TECH 3706 & ARCH 6760 - AR/VR in Architectural Environments

TECH 421 - Future of Digital Media

Section Name: TECH 3707.F1 and TECH 421.F1
08/21/2017 - 12/08/2017
Tuesday & Thursday 9:30AM - 12:00pm
Classroom: M209
Instructor: Ivaylo Getov - ivaylo.getov@woodbury.edu

This class will explore various platforms for the design and creation of AR and VR applications. Emphasizing hands-on experimentation, this experiential studio is meant to be a collaboration between both programmers and designers to research and develop new paradigms for user experience and new pipelines for the creation of 3D content. Using the Unity game engine and various hardware equipment, such as the Microsoft Hololens, HTC Vive, and mobile devices, students will work individually and in teams to practically apply novel design principles, culminating in a semester project demonstrating a critical approach to designing for these emerging forms of media.

Class Format

This class is brand new for the department. I want to create an environment where you can experiment with new techniques and practices, which are themselves in constant flux as the technology changes and finds its audience.

The class will be structured as a hands-on lab - lectures will serve to introduce or explore concepts that are then put to the test.

The first session each week (Tuesday) will tend to be more theoretical, while the second (Thursday) will dive deeper into execution, coding, and implementation.

We will be on our feet. We will move fast and break things so that we learn how to fix them. We will venture outside and get our hands dirty. You may be asked

to split into groups - others may be relying on you to complete a portion of a larger project and it will be your responsibility to deliver.

The schedule below is tentative and will *very likely* change over the first couple weeks. Please check the git repository each week to find the most up to date schedule and topics.

Reading and Course Notes

This course will not have an assigned textbook. Rather, students are required to read or watch additional material as assigned each session. We will be leaning heavily on participation and discussion in this course, and these readings will help get a better intuition and deeper understanding into relevant topics.

All presentation materials, notes, and referenced texts will be made available via this git repository as soon as possible after each session.

Requirements and Grading

Your final grade will be made up from:

- Participation, attendance, in-class projects/exercises: 60%
- Midterm project: 15%
- Final project: 25%

Schedule (*Tentative*)

Session 01 - 08/22/17

- Introductions, course overview, housekeeping
- Intro to AR/VR design principles
  - A brief history
  - Defining some terms
  - designing the real world
- Choosing our tools for efficient prototyping
  - What is *abstraction*?
  - Why use gaming engines?
- Intro to Unity

Session 02 - 08/24/17

- Intro to Microsoft Hololens
- What is "Creative Coding"?
  - Coding as writing
  - Coding as prototyping
- Into to Unity Continued

Session 03 - 08/29/17

- AR/VR design principles continued
  - designing the real world (continued).
  - User interaction and expectations
  - Microsoft Hololens Input and Interaction

Session 04 - 08/31/17

- Basic Programming Concepts Review
  - class/variable/function
  - public vs private
  - Debugging/Testing
    - `Debug.Log()`
- Unity Animations
  - Keyframes vs Curves

Session 05 - 09/05/17

- AR/VR design continued
  - UX and UI
  - Diegetic vs Non-Diegetic
  - Pseudocode and planning
- Design Process
  - Double Diamond model
  - Minimum Viable Product

Session 06 - 09/07/17

- Unity Colliders and triggers
- Unity recap
  - Summarize concepts and workflow

    - In-class work

Session 07 - 09/12/17

- Introduce HoloLens "mini" project
- Catch-up/recap as needed

Session 08 - 09/14/17

- **Ivaylo out of town**
- Remote/Skype class or guest speaker
- Work on HoloLens "mini" project
- TBD

Session 09 - 09/19/17

- **Ivaylo out of town**
- Remote/Skype class or guest speaker
- Work on HoloLens "mini" project
- TBD

Session 10 - 09/21/17

- **Ivaylo out of town**
- Remote/Skype class or guest speaker
- Work on HoloLens "mini" project
- TBD

Session 11 - 09/26/17

- HoloLens "mini" project presentation and recap
- Introduce midterm

Session 12 - 09/28/17

- Building to Hololens
    - Using Unity files from "mini" project
    - Using the Microsoft MixedReality Toolkit for Unity
    - Previewing to a device over the network

Session 13 - 10/03/17

- Midterm Project Proposals & Discussion

Session 14 - 10/05/17

- Individual midterm meetings
- Midterm workshop
    - Topics TBD as needed

(Possible Weekend/Alt Session TBD)

No Class - 10/10/17

- University Enrichment Days

Session 15 - 10/12/17

- Midterm workshop
    - Helpful scripts in HoloToolkit
    - Individual Questions

Session 16 - 10/17/17

- Midterm workshop
    - Basic interactions in VR
    - Individual Questions
- Midterm Projects Check-In/Milestone
    - Main interaction/test of project should be roughed-in

Session 17 - 10/19/17

- AR/VR design principles continued
    - User interaction and expectations continued
    - HTC Vive hand controllers: more input = more design

Session 18 - 10/24/17

- Midterm Projects - Unity Scenes Due
    - All work on logic/art of your programs is done.
    - We will spend the day troubleshooting the build process

Session 19 - 10/26/17

- Midterm Projects Due
  - In-class showcase and discussion

Session 20 - 10/31/17

- **All Midterm Materials Due:**
  - *Documentation*
    - Planning/Diagrams/Pseudocode
    - Video of project working
  - *Unity Project File (Will already have been turned in last week)*
  - *Finished compiled/usable program*
- AR/VR design continued
  - From AR to VR
  - Designing *everything* the user sees
  - Health and Safety concerns
  - Thinking about different scales
  - What is *"room-scale"*?
- "Tech for Me vs Tech for You"
  - technology as design process for the artist/creator VS technology as final deliverable/medium for the user
  - Using AR/VR as tools for the "Generalist"

Session 21 - 11/02/17

- AR/VR design principles continued
  - Interaction and imagination
  - Graphics quality vs speed of prototyping
  - What can you leave up to the user?
- Vive recap
  - Summarize concepts and workflow
- Catch-up/recap as needed

Session 22 - 11/07/17

- Introduce final project
- Recap important concepts
- Recap available tools/resources

Session 23 - 11/09/17

- Individual final project meetings
- Additional recap as needed

Session 24 - 11/14/17

- Final Project workshop and notes
    - Topics TBD as needed

Session 25 - 11/16/17

- Final Project workshop and notes
    - Topics TBD as needed

Session 26 - 11/21/17

- Final Project workshop and notes
    - Topics TBD as needed

No Class - 11/23/17

- **Thanksgiving Day**

Session 27 - 11/28/17

- Final Project workshop and notes
    - Topics TBD as needed

Final - 11/30/17 (TBD)

- Final Project presentation and discussion
- Class Topic Recap
    - Revisit "The Future of Media"
- Final Project Public Demo Day (Alt date TBD)

Coding Resources

Some of you asked for suggestions on where to turn to learn coding.

- Hello Unity is a great place to start that would specifically help you in *this* class. He covers a good intro to Unity as well as coding in general.
- One of my favorite general learn-to-code resources is anything by Daniel Shiffman at NYU. He has a series of videos called Computer Programming for the Total Beginner, but once you've got the very very basics down (what are variables? what are functions?) I would highly recommend his Nature of Code videos.

Suggested Reading

Reference

- Form+Code in Design, Art, and Architecture - Casey Reas, Chandler McWilliams
- The Design of Everyday Things (Revised Edition) - Don Norman
- The Nature of Code: Simulating Natural Systems with Processing - Daniel Shiffman
- Generative Design: Visualize, Program, and Create with Processing - Hartmut Bohnacker, Benedikt Gross, Julia Laub
- Virtual Reality - By Steven M. LaValle
- Gödel, Escher, Bach: an Eternal Golden Braid - Douglas Hofstadter
- The Pragmatic Programmer - Andrew Hunt, David Thomas
- Code Complete, Second Edition - Steve McConnell

Video

- The Nature of Code: Simulating Natural Systems with Processing
- Harvard CS50 2012 or CS50 2017

Fiction

- Snow Crash - Neal Stephenson
- Neuromancer - William Gibson
- Ready Player One - Ernest Cline