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 Reality (MR and AR) as a platform 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. Students will use the Argon AR Web Browser (developed here at Georgia Tech) to experiment with MR and AR. (For more information about Argon, see argonjs.io). The goal of the course is explore the potentials of MR and AR in particular through the use of this innovative browser.

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.

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.

T-Square

In addition to this syllabus, resources (lecture slides and readings), assignments will be available on t-square.

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 Wiki Page

Each project team is expected to maintain a t-square wiki page for their project. This page should be linked of the wiki group page where you list the group members. The wiki should have a summary of the project design concept, links to all the turn-ins and presentations, including the final video and poster of the project. The content should be neatly and concisely laid out on this page, with explanations of what each linked element is. All elements must be clearly documented and accessible from your project page.

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

Unless otherwise indicated, readings will be found in the Resources folder in t-square.

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

1. Illustration of the difference between Film, VR and AR
Vision of a darkened theatre. User is watching the screen from a seat. There is a video playing on the screen (describes the different between AR and VR). User is invited to look all around the theatre. Then the panorama is removed and the devices video camera illustrates AR.

2. 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). MRx diagram.

3. 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.

4. 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).

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

6. 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

Week 1
Jan 10. Course Introduction: Introduction to Argon4 system; Overview of Tutorials;
Jan 12. Introduction to Augmented Reality: Billinghurst: Introduction and Taxonomy

Week 2
Jan 17: Argon-aframe tutorials; (Assignment #1 handed out)
Jan 19: Argon-aframe tutorials; Intro to three.js and github

Week 3
Jan 24: Intro to Design Aesthetics (the IDEO video)
Jan 26: Twine example*;* Team Building

Week 4
Jan 31: More about Argon; Assignment #1 discussion
Feb 2: Class work day: Team brainstorming; (Assignment #2 handed out)

Week 5 -
Feb 7: Aframe: Making Components
Feb 9: Teams present ideas and critique

Week 6
Feb 14: Argon assignment #2 discussion
Feb 16: History of Panoramas

Week 7
Feb 21: Critique and feedback
Feb 23: Flow and Catharsis (two design aesthetics)

Week 8
Feb 28: Individual Reading Presentations and Discussion
March 2: Class work day

Week 9
March 7: Individual Reading Presentations and Discussion
March 9: Class work day

Week 10
March 14: Individual Reading Presentations and Discussion
March 16: Progress report**:** Students present working prototypes

11 SPRING BREAK

Week 12
March 27: Individual Reading Presentations and Discussion
March 30: Class work day

Week 13
April 4 : Individual Reading Presentations and Discussion
April 6: Class work day

Week 14
April 11: Individual Reading Presentations and Discussion
April 13: Class work day

Week 15:
April 18: Individual Reading Presentations and Discussion
April 20: Final Presentations

Week 16:
April 25: Final Presentations