  o By Dieter Schmalstieg (Author), Tobias Hollerer (Author)
• **Immersed in Media: Telepresence in Everyday Life** by Paul Skalski & Cheryl Campanella Bracken, editors
• **The VR Book: Human-Centered Design for Virtual Reality** by Jason Jerald

**Recommended Readings/Viewings**

- Rainbows End by Vernor Vinge
- Neuromancer by William Gibson
- Ready Player One: A Novel by Ernest Cline
- Sly Mongoose by Tobias S. Buckell
- Memories with Maya by Clyde Dsouza
- Hallucinations by Oliver Sacks
- Simulacron 3 by Daniel Galouye
- The Invention of Morel by Adolpho Bioy Casares
- Ice by Anna Kavan
- Creative Control
- World on a Wire (Fassbinder)
- [Dennō Coil](#)
- Black Mirror
  - “The Entire History of You”
  - “White Christmas”
  - “Playtest”
  - “Men Against Fire”
- Philip K. Dick's Electric Dreams
  - “Real Life”

**Topics to be Covered**

- Prehistories
  - [pre-cinematic:] theatre, phantasmagoria, perspective, trompe l’oeil, photography, stereoscope, panorama, zoetrope, etc
  - cinema: silent, sound, widescreen, color, 3D
  - simulators
  - tele-technologies (telegraph, telephone, radio, TV)
- Histories
  - 1950s: Morton Heilig
  - 1960s: Ivan Sutherland
  - 1970s: Aspen Movie Map, Myron Krueger
  - 1980s: NASA, VPL
- 1990s: CAVE, BOOM, VRML
- 2000s: Wide 5, Google Street View
- 2010s: MxR, Oculus, Google Cardboard, Vive, Hololens, etc

  o Philosophical backgrounds & definitions
    - David Chalmers, Donald Hoffman, Janet Murray, Janet Levin, Mel Slater, etc
  o Components
    - 360 imaging, head/body/hand tracking, optics, stereoscopy
    - vision, hearing, touch (haptics), smell, taste, proprioception
  o Terminology, etymology, technical definitions
    - cyberspace, immersion, virtual reality (VR), mixed reality (MR or MxR), augmented reality (AR), telepresence, cinematic VR
  o Representations in literature & SF
    - comics & graphic novels
  o Representations in cinema and television
    - Open Your Eyes (Vanilla Sky), Lawnmower Man, Strange Days, Brainstorm, World on a Wire, The Matrix, Star Trek (Holodeck), Total Recall, Until the End of the World, eXistenZ, Avatar, Inception, Black Mirror
  o Virtual Reality + Art
    - Jeffrey Shaw, Char Davies, Maurice Benayoun, Michael Naimark, Kevin Mack, Chris Milk
  o Alternate technologies
    - CAVE, volumetric imaging, “screen-based” AR, etc
  o Styles and genres
    - realism, photorealism, modernism, abstraction, stylization
    - games, apps, simulations, narratives, installations
  o Related fields
    - ubiquitous/pervasive computing, projection mapping, holography, stereoscopic cinema, internet of things, physical computing/maker movement

**Weekly Schedule**

**Week 1 – Class and Project overview and introductions**
- Self intros
- Setup G+ accounts
- Setup Slack accounts
- Setup Wiki accounts
Week 2 – Intro to Mixed Reality Concepts
Readings:
- “Location-Based Mixed and Augmented Reality Storytelling”, Ronald Azuma

Assignment:
- Browse NextReality website: http://next.reality.news/
- Start G+ posting & commenting (at least 2 new items)

Week 3 – Seminar: History of AR, VR, and MxR - A look at where we’ve been
Workshop: Tiltbrush, Blocks, and AnimVR

Readings:
- “Introduction to Augmented Reality”, Chapt. 1 in Augmented Reality: Principles and Practice, Schmalstieg & Hollerer
- “A Taxonomy of Mixed Reality Displays” - Milgram
- “Recent Advances in Augmented Reality”. Azuma, et al

Assignment:
- G+ posting & commenting (at least 2 new items)

Week 4 - Seminar: Current MxR applications - small group presentations on current Mxr applications
Workshop: WebVR: A-Frame and Amazon Sumerian

Assignment:
- G+ posting & commenting (at least 2 new items)
- Create at least one mixed reality experience using Tiltbrush, Blocks, and/or AnimVR to show in class. The 3d object, scene, or world you make should run in a MxR display.

Week 5 – Seminar: Design Fiction #1 - Brainstorming future mixed reality environments and experiences.
Workshop: Apple ARKit and Vuforia

Assignment:
- G+ posting & commenting (at least 2 new items)
- Create at least one mixed reality experience using Web VR (A-Frame or Sumerian) to show in class. The 3d object, scene, or world you make should run in a MxR display.
Readings:
- “Displays”, Chapt. 2 in *Augmented Reality: Principles and Practice*, Schmalstieg & Hollerer

**Week 6 – Seminar: Design Fiction #2** - Brainstorming future mixed reality environments and experiences.

**Workshop: Scanning tools/Hololens Pipeline**

**Assignment:**
- G+ posting & commenting (at least 2 new items)
- Create at least one mixed reality experience using ARkit and Vuforia to show in class. The 3d object, scene, or world you make should run in a MxR display.

**Week 7 – Visiting Speaker/Fieldtrip**

**Week 8 – Initial project design**
- Develop Candidate Concepts for initial projects
- Pitch and class critique

**Week 9 – Rapid prototyping**
- Paper prototyping and iteration
- Present and class critique

**Week 10 – No Class (Spring Break)**

**Week 11 – Project presentation and critique**
- Demonstration of rapid prototype
- Class critique

**Week 12 – Final project design**
- Brainstorm final project ideas
- Pitch and class critique

**Week 13 – Rapid prototyping**
- Paper prototyping and iteration
- Presentation and class critique

**Week 14 – Project presentations and critique**
- Demonstration of rapid prototype
- Class critique
Week 15 – Final project iterations
- Experiences live and tuning

Week 16 – Final project presentations for Industry Partner and guests
- Final demo(s)

Grading Breakdown
15% - Class participation (showing up, participating in discussions, contribution to the class web sites, posting to G+ community, etc.)
30% - Three small projects using tools introduced in the class tools workshops (10% each).
55% - Final group project

The final assignment will be a small group project that clearly demonstrates a novel application or implication for MxR. The deliverables will include a design document and some form of functional/playable prototype.

Policies
Absence Policy
Students are expected to attend every class. Unexcused absences will affect your participation grade.

The only excused absences are for illness, family emergencies, and (with advance notice) commitments related to a scholarship you are receiving, e.g. for a varsity sport. You must contact instructor or SA as soon as possible regarding any absence. The only acceptable reasons for taking an incomplete in the course are personal illness or a family emergency. Students who wish to take incompletes must present documentation of the problem to the instructor before final grades are due. Incompletes are not available before the Week 12 withdrawal deadline.

Fair Use and Citation Guidelines
We assert that all of our course work is covered under the Doctrine of Fair Use. In order to make this claim, however, all projects will need to include academically appropriate citations in the form of a Works Cited section, which covers all sources, in order to receive a passing grade. The Works Cited is either included in the project or as a separate document, as appropriate to your project. The style we use is MLA and you may refer to these guidelines:
https://owl.english.purdue.edu/owl/resource/747/05/

Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations
both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday.

Emergency Plan
In the event that classes cannot convene at the university, all MA+P courses will continue via distance education.

Syllabus Updates
This syllabus is liable to change up to the beginning of class and possibly over the semester. Please check the posted syllabus regularly, and note all changes that are shared by the instructors in class.