SYLLABUS

Course title and number	Computer Animation VIZA 615 section 600
Term	Spring 2012
Meeting times and location	TR 2:20pm – 4:25pm, Langford Architecture Center, Building C, Room 414

Course Description and Prerequisites from the Graduate Course Catalog

Intermediate level computer animation – focusing on production of three-dimensional computer generated animation that may or may not integrate video and photographic elements. Prerequisite: VIZA 613 or approval of instructor.

Subject Matter Philosophy Specific to this Offering of the Course

Animation is the interpretation of action. This course focuses on the analysis of actions of animals, the biomechanical systems supporting action, and their re-interpretation and presentation as performance through computer animation.

Computer animation is often viewed through the lens of traditional animation. However, viewers often overlook the degree to which performance animation relies on fundamental principles of biological motion. Computer animation will be approached in this course by the study of movement, how movements lead to actions, how the structure of a body inhibits or promotes particular actions, and how the presentation of action affects its perception and comprehension.

Learning Outcomes or Course Objectives

By the end of this course it is expected that students will be able to use computer graphics techniques to reproduce believable animal locomotion through modeling, rigging, animation and deformations. Students will have a fundamental grounding in the artistic (interpretive) and technical (applied) issues surrounding technical animation. Specific learning objectives include:

- A general understanding of the history and current uses of computer graphics techniques for character/creature animation.
- The ability to identify, analyze, and utilize reference material for animation.
- Recognition of primary, secondary, and tertiary motion patterns in animal movement.
- Efficient use and proceduralized accurate placement of motion system elements for animation.
- Development and proceduralized instantiation of an animation control structure.
- Recognition of the variety of deformation problems inherent to soft surface animated objects and appropriate use of deformation systems to handle the problems.
- The ability to create key-frame cycle animation of a quadrupedal animal.
- The ability to combine information and techniques from a variety of sources to solve novel problems related to the use of computer graphics techniques for character/creature animation.

Instructor Information

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Required Textbook

Digital Character Development: Theory and Practice by Rob O'Neill. Published by Morgan Kaufmann.

Other Suggested Information Sources
- Learning Python: Powerful Object-Oriented Programming by Mark Lutz. Published by O'Reilly.
- The Art of Rigging by Kiaran Ritchie and Karim Biri. Published by CG Toolkit.
- How Animals Run by P.P. Gambaryan. Published by Halsted Press.
- Animals in Motion by Eadweard Muybridge. Published by Dover.
- Vertebrate Comparative Anatomy, Function and Evolution by K. Kardong. Published by McGraw-Hill.

Technical Requirements
Successful completion of the projects for this course will require access to graphical computing workstations and 3D animation software. The 3D animation software must, minimally, have the following components:
- Modeling of 3D geometry as polygons, NURBS, or sub-division surfaces.
- Forward and inverse kinematics.
- Key-framing, including the manipulation of interpolation method used between key-frames.
- Indirect node connections for translation, rotation, and scale.
- Deformation of surfaces driven via the transformation of connected nodes.
- Permit the use of scripting as a substitute for interactive commands. Scripted commands must be able to be saved to file, edited, and re-loaded from the interface.
- Rendering of cast shadows and motion blur.
- Rendered image output.

Grading Policy
This is a project oriented course. Assignments will primarily be completed using computers, however some traditional drawing is required. There are five projects, plus the final project. The specific definition and requirements for each project will be provided in written form in class.

Each project will be given a number grade between 0 (lowest) and 100 (highest). The number grade is based upon a combination of the aesthetic (1/3), technical (1/3), and presentation expertise (1/3) demonstrated.

Attendance, contribution to group discussions, and participation in critiques is a requirement of this course. An additional 15% of the final grade is composed of an Attendance/Participation grade on a 0 to 100 scale.

Each project's value in relationship to the composition of the final grade is:
>10% Project #1 (project grade * 0.10)
>10% Project #2 (project grade * 0.10)
>10% Project #3 (project grade * 0.10)
>10% Project #4 (project grade * 0.10)
>10% Project #5 (project grade * 0.10)
>10% Project #6 (project grade * 0.10
>25% Final Project (project grade * 0.25)
>15% Attendance/Participation (grade * 0.15)
>_____
>100 Total Points Possible

A final letter grade is determined as follows:
$$\textbf{A} = 90 - 100 \quad \textbf{B} = 80 - 89 \quad \textbf{C} = 70 - 79 \quad \textbf{D} = 60 - 69 \quad \textbf{F} = \text{below } 60$$

Late projects, including the final project, will incur a 10% penalty per class session that they are late. It is advisable to demonstrate incomplete work on the due date for partial credit rather than having the entire grade for the project penalized.

Course Topics, Calendar of Activities, Major Assignment Dates
(All information below is subject to change)

Date	Topic	Due Dates / Readings to be Discussed
Tues. 1/17	Introduction to course; Why is technical animation important and how it is used?; Terminology; History of digital characters; Action vs. performance; Assign projects #1 & #6; Assign reading #1.	
Thurs. 1/19	In class "dailies" of Project #1. Learning to see action; Perception of motion (Muybridge); Primary, secondary & tertiary action; Motion blur. In class	Review reading #10: *"Character Rigging, Deformations, and Simulations in Film and Game Production" by McLaughlin,*

	review of animal motion reference videos; Assign reading #2.	*et. al. SIGGRAPH 2011.*
Tues. 1/24	Field trip to Reel FX Creative Studios in Dallas.	
Thurs. 1/26	In class "dailies" of Project #1. Assign reading #3. Analysis of open-source biped rigs.	Review reading #2: *Chapters 1, 2 & 3 (pp 3-48) of Digital Character Development, DCD.*
Tues. 1/31	In class "dailies" of Project #1. Analysis of concept art; Rest poses; Orientation; Scale; Joints; Rotations.	Review reading #3: *Chapter 13 (pp 249-269) Procedural Animation, DCD.*
Thurs. 2/2	In class reviews of Project #1. Introduce project #2. Assign reading #4.	**Project #1 – Procedural Motion.**
Tues. 2/7	Structure and action of hips, legs, and feet; Structure and action of the neck, head, and eyes. Assign reading #5.	Review reading #4: *"Taxonomy of Digital Creatures: Interpreting Character Designs as Computer Graphics Techniques" SIGGRAPH 2005 course notes by Tim McLaughlin*
Thurs. 2/9	In class "dailies" of Project #2. Determining scope of work. Tauntaun analysis; Reviewing storyboards; Understanding animator needs and performance requirements; Assign reading #6.	Review reading #5: *"Taxonomy of Digital Creatures: Defining Character Development Techniques Based Upon Scope of Use" SIGGRAPH 2006 course notes by Tim McLaughlin*
Tues. 2/14	In class "dailies" of Project #2; Structure and action of shoulders, arms, and hands. Guest Lecture: Jay Davis, Animator	Review reading #6: *"The Morphology of Digital Creatures" SIGGRAPH 2007 course notes by Tim McLaughlin & Stuart Sumida*
Thurs. 2/16	In class review of project #2. Introduce project #3.	**Project #2 – Form & Performance Analysis**
Tues. 2/21	Python & Mel scripting tutorial #1 (TA delivered); Assign reading #7.	
Thurs. 2/23	Python & Mel scripting tutorial #2 (TA delivered); Assign reading #8.	Review reading #7: *Chapter 6.14 (pp 109-112), Kinematics, and Chapter 9.1-9.3 (pp 187-193), Rig Synthesis, DCD.*
Tues. 2/28	Types of terrestrial motion; Gait changes; Balance & center of gravity; Staging; Posing; Straight-ahead action; Cameras & camera animation; Node types; Direct & indirect connections; Conditional actions; Procedural animation.	Review reading #7: *"Animating Quadrupeds: Methods and Applications" by Skrba, et. al. Computer Graphics Forum (2008).*
Thurs. 3/1	Hierarchy; Workflow organization; Mid-term evaluation of course topics and student progress. Assign reading #8.	
Tues. 3/6	In class "dailies" of Project #3; Control systems; Switches; Kinematics. Cycles, Motion Tests, Driving points & force. Modeling for animation and deformations.	Review reading #8: *"Modal Locomotion: Animating Virtual Characters with Natural Vibrations" by Kry, et. al. Eurographics 2009.*
Thurs. 3/8	In class review of Project #3; Introduce Project #4.	**Project #3 – Scripted Rig Build**
Tues. 3/13	*Spring Break – No Class*	
Thurs. 3/15	*Spring Break – No Class*	
Tues. 3/20	In class "dailies" of Project #4; Layering; Function curves; Dope sheets; Reference material;	
Thurs. 3/22	In class review of project #4. Introduce project #5. Assign reading #9.	**Project #4 – Cycle Animation**
Tues. 3/27	In class "dailies" of Project #5. Contours and silhouettes; Skin deformations: stretch, compress, fold, wrinkle, and bulge; Introduce final project.	Review reading #9: *Chapter 7 (pp 127-158) Deformation Systems, DCD.*
Thurs. 3/29	In class "dailies" of Project #5. Out-of plane and in-plane deformations; Basic deformation systems. Assign reading #10.	

Tues. 4/3	In class "dailies" of Project #5; Shape animation; Spines, tails, tentacles & spline-IK. Pose space deformations;	Review reading #10: *"Pose Space Deformation: A Unified Approach to Shape Interpolation and Skeleton-Driven Deformation"* SIGGRAPH 2000 paper by Lewis, et. al.
Thurs. 4/5	In class "dailies" of Project #5 and Final Project. Deformers; Volume preservation; skin relaxation	
Tues. 4/9	In class review of Project #5. Assign reading #11.	**Project #5 - Deformations**
Thurs. 4/12	In class "dailies" of Final Project. Rigging for performance animation. Exaggeration; Abstraction; Assign reading #12.	Review reading #11: *"Principals of Traditional Animation Applied to 3D Computer Animation"* SIGGRAPH 1987 course notes by John Lasseter.
Tues. 4/17	In class "dailies" of Final Project. Facial animation.	Review reading #12: *"Evaluation of Real-World and Computer Generated Stylized Facial Expressions"* by Wallraven, et. al. ACM Transactions on Applied Perception 2007.
Thurs. 4/19	In class "dailies" of Final Project. Trends in performance animation. In class review of Project #6.	**Project #6 – Biped Rig**
Tues. 4/24	In class "dailies" of Final Project.	
Thurs. 4/26	In class review of Final Project	**Final Project**
Tues. 5/1	*Redefined Friday – No Class*	

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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.