

36

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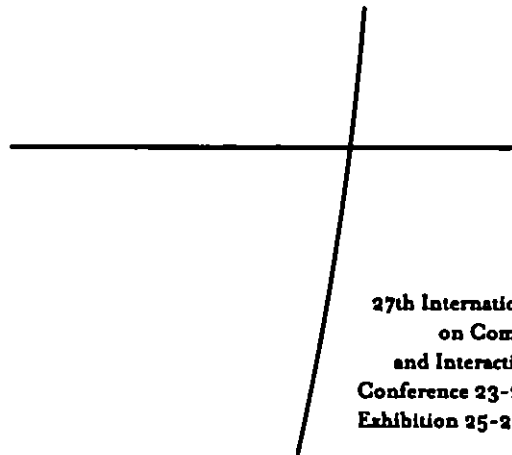
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COURSE NOTES

3D User Interface Design:
Fundamental Techniques,
Theory, and Practice



27th International Conference
on Computer Graphics
and Interactive Techniques
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NEW ORLEANS
2000
SIGGRAPH

SIGGRAPH 2000 COURSE 36: 3D USER INTERFACE DESIGN: FUNDAMENTAL TECHNIQUES, THEORY, AND PRACTICE

Morning:

- 8:30 Welcome and introduction – Bowman
- 9:00 Input and output hardware – LaViola
- 10:00 Break
- 10:15 3D navigation – Bowman and Kruijff
- 11:00 3D selection & manipulation – Poupyrev
- 11:40 3D system control – Kruijff

Afternoon:

- 1:30 Using 2D metaphors in a 3D world – LaViola
- 2:00 The art of interaction design – Poupyrev
- 2:30 The science of interaction design – Bowman
- 3:00 Break
- 3:15 Example applications with rich 3D interaction – all
- 4:00 Industry perspective – Mine
- 4:40 Question & Answer – all

Table of Contents

PART I: Lecture Slides and Notes

- 1. Introduction and Welcome – Doug Bowman**
- 2. Input and Output Device Hardware**
Notes: "Input and Output Devices", Joseph LaViola
- 3. Interaction Techniques**
 - A. Navigation**
Notes: "Travel Techniques", Doug Bowman

Notes: "Wayfinding", Ernst Kruijff
 - B. Selection and Manipulation**
Notes: "3D Manipulation Techniques", Ivan Poupyrev
 - C. System Control**
Notes: "System Control", Ernst Kruijff
 - D. 2D Interaction in a 3D World**
Notes: "2D Interaction in a 3D World", Joseph LaViola
- 4. The Process of Design and Evaluation**
 - A. The Art of Interaction Design**
Notes: "The Art of Designing 3D Interfaces", Ivan Poupyrev
 - B. The Science of Interaction Design**
Notes: "The Science of Interaction Design", Doug Bowman
- 5. Example Interfaces and Applications**
 - A. Spatial Information Displays**
Notes: "Interfaces for 3D Informational Displays: From VR to UbiCom", Ivan Poupyrev
 - B. Multimodal Interfaces for VEs**
Notes: "Multimodal Interfaces in Virtual Reality", Joseph LaViola
 - C. Visualization Tools**
Notes: "Exploring Complex Data Visualizations using the Cubic Mouse", Ernst Kruijff
 - D. VEs for Design Education**
Notes: "VEs for Design Education", Doug Bowman

6. Industry Perspective

Notes: "Building Virtual Disney Worlds", Mark Mine

7. Color Plates

PART II: Papers

Input and Output Devices

"HMDs, Caves, and Chameleon: A Human-Centric Analysis of Interaction in Virtual Space", Bill Buxton and George W. Fitzmaurice

"Flex and Pinch: A Case Study of Whole Hand Input Design for Virtual Environment Interaction", Joseph LaViola and Robert Zeleznik

"The Lego Interface Toolkit", Mathew Ayers and Robert Zeleznik

Navigation – Travel

"Travel in Immersive Virtual Environments: An Evaluation of Viewpoint Motion Control Techniques", Doug A. Bowman, David Koller, and Larry F. Hodges

"Maintaining Spatial Orientation during Travel in an Immersive Virtual Environment", Doug Bowman, Elizabeth Davis, Larry Hodges, and Albert Badre

Navigation – Wayfinding

"Spatial Knowledge Acquisition from Maps and Virtual Environments in Complex Architectural Spaces", Simon R. Goerger, Rudolph P. Darken, et al.

Selection and Manipulation

"Go-Go Interaction Technique: Non-Linear Mapping for Direct Manipulation in VR", Ivan Poupyrev, Mark Billinghurst, Susanne Weghorst, and Tadao Ichikawa

"Non-isomorphic 3D Rotational Interaction Techniques", Ivan Poupyrev, Susanne Weghorst, and Sidney Fels

"Aperture-based Selection for Immersive Virtual Environments", Andrew Forsberg, Ken Herndon, Robert Zeleznik

"An Evaluation of Techniques for Grabbing and Manipulating Remote Objects in Immersive Virtual Environments", Doug Bowman and Larry Hodges

"Image Plane Interaction Techniques in 3D Immersive Environments", Jeff Pierce, Andrew Forsberg, Matt Conway, Seung Hong, and Robert Zeleznik

"Moving Objects in Space: Exploiting Proprioception in Virtual-Environment Interaction", Mark Mine, Fred Brooks, and Carlo Sequin

System Control

"Toolsets for the Development of Highly Interactive and Information-Rich Virtual Environments", Doug A. Bowman and Larry F. Hodges

"Interaction Techniques for a Virtual Workspace", Luis Serra, Timothy Poston, et al.

2D Interaction in a 3D World

"ErgoDesk: A Framework for Two- and Three-Dimensional Interaction at the ActiveDesk", Andrew S. Forsberg, Joseph J. LaViola Jr., and Robert C. Zeleznik

"Virtual Notepad: Handwriting in Immersive VR", Ivan Poupyrev, Numada Tomokazu, and Susanne Weghorst

The Art of Interaction Design

"A Survey of Design Issues in Spatial Input", Ken Hinckley, Randy Pausch, John Goble, and Neil Kassell

"3DM: A Three Dimensional Modeler Using a Head-Mounted Display", Jeff Butterworth, Andrew Davidson, Stephen Hench, and T. Marc Olano

Spatial Information Displays

"Mixing Realities in Shared Space: An Augmented Reality Interface for Collaborative Computing", Mark Billighurst, Ivan Poupyrev, Hirokazu Kato, and Richard May

Multimodal Interfaces for VEs

"MSVT: A Virtual Reality-Based Multimodal Scientific Visualization Tool", Joseph LaViola

"Room Designer: A Virtual Reality-Based Furniture Layout Tool", Joseph LaViola

Information Rich VEs

"Designing Animal Habitats within an Immersive VE", Doug Bowman, Jean Wineman, Larry Hodges, and Don Allison

Industry Perspective

"Panda 3D", Cary Sandvig and Jesse Schell

Annotated Bibliography

"20th Century 3DUI Bib: Annotated Bibliography of 3d User Interfaces of the 20th Century", compiled by Ernst Kruijff and Ivan Poupreyev