

## Course Title: 370. Interactive Virtual Environments. (3-0)

**Term: Fall 2015**

**Meeting times and location: Online**

### **Course Description and Pre-requisites:**

Languages and techniques useful for the creation of real time virtual environments; definition of formal scene description structures; modeling and transformation techniques; simulation techniques; behaviors and message passing; user interaction and animation; multiuser environments; creating virtual interfaces; scripting techniques.

### **Prerequisite:**

Visualization majors; junior or senior classification.

### **Introduction:**

In this course, we will learn the best practices and new industry techniques for building digital environments for game or film using multiple cutting edge techniques. Such methods include studying a subject matter to analyze its taxonomy, dissecting the rules that define this particular subject matter, building modules which generate components based on such rules, and creating a system which uses such modules to generate many believable and interactive iterations of the subject matter.

### **Learning Outcomes or Course Objectives**

After completion of the course, student will achieve the following learning outcomes, and be able to demonstrate having reached each outcome by meeting the corresponding objectives:

- *Knowledge (Demonstrate the ability to...)*
  - Identify modeling principles and terminology useful in the simulation process.
  - Define a methodology for driving the creation of content for the simulation
- *Application (Demonstrate the ability to...)*
  - Employ interactive based technologies as a communication methodology for real time simulation.
  - Produce visually appealing assets using cutting edge techniques in procedural content creation
  - Employ a variety of media, including animation, audio and time based works in the creation of a simulation.
- *Synthesis (Demonstrate the ability to...)*
  - Construct accurate simulation models based on physically based processes and the subject's taxonomy.
  - Assemble interfaces with the user based on a variety of interactive techniques
  - Develop modules and scripts as a means of extending and exploring real time interactions.

### **Instructor Information**

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### **Textbook and Resources Materials**

Content Page, Videos

### **Grading Policies**

Student will be graded based on the following criteria:

- 90% - Projects, Assignments, and Discussion Boards
- 10% - Participation and Professionalism

## Grading Scale

- A / 100 - 90
- B / 89 - 80
- C / 79 – 70
- D / 69 – 60
- F / 60 and below

The measure of the grading for projects will be based on quality of planning and preparation, overall system design (modularity, reusability, taxonomy, etc.), quality and reusability of the output and experience, and rate of success of the runtime and offline systems

The measure of the grading for collaboration will be based on share ability of modules with the class, proper communication skills during critiques, and presentation of modules to your peers online

The measure of the grading for participation will be based on attendance, preparedness, professionalism, and contributions to the class forum

## Projects:

### The Virtual Environment Experience

This class will cover the creation of a virtual environment experience, from the inception in the conceptual stages, all the way to the experience itself. The semester will be divided into sections covering major parts of the production pipeline:

- *Session 1 – Planning and white-boxing of virtual environment (20%)*
  - *Week 1 - Introduction Discussion Boards - 5%*
  - *Week 1 - Discussion Board - 5%*
  - *Week 1 - Assignment - 20%*
  - *Week 2 - Discussion Board - 5%*
  - *Week 3 - Discussion Board - 5%*
  - *Week 3 - Assignment - 25%*
  - *Week 4 - Discussion Board - 5%*
  - *Week 4 - Session 1 project: White Box Virtual Environment - 30%*
- *Session 2 – Data Acquisition and Asset generation modules (20%)*
  - *Week 5 - Discussion Board - 5%*
  - *Week 5 - Assignment - 20%*
  - *Week 6 - Discussion Board - 5%*
  - *Week 7 - Discussion Board - 5%*
  - *Week 7 - Assignment - 25%*
  - *Week 8 - Discussion Board - 5%*
  - *Week 8 - Session 2 project: Asset Creation Pipeline/Procedural creation modules - 35%*
- *Session 3 – Asset generation modules to Runtime development (20%)*
  - *Week 9 - Discussion Board - 5%*
  - *Week 10 - Discussion Board - 5%*
  - *Week 10 - Assignment - 30%*
  - *Week 11 - Discussion Board - 5%*
  - *Week 12 - Discussion Board - 5%*
  - *Week 12 - Session 3 project - Virtual Environment Alpha Stage / Completion of runtime pipeline - 50%*
- *Session 4 – Runtime Completion (20%)*
  - *Week 13 - Discussion Board - 5%*

- *Week 13 - Assignment - 10%*
- *Week 14 - Discussion Board - 5%*
- *Week 14 - Assignment - 10%*
- *Week 15 - Discussion Board - 5%*
- *Week 15 - Session 4 project- Final Virtual Environment - 65%*

## **Definitions:**

*White-boxing:* A minimalistic and low cost representation of a concept, level, gameplay, etc. A white-box level should provide enough information to decide whether the level meets the goals of the interaction with the use of placeholder meshes and textures, small bits of functionality, color blocking (if applicable), etc.

*Clarity of concept:* How easy it is for a user to grasp how your main idea ties into the virtual experience

*Early interactivity in engine:* How well the first white-box experience in the engine represents the main idea. Technical issues are expected at this stage, but you should be able to have a connection with your concept at this stage

*Source Design/Data Acquisition Quality:* The level of detail and overall quality of the source material used to develop the environment assets. This material can vary from photography, scans from photogrammetry, concept files, technical blueprints, etc.

*Asset generation modules:* The modules used for generating the assets for your virtual environment. The quality of these will be graded based on how close the generated assets are to the final stage, and their quality in technical design (modularity, taxonomy, etc.). The expectation is that such modules allow for a high level of high quality procedural content creation for mass producing assets for your virtual environment experience

*Alpha Stage Runtime:* A runtime in alpha stage has a sense of what the experience will be, but will have areas which are still incomplete, juxtaposed to areas which are more complete. Ideally, at this stage, we have at least a single vertical slice of an instance of the full experience, and a horizontal slice of the whole experience

*Final Runtime:* A final runtime encompasses the full experience as intended in the original design (with adjustments where agreed on in between the teacher and the student) It is expected at this stage that the assets will be at a quality level signed off by the teacher, as well as the virtual environment will be fully accessible

*Interaction/Experience:* the overall quality of the experience for a user interacting with the virtual environment. At the final stage, a user should be able to participate in the experience with little to no direction, and the experience should give the user a sense of your concept main idea

*Artistic/Technical execution:* The quality of the process for achieving a particular stage of the process, from the standpoint of a visual artist or a technical artist where applicable. Examples of good execution are well designer reusable modules for asset creation, proper source data/acquired data for creating assets, a well representing white-box level, etc.

## **Assignment Grading Practice**

F: 60 and below:

- System freezes and/or crashes consistently and is unusable. Framerate dips below 30 at all times
- Environment and interactions have no correlation with subject matter
- New users have no way to use or learn the system
- Asset creation modules fail consistently and are not able to produce any successful output
- Outputs are not usable in any viable production
- Technical design is repetitive and does not leverage existing toolset or modules

- use of rules to build the assets is not present and system relies on parameters or hand modeling for everything
- System presentation to the class is poor. No forum presence

D: 69 – 60:

- System hitches or slows down consistently. Framerate dips below 30 often
- Environment and interactions have little to no correlation with subject matter
- Interaction is unclear to a new user. New user needs a lot of coaching to use the system
- Asset creation systems fail often and outputs miss on the agreed upon quality level
- Some outputs are usable in production with some cleanup, but most are unusable
- Technical design is repetitive and does not leverage existing toolsets or modules
- Use of rules to build the assets is present in very few areas but system relies mostly on parameters and manual creation. Many of the parameters are unclear to a user
- System presentation to the class or in the forums is poor

C: 79 – 70:

- System hitches or slows down once in a while but for the most part, framerate stays around 30
- Environment and interactions feel tied to the subject matter
- New users are able to use the system with some direction
- Asset creation system is able to produce some successful results below the agreed quality level
- Outputs can be used in an interactive experience production context, although some cleanup may be needed
- technical design shows some organization and modularity, but there is very little reusability of modules
- the majority of the asset is constructed with parameters which make sense, but use of rules in the system is very low
- System presentation to the class is acceptable. No forum presence

B: 89 – 80:

- Framerate stays around 30
- Environment and interactions feel tied to the subject matter
- Whole system is intuitive for a new user. New user can use with little direction
- System produces successful results constantly to the agreed quality level
- Outputs can be used in a single target but can produce multiple LODs and variations within the same context, multiple targets requiring minimum cleanup
- technical design is modular and organized and many of the components are reusable
- most of the asset is driven by rules with a few extra parameters to help some difficult areas
- presentation to class is engaging, and has good forum presence

A: 100 – 90:

- Framerate stays around 60
- Environment and interactions are clearly tied to the subject matter and represent the idea clearly
- Whole system is intuitive for a new user. Easy to pick up
- System produces successful results the majority of the time which meet or exceed the agreed upon quality
- Outputs can be used in multiple contexts and can produce different representations (renders, game meshes, etc.). Fully resolution independent
- Strong technical design of the system which includes well designed atomical modules which are reused thorough the asset. Student demonstrates strong understanding of how to leverage the toolset modules
- Very few to no parameters (only the true core parameters are exposed, and mostly driven by rules). System uses on screen widgets to help guide the user
- Detailed presentation of the design and execution, with a strong presence on the forums

### **Discussion/Collaboration Grading Practice**

F: 60 and below:

- Lack of participation on critiques with peers
- No contribution to discussion boards
- No replies to discussion boards from peers

D: 69 – 60:·

- Some participation on critiques with peers
- No contribution to discussion boards
- No replies to discussion boards from peers

C: 79 – 70:·

- Good participation on critiques with peers
- No contribution to discussion boards
- No replies to discussion boards from peers

B: 89 – 80:·

- Consistent participation on critiques with peers
- Contributes to discussion boards as required each week
- Replies to at least 1-2 peer's discussion board topic

A: 100 – 90:·

- Good participation on critiques with peers
- Contributes to discussion boards as required each week with a few additional postings to give updates. Active in the class online community
- Replies to at least 3 peer's discussion board topics

### **Attendance Policy**

The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located on-line at <http://student-rules.tamu.edu>.

### **Americans with Disabilities Act (ADA)**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit <http://disability.tamu.edu>

### **Academic Integrity**

For additional information please visit: <http://aggiehonor.tamu.edu>

*"An Aggie does not lie, cheat, or steal, or tolerate those who do."*

### **Statement of Responsibility**

"It is unlawful for any person to damage or deface any of the buildings, statues, monuments, trees, shrubs, grasses, or flowers on the grounds of any state institutions of higher education (Texas Education Code Section 51.204)"  
The words damage or deface refer specifically to any and all actions, whether direct or indirect, that either diminish the value or mar the appearance of the physical environment.

**Summary:**

<b>Week</b>	<b>Topic</b>	<b>Project due</b>
1	Introduction/Research of virtual environments	
2	Main ideas for Virtual environments/ beginnings of white boxing	
3	Concept refinement/White-boxing development	
<b>4</b>	<b>White boxing complete/ White box critique</b>	<b>Presentation of white box module to class</b>
5	Data Acquisition / Study of Proceduralism modules	
6	Final Data Acquisition / Begin setup of procedural creation modules/ continue study	
7	Setup of procedural creation modules/ study of Taxonomy	
<b>8</b>	<b>Alpha stage of procedural creation modules / Critique of asset creation pipeline</b>	<b>Presentation of Asset creation pipeline progress</b>
9	Prep of runtime pipeline/ Study of engine	
10	Creation modules -> runtime pipeline -> replacing white-box elements	
11	Beginning of interaction/ interaction in environment/ Full pipeline	
<b>12</b>	<b>Interactive virtual environment</b>	<b>Presentation of final asset creation pipeline/Alpha stage virtual environment</b>
13	Refinement of runtime/modules for asset creation	
14	Refinement of interaction	
<b>15</b>	<b>Final Critique</b>	<b>Presentation of full pipeline and runtime experience</b>