Mixed Reality Experience Design

LMC-4813F, LMC-6340-JB,

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Overview

This course gives students an opportunity to learn about Mixed and Augmented and Virtual Reality (MR, AR, VR) as platforms for interaction design. MR/AR refers to computer systems that combine virtual content with the physical environment, allowing users to interact with these combined physical/virtual worlds in appropriate locations. (MR and AR are increasing converging with VR, and we will be exploring VR to some extent as well.) Students will use developing WebXR technologies, including Aframe (developed by Mozilla) and the Argon AR Web Browser (developed here at Georgia Tech) to experiment with MR and AR. (For more information about Aframe see https://aframe.io/examples/; for more information about Argon, see https://argonjs.io). The goal of the course is explore the potentials of MR/AR/VR particularly for browser platforms.

In addition to various programming exercises, students will work in small groups on a major semester long project. The project will be drawn from a list provided at the beginning of the semester, or groups can choose their own project. All projects will be subject to approval. Each project will illustrate the design potential of one or a few related affordances.

Course Objectives

By the end of the course, students will be able to:

- Apply appropriate design principles and techniques for creating mobile AR/MR experiences;
- Employ techniques and technologies for programming and content creation for AR/MR experience in an AR browser;
- Work in a team to realize a significant digital media prototype.

Canvas

In addition to this syllabus, resources (lecture slides and readings), assignments will be available on Canvas

Assignments

The major activity of the class is centered around the group project (below), but there will also be individual assignments. The goal of these assignments is to ensure everyone in the class gains experience and understanding of AR and MR

design and implementation. In addition, in the second half of the semester, each student will deliver an oral report and lead discussion on one article (some of which are listed below).

Readings

- Auslander, Philip. Liveness: Performance in a Mediatized Culture, 2008.
- Bolter, Catharsis and Flow
- Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. Journal of Computer-Mediated Communication, 3(2).
- MacIntyre, B., Bolter, J., and Gandy, M. (2004) "Presence and the Aura of Meaningful Places" *7th Annual International Workshop on Presence (PRESENCE 2004)*, Polytechnic University of Valencia, Valencia, Spain, 13-15 October 2004.
- Barba, E., MacIntyre, B. and Mynatt, E. D., “Here we are! where are we? Locating mixed reality in the age of the smartphone”, Proceedings of the IEEE, 100, pp. 929-936, (2012)
- Grau, Oliver. Virtual Art: From Illusion to Immersion, 2003. (Chapter 1)
- Wright, P. and McCarthy, J. *Technology as Experience*, 2007. (Chapter 1)
- Tuan, Yi-Fu. *Space and Place: The Perspective of Experience*, 1977. (Selections)
- Buchanan, Richard. "Good Design in the Digital Age." GAIN: AIGA Journal of Design for the Network Economy. Vol 1, No 1. October, 2000.

Project Collaboration Page

Each project team is expected to maintain a collaboration for their project. This should have a summary of the project design concept, links to all the turn-ins and presentations, including the final video of the project. The content should be neatly and concisely laid out on this page, with explanations of what each linked element is.

Grading

Your grade for the class will be determined based on the following:

10% Short program/design/blog assignments and class participation

15% individual reading presentation (second half of semester)

25% Group Progress Report (presentation and delivery of prototype)

10% Final group presentation

35% Final Submission (prototype and design document)

Readings

Readings will be found in the Files folder in Canvas.

Attendance

Students are expected to attend class and participate in the discussions and presentations.

Disability Statement

Students with Disabilities should report to the Access Disabled Assistance Program for Tech Students (ADAPTS) at: Smithgall Student Services Building, Suite 210; 404-894-2563 (V); 404-894-1664 (TDD) (adaptsinfo@gatech.edu) If you are already registered with ADAPTS and expect to use any of your special accommodations in this class, please let me know as soon as possible so I can work with you and ADAPTS to ensure a good experience for us all.

HONOR CODE

Plagiarizing is defined by Webster's as "to steal and pass off (the ideas or words of another) as one's own : use (another's production) without crediting the source."
If caught plagiarizing, you will be dealt with according to the GT Academic Honor Code.For any questions involving these or any other Academic Honor Code issues, please consult me, or www.honor.gatech.edu.

SUGGESTED PROJECTS
(The goal of all the projects is to illustrate features of AR/VR/MR in an interactive format so that the a user comes to understand the power and limitations of the technology. Each project should focus on one or a few features.)

The projects can make sure of sharable code elements. We have some of these elements now or your group can make them and share them with the class, including

A. An alpha-channel video shader
B. A narrator component

1. Visualization of diagrams
This project is about experimenting with various forms of visualization of diagrams. Paul Milgram's AR and VR spectrum diagram. Other diagrams from the Billinghurst chapter in the AR monograph).

2. Camera and the Scene graph
Depiction of 3D virtual camera and how it functions. 3rd and 1st person perspectives. Visualization of how scene graphs work. A sample scene (3D graphics and textures) and then how the scene appears to the camera. How objects are added and subtracted from the scene graph and how this appears. Illustration of lighting and shading if possible.

3. Image tracking (putting virtual objects in the world)
Examples of how image tracking works, again from a third person and first person perspective. The example show how the frame of reference "radiates" out from the image (and depends on it).

4. Geolocation (situating virtual objects in the world)
Illustration of how GPS works and/or how frames of reference are coordinated based on the user's location.

5. The Panorama
Animated illustrations of how panoramic projections work (mapping from a sphere onto a plane). The viewer will then seen how the panorama can surround her in an AR/VR application. She can access google Street View of her location. Interactive illustrations of early panoramic photograph and paintings.

Schedule (changed in Canvas - see Canvas for final version)

Week 1
Jan 9. Course Introduction: Introduction to aframe system
Jan 11. Aframe tutorials. (Assignment #1 handed out)

Week 2
Jan 16: Introduction to Augmented Reality: Billinghurst: Introduction and Taxonomy
Jan 18: Argon-aframe tutorials; Intro to three.js and github; argon-aframe

Week 3
Jan 23: Intro to Design Aesthetics (the IDEO video)
Jan 25: More about Aframe, Argon; Assignment #1 discussion

Week 4
Jan 30: Team Building
Feb 1: Class work day: Team brainstorming; (Assignment #2 handed out)

Week 5
Feb 6: Aframe: Making Components
Feb 8: Teams present ideas and critique

Week 6
Feb 13: Argon assignment #2 discussion
Feb 15: History of Panoramas

Week 7
Feb 20: Critique and feedback
Feb 22: Flow and Catharsis (two design aesthetics)

Week 8
Feb 27: Individual Reading Presentations and Discussion
March 1: Class work day

Week 9
March 6: Individual Reading Presentations and Discussion
March 8: Class work day

Week 10
March 13: Individual Reading Presentations and Discussion
March 15: Progress report**:** Students present working prototypes

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Week 12
March 27: Individual Reading Presentations and Discussion
March 29: Class work day

Week 13
April 3 : Individual Reading Presentations and Discussion
April 5: Class work day

Week 14
April 10: Individual Reading Presentations and Discussion
April 12: Class work day

Week 15:
April 17: Individual Reading Presentations and Discussion
April 19: Final Presentations

Week 16:
April 24: Final Presentations