CSE 165: 3D User Interaction

Lecture #3: Overview

Announcements

- Sign up for video presentation
 - o by Sunday 1/21
- Form a team
- Get Rift access

Course Topics

- Introduction to 3D Interaction
- Application Domains
- Input Devices
- Selection and Manipulation
- Navigation (Travel, Wayfinding)
- System Control
- Symbolic Input
- o 3D user Interface Design
- Evaluation

What are 3D Uls?

- 3D interaction: human-computer interaction in which the user's tasks are carried out in a 3D spatial context
 - 3D input devices
 - 2D input devices with direct mappings to 3D
- 3D user interface (3D UI): A UI that involves 3D interaction
- 3D interaction technique: A method (hardware and software) allowing a user to accomplish a task in a 3D UI

Why 3D Uls?

- 3D applications should be useful
 - Immersion
 - Natural skills
 - Immediacy/directness of visualization in general
- But, many real world applications have low complexity of interaction
 - Don't need 3D UI

Goals of 3D Uls

- Performance
 - efficiency
 - accuracy
 - productivity
- Usability
 - ease of use
 - ease of learning
 - user comfort
- Usefulness
 - interaction helps meet system goals
 - interface transparent so users can focus on tasks

What makes 3D interaction difficult?

- Spatial input
- Lack of constraints
- Lack of standards
- Lack of tools
- Lack of precision
- Fatigue
- Spatial scene layout

Universal 3D Interaction Tasks

- Navigation
 - travel: motor component
 - wayfinding: cognitive component
- Selection/Picking
- Manipulation
 - specification of object position & orientation
 - specification of scale, shape, other attributes
- System Control
 - changing the system state or interaction mode (e.g., menus)
 - may be composed of other tasks
- Symbolic Input (text, numbers)

3D UI Design Philosophies

- Artistic approach: Base design decisions on
 - intuition about users, tasks, and environments
 - heuristics, metaphors, common Sense
 - aesthetics
 - adaptation/inversion of existing interfaces
- Scientific approach: Base design decisions on
 - o formal characterization of users, tasks, and environments
 - quantitative evaluation results
 - performance requirements
 - examples: taxonomies, formal experimentation

Applications

- Games
- Architecture / CAD
- Education
- Medicine
- Manufacturing
- Simulation / Training
- Design / Prototyping
- Information / Scientific Visualization
- Collaboration / Communication

Areas influencing 3D UIs

Theoretical and social background

- Human spatial perception, cognition, and action
- · HCI and UI Design
- · Popular Media

3D UIs

3D interaction techniques and interface components

- Interaction techniques for universal tasks
- Interaction techniques for complex or composite tasks
- 3D interaction techniques using 2D devices
- 3D UI widgets

3D UI evaluation

- · Evaluation of devices
- Evaluation of interaction techniques
- Evaluation of complete 3D Uls or applications
- Specialized evaluation approaches
- Studies of phenomena particular to 3D UIs

Areas impacted by 3D UIs

Application areas

- · Simulation and training
- Education
- Entertainment
- Art
- Visualization
- Architecture and construction
- Medicine and psychiatry
- Collaboration

Technological background

- · Interactive 3D graphics
- 3D visualization
- · 3D input devices
- 3D display devices
- Simulator systems
- · Telepresence systems
- · Virtual reality systems

3D UI design approaches

- Hybrid interaction techniques
- · Two-handed interaction
- · Multimodal interaction
- 3D interaction aids
- 3D UI design strategies

3D UI software tools

- Development tools for 3D applications
- Specialized development tools for 3D interfaces
- 3D modeling tools

Standards

- · For interactive 3D graphics
- For UI description

Reciprocal impacts

- · On graphics
- On HCI
- · On psychology

Interaction Workflow

