Building 3D Virtual Environments (5 credits)

Course Prerequisites and Description

prerequisites: permission of instructor
description: this course provides an introduction to the creation and implications of single and multiple participant three dimensional virtual environments.

Winter 2005 Information

instructor: Peter Gerstmann (pgerstma@accad.ohio-state.edu)
website: http://www.accad.osu.edu/~pgerstma/class/vnv/
lectures: TR, 5:00 – 7:00pm
help: TR, 4:00 – 5:00pm; by appt
number: ARTS COL 762 #02399-1, 5 credits
location: 1224 Kinnear, Rm. 205

Course Objectives and Student Learning Outcomes

Fully interactive virtual environments (VEs) can today be created and displayed on common desktop and home gaming computers, instead of the expensive research machines of years past. As it becomes feasible for artists and designers to create these rich virtual environments, they need to be aware of both practical and aesthetic issues unique to interactive virtual worlds. It is this course's aim to present the techniques, experiences, and implications of VE development.

Students will be exposed to state of the art virtual environment software and hardware. They will be given an overview of VE issues and implications. Students will learn to create and evaluate interactive virtual environments relevant to their discipline.

Course Methodology

The course will attempt to survey most of the important issues surrounding the creation and experience of virtual environments (VEs). The many reasons and methods for creating virtual spaces will be discussed, as well as their implications. Examples of existing VEs will be shown whenever possible, but students will learn primarily by creating their own.

The class format will take on a variety of styles, as the disparate subjects dictate. Examples will be presented in lectures and demonstrations. Papers and videos will be discussed. Students will present their environments in critique sessions.

Students must demonstrate satisfactory achievement of course objectives through fulfillment of course projects and by contributing to class discussions and critiques.

Course projects will require students to use a wide variety of software and equipment at ACCAD to produce virtual objects and environments. Collaboration between students in the course and other faculty, staff and students at ACCAD is encouraged.

Course evaluation will be based on the following:

tasks 1 — 6:	12%	each
final task:	20%	
participation:	8%	

Course Grading Scale:

A	=	100	-	94
A-	=	93	-	91
B+	=	90	-	89
B	=	88	-	83
B-	=	82	-	80
C+	=	79	-	78
C	=	77	-	73
C-	=	72	-	71
D+	=	70	-	69
D	=	68	-	64
E	=	63	-	0

Course Grading Policy:

All students are expected to be on time and in attendance for each and every class.

Adherence to deadlines is required. It is the individual student's responsibility to keep track of deadlines and to present the work to the class and instructor on the specified dates. The maximum grade for a late assignment will be lowered according to the number of classes it is late:

on time (beginning of class)	100	(A)
one class late	83	(B)
two classes late	68	(D)

Any assignment more than two classes (one week) late will be counted as a 0 (E).

Students choosing to use "at home" hardware and software must have their current working files on the course system and available for review at the beginning of each and every class. Problems with home systems or incompatibilities will not be an acceptable excuse for missed goals. Technical problems will happen frequently during the semester and students will have trouble accessing the computer lab during "prime time" hours. Students must make their own arrangements for overcoming these difficulties and submitting their work on time. Unless there is a complete system failure in a computer-related course, technical difficulties are never an acceptable excuse for not meeting a deadline. Students should plan their time and work so as to anticipate the technical hurdles that are a part of this profession.

Academic Dishonesty:

Any and all suspected cases of academic dishonesty will be dealt with according to university procedures. Students are referred to the student handbook for further information on academic dishonesty and the accompanying procedures and penalties (http://studentaffairs.osu.edu/resource_csc.asp).

Accommodations for Students with Disabilities:

It is the intent of the University and its instructors to provide access to support services and programs that enable students with disabilities to succeed in this course. Students with disabilities are responsible for making their needs known to the instructor and seeking available assistance in a timely manner. Students will be referred to the Office for Disability Services (ODS), located in Pomerene Hall, for further assistance (call 614-292-3307 or visit 150 Pomerene Hall).

Personal Safety:

The University Escort Service operates until 3am when classes are in session (i.e. not during quarter breaks and University holidays), and will assist OSU students who live off campus as well as on campus. The University Escort Service can be contacted at 614-292-3322, and scheduled pick-ups are taken in advance.

Course Topics

class overview (syllabus, coursework, final, website, examples)
intro to vrml (hierarchical scene graphs, nodes, syntax, reference, shape)

composition (grouping nodes, primitives, instancing)
surfaces (material properties, lighting)
sound (location, spatialization, file formats)
complex models (points, lines, polygons)
textures (default mapping, texture coordinates)
exporting vrml (software considerations, file cleanup)
protos (definition, instantiation)

interactivity (sensors, manipulators)
animation (triggers, timers, engines, keyframes)
environments (backgrounds, terrain, sky, optimizations)
characters (avatars, humanoid standards, virtual communities)
navigation (collision, depth cues, design theory)
game demos (real world applications)

intro to scripting (languages, 3d math & functions, event type conversion)
state & logic (maintaining state, state machines, conditional reactions)
the Browser object (access to runtime system)
procedural modeling (iterative & stochastic creation)
user input (mouse, keyboard, joypad)
basic behavior (attraction & repulsion, state machine 'AI', flocking)
basic physics (force, drag, projectile motion, collision detection & response)

survey of vr hardware (OSC interface lab tour, state of the art)

Course Tasks

01 vrml warmup (hello world)
02 still life sketch with sound (blocking and composition with primitives; sound and lighting basics)
03 hand-built model (polygonal shapes and texturing basics)
04 finished still life (sophisticated modeling, texturing and lighting; use of PROTO)
05 navigable environment (wayfinding, collision proxies, large scale modeling)
06 script-driven scene (scripted scene control)
0F final project (student defined)

Course Bibliography

Carey, Bell. *The Annotated Vrml 2.0 Reference Manual*.
Addison-Wesley Pub Co, 1997. ISBN: 0201419742.
(online: http://accad.osu.edu/~pgerstma/class/vnv/resources/info/AnnotatedVrmlRef/Book.html)

Course Resources

Ames, Nadeau, Moreland. *VRML 2.0 Sourcebook, 2nd Edition*.
John Wiley & Sons, 1996. ISBN: 0471165077.
cortona vrml browser (*http://www.parallelgraphics.com/products/cortona*)
vrmlpad vrml text editor (*http://www.parallelgraphics.com/products/vrmlpad*)
proto library (*http://www.accad.osu.edu/~pgerstma/protolib/protolib/index.html*)
vrml97 cheat sheet (*http://www.accad.osu.edu/~pgerstma/class/vnv/resources/info/vrml97.cheatSheet.pdf*)
vrml97 specification (*http://www.web3d.org/x3d/specifications/vrml/ISO_IEC_14772-All/index.html*)
web3d.org (*http://www.web3d.org/*)