Welcome to Applications in VR

First Things First

- This is 4003-590-09 / 4005-769-09
  - (Applications in Virtual Reality)
- I am Joe Geigel…your host!

Plan for this afternoon

- Logistics
- Answer the questions
  - What is this course about?
  - How will the course will run
  - What exactly is Virtual Theatre…and why should I care?
  - How do I fit in
- More logistics
- But first…
  - attendance

Logistics

- mycourses
  - Announcements
  - Dropboxes
  - Grades
  - GRADS ADDED To UGRAD SECTION
- E-mail
  - Be sure that your e-mail is being forwarded correct.

Logistics

- Course Web Site:
  - http://www.cs.rit.edu/~jmg/vr
- Contact:
  - office hours: MW 2-4 or by appt.
  - Office: 70 (GCCIS) Rm 3527
  - e-mail: jmg@cs.rit.edu
  - phone: 475-2051
- Slides:
  - Will be available (in B&W – PDF) on Web site.

Logistics

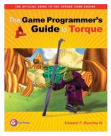
- Official Prerequisite – one of the following:
  - Computer Graphics 1(CS 570/761)
  - Foundations of 3D Graphics Programming (IT 502)
  - 3D Graphics Programming (IT 735)
- However…
  - Need expertise in
    - Graphics Progamming
    - Basic programming
    - Audio
    - Networking
    - Logistics
    - …

More Logistics

- Computing Environment
  - ICL6
    - Windows Machines
    - TORQUE gaming engine
  - Graphics Lab (70-3405)
    - MoCap development
    - Need access
  - CASCI ICE Lab (Building 74)
    - Access Grid

Textbooks

3D Game Programming All in One, 2nd Edition
By Kenneth Finney



The Game Programmer's Guide to Torque
By Edward F. Maurina III

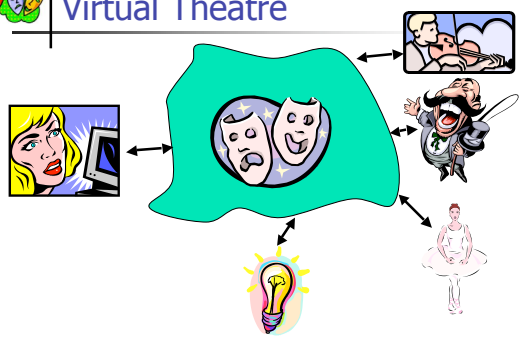
Other references

- TORQUE developer pages
  - http://www.garagegames.com/developer/torque/tge

Goals of the course

- Introduce students to virtual reality hardware, software, and toolkits
- Apply to a given domain
- Apply to a large scale problem.
- Teamwork, teamwork, teamwork!

Virtual Theatre



VR and Theatre

- Virtual Theatre
  - A distributed computer system whereby performers, stage crew, and audience can be in physically separate places yet share in the same live theatrical performance.

Logistics

- This is a project based course
- Teams will be assembled
  - Each team will build a VT software component
  - Components will be connected via a common networking infrastructure.
  - Team Web site!
  - Grad students as team leaders!
- Collective goal:
  - To build on an existing framework for a virtual theatre system
  - Test the framework out on short virtual performance.
  - Opening night: Finals week!

Logistics

- Collaboration
  - Within teams
  - Between teams
  - With artists in School of Design
- Questions so far?

How will the course be run?

- **Schedule will be aggressive**
- Weeks 1
  - Intro material
  - Team formation
- Week 2
  - Define team goals
- Weeks 3 – 8
  - Group work
  - Lectures: status meetings / updates / working sessions
  - 3 checkpoints
- Week 9 - 10
  - Rehearsal / Tech run
- Finals Week
  - Showtime!

How will the course be run

- Checkpoints
  - Periodic Status checks
    - Weeks 3,5,7
    - At least 1 intermediate deliverable
    - Demo
- Brick City Demo
  - Saturday, Oct 6th (11:15am)
- Checkpoint deliverables vary by team
  - Will be discussed at start of CP cycle.

How will the course be run

- Status meetings
  - Announcements / new developments
  - News from the artistic side
- Updates
- Mini-deliverables
  - TBD
- Guaranteed team working time.

Important dates

- Checkpoint 1 -- Sept 19
- Checkpoint 2 -- Oct 3
- Midterm (Brick City) -- Oct 6th
- Checkpoint 3 -- Oct 22
- Weeks 9 /10 -- Rehearsal
- Showtime!
  - Finals week

Assessment – Team Grade

- Team grade
  - Meeting checkpoint
  - Deliverable + demos
  - Working with final demo
- Individual Grades
  - Peer review
    - Evaluation of teams from those not in teams
  - Teammate Evaluation
    - Evaluation of students from teammates
  - Leader Evaluation
    - Evaluation of grad leaders from teammates

Grad Students

- In addition, Grad Students will be assessed:
  - Leadership Role -- Leader evals
  - Documentation -- Team documentation is responsibility of leader.
  - Other deliverables -- as agreed upon with instructor.

Assessment

	Graduate	Undergrad
Checkpoints (Team)	25%	35%
Final Demo (Team)	35%	40%
Peer Evals (Individual)	20%	25%
Leadership / Docs (GRAD)	20%	

Plan for today

- Answer the questions
  - What is this course about?
  - How will the course will run
  - What exactly is Virtual Theatre…why should I care?
  - How do I fit in
- Any questions?

This year's domain

Virtual Theatre

- Art and Technology Collaboration

R·I·T School of Design

✓ Visuals

✓ Lighting / Staging

R·I·T Department of Computer Science

✓ Technology

Virtual Theatre

Integration of distributed virtual reality / gaming technologies into the theatrical storytelling process.

- Our experiments in theatrical storytelling
  - Live…action takes place in a distributed virtual space
  - Performers / crew control from a physical space
  - Active Audience Participation

Spring 2004 - present

Motivation

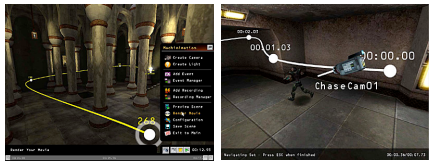
- Machinima

a new form of filmmaking that uses computer games technology to shoot films in the virtual reality of a game engine.

Anna (2003) -- Fountainhead Entertainment

Motivation

- Machinimation (Fountainhead Entertainment)



http://www.fountainheadent.com

Cinema vs. Theatre

Cinema	Theatre
Recorded	Live
Editted	Real time
Passive Audience	Active Audience
POV of filmmaker	POV of audience

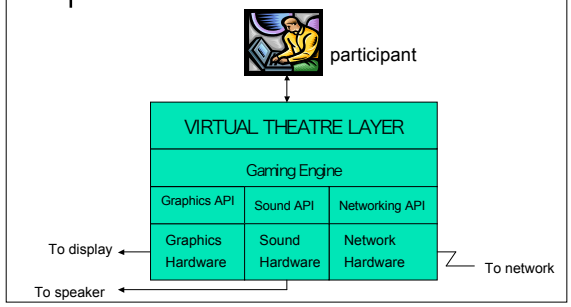
Why Start From Scratch?

- Gaming Engines
  - Provide object oriented graphical abstraction
  - Performs real time rendering
  - Provides networking infrastructure
- Requirements for theatrical use
  - Adapt to use theatrical metaphor / language
  - Physical control of virtual characters and staging
  - Theatrical components designed by artisans.

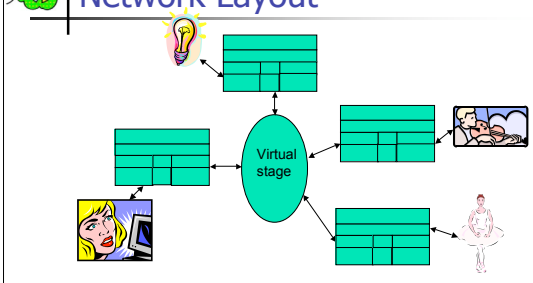
Gaming Engines

- API
  - Set of programming libraries used to create 3D games
  - Implies use of low level language (C, C++, Java)
- Scripting Systems
  - Extending of existing games (Mods)
  - Game specific language
  - Constrained by capabilities of game / script
  - Examples
    - Quake II
    - Unreal Tournament
    - Second Life

System Architecture



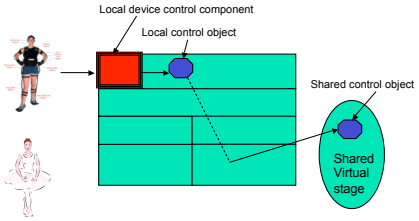
Network Layout



The Virtual Theatre Layer

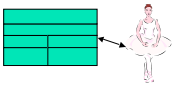
- Components of a theatrical production
  - Action
  - Staging
  - Audience
  - Sound / Music
- Objects to be defined on virtual stage
  - Actors
  - Stage Manager
  - Audience Member
  - Orchestra

Local device control



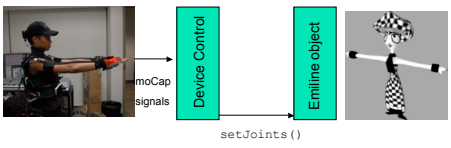
Actor Objects

- Controls characters on stage
- Actors have associated avatar(s) on virtual stage.
- Specific control of avatar behavior defined by subclasses of Actor



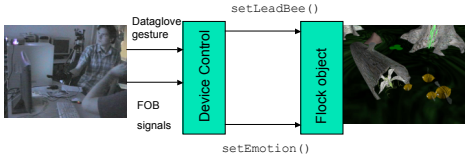
Actor Objects

- Example 1
  - Emiline (*Getting By* -- Spring 2005)



Actor Objects

- Example 2
  - Flock of bees (*What's the Buzz?* Spring 2004)

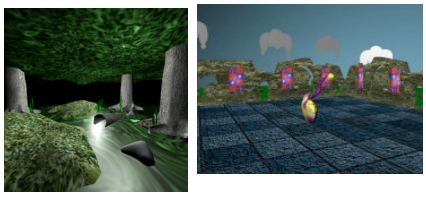


Staging

- Set and Lighting Design
  - Created by artistic team
  - Imported into Virtual Stage
  - Controllable Components
    - Triggering of Cues
    - Continuous Events

Staging

- What's the Buzz?



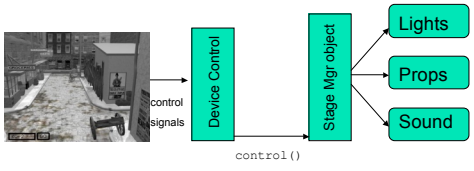
Staging

- Getting By

Stage Manager Object

- Controls dynamic staging, lighting, and sound effects
- Triggering of predefined cues.
- Stage manager object manages cues and allows for manual (or automatic) triggering of these cues.
- Object in virtual space

Stage Manager



Audience

- Each audience member is also an object in the virtual space
  - May (or may not) have a physical avatar
  - Human audience member connected via audience device control
  - Interactivity
- Control of what the audience sees

Playing Games with the audience

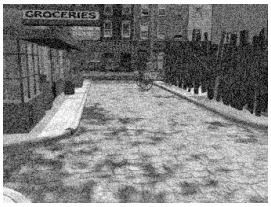
- Interactivity (*What's the Buzz?)*

Playing Games with the audience

- Perspective (*What's the Buzz?)*

Playing Games with the audience

- Special Effects



Playing Games with the audience

- Critters (Spring 2006)
  - Rose colored glasses
  - Audience decides to see visions or not.

Questions?

- Let's take a break…
- After break: video + critters!

Existing system

- Video

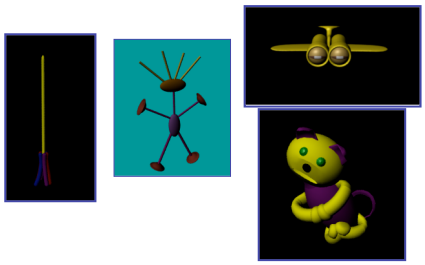
This year's production

- CRITTERS
  - Story
  - Audience Participation

Critters

- Preliminary list of critters
  - Critter in refrigerator
  - Critter cat on chair
  - Synchronized swimming critters in soup pot
  - 'hand' critter in flower pot
  - Bird critters with head lights outside LR window
  - Dancing broom critter

Critters (Spring 2006/7)



Critters

- Models from Design Team (CIAS)
  - Modeled using Maya
  - Models
    - Skeletons
    - Skins
  - Predefined animations

Teams for this year

- Each team will focus on one class of participants in the performance
  - Actors (using moCap)
  - Actors (using "puppets")
  - Stage Manager
  - Audience
  - Also:
    - Orchestra
    - Networking(?)

Actors / moCap

- Probably the largest team
- moCap systems
  - ShapeWrap II (measurand - full body)
  - 5DT Data Glove (hand)
  - Flock of birds (1 node - 6DOF)
- Display device
  - Stereo head mounted display OR
  - Emersive visualization environment (Innovations IT class)
- Ray Tordoff's moCap API.
  - C++ layer over ShapeWrap II and dataglove drivers

Actors / moCap

- Tasks:
  - Hardware
    - Become experts in suiting up an actor
  - Models
    - Successfully import actor skinned models into Torque
    - Advise art team on doing this.
  - Viewing environment
    - Get torque to effective output to HMD or emersive envrionment

Actors / puppets

- Puppets:
  - Skinned/rigged models
  - Set of predefined animations.
- Tasks:
  - Import of models
  - Import of animations
  - GUI to allow performer to trigger when model should perform a given animation.

Stage Manager

- Responsible for:
  - Stage elements / Set
  - Lights
  - Triggered sound effects
- Some view of stage (can be another audience member)
  - Access Grid to coordinate views
- Tasks:
  - Import set / stage
  - Cueing system
    - Allow for control of lights
    - Allow for control of sound
  - GUI for control panel.

Stage Manager

- Access Grid demo

Audience

- Audience
  - Predefined seat in theatre
    - Avitar in virtual space.
  - Allow control of
    - View, lookat, zoom
  - Feedback
    - Boo / Clap to trigger audio clips
  - Interactive control
    - Rose colored glasses
  - GUI for interaction (may just be keyboard/mouse controlled).

Orchestra

- Streamed audio / MIDI to all.
- Assume MIDI
- Live or prerecorded.
- Some view of the stage (can be another audience member).
- Tasks
  - MIDI instrument to Torque
  - Sound subsystem of torque
  - Interface with staging and audience

Team Networking

- Responsible for networking infrastructure
  - Torque is client / server
    - Must configure, manage, maintain
    - Create tools as needed

Teams

- Choosing teams
  - First Quiz!
    - Student questionairre on mycourses
    - Please fill out ASAP (by EOD Sept 5)
    - Will try my best to accommodate
  - Grad Leaders
    - 4-5 teams / 4 grad students
    - We'll see.
- Questions?

Torque

- One last matter of logistical business…
  - Torque licenses
    - Need password to enter Wiki and other documentation.
    - Will be sent via e-mail
  - We will be looking at Torque next class

For Next time…

- Fill out student questionaire / team request on mycourses.
- To prepare for next class:
  - Chapters 4,5,6 of Torque book on e-reserve. Get from mycourses and read for next time.