

3D USER INTERFACES: FROM LAB TO LIVING ROOM

CHI 2008
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Welcome, introduction & roadmap
Ernst Kruijff

You're at the
3D User Interfaces:
From Lab to Living Room
course now!

Welcome, introduction, & roadmap
3DUIs in a nutshell
3DUI new directions introduction
New directions I
New directions II
Video Games: 3DUIs for the Masses
Beyond Visual: shape, haptics and actuation in 3DUI
From Hack to Pack
Conclusion

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ACM 09/0004

Welcome to the 3D User Interfaces: From Lab to Living Room course at CHI 2008. Hope you will learn and enjoy from the material we present!

Over the last decade, the field of 3D user interfaces has grown out of its infancy, forming the basis for many game and industry applications. In this course, you will gain a solid background on the theory and the methods to create your own 3D spatial interfaces. Focusing particularly on real-world applications, we identify the particular difficulties of designing and developing spatial interfaces, carefully embedding the latest evaluation results. In addition, the course will address novel research themes such as 3D interaction for large displays and games; and integrating 3DUIs with mobile devices, robotics, and the environment.

Who are we?

who | introduction | roadmap

Doug A. Bowman

- ▶ Associate Professor of Computer Science and member of the Center for Human-Computer Interaction at Virginia Tech

Ivan Poupyrev

- ▶ Researcher in the Interaction Lab at Sony Computer Science Laboratories

Joseph J. LaViola Jr

- ▶ Assistant professor at the University of Central Florida and adjunct assistant research professor at Brown University

Ernst Kruijff

- ▶ Senior researcher at the Institute for Computer Graphics and Vision at the Graz University of Technology
Senior consultant kr7 studios



The team in the old days

What did we do together

who | introduction | roadmap

A brief history...

Team together since the last century (1999)

Presented multiple courses on 3DUIs

- ▶ IEEE VR, ACM VRST, ACM SIGGRAPH
- ▶ This course is a significant update!

Authors of the first comprehensive text/reference book on 3D user interfaces

- ▶ „3D User Interfaces: Theory and Practice“
Addison-Wesley 2005, available in English,
Chinese and Japanese



The speakers for this course have worked together previously to present courses and tutorials at four different conferences, such as ACM SIGGRAPH, ACM VRST and IEEE VR. Together, they also wrote the book “3D User Interfaces: Theory and Practice”, published by Addison-Wesley in 2005. It is used world-wide as reference for 3DUIs and is actively used as course book. The material presented in this course considerably extends the material from the book and the previous courses, by handling new topics such as games, robotics, and extremely large, multi-user display systems.

What is this course about?

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... the latest in 3D User Interfaces

- ▶ Spatial interfaces
- ▶ Mix between fundamental issues and practical examples
- ▶ From home to industry
- ▶ Explore state of the art in established areas and investigate new „hot topics“

Goal

- ▶ How can we design, implement and evaluate hardware and software interfaces that allow for effective and enjoyable interaction with 3D computer-generated environments

For whom

- ▶ Intermediate level course
- ▶ For those with background or interest in HCI, design, games,

In this course, you will gain a solid background on the theory and the methods to create your own 3D spatial interfaces

3D user interfaces (3DUIs) are an exciting field of research that aims to answer an important question: how we can design, implement and evaluate hardware and software interfaces that allow for effective and enjoyable interaction with 3D computer-generated environments. With proliferation of spatial 3D user interfaces into real-world application usage such as in video game platforms (e.g., Sony EyeToy or Nintendo Wii) engineering, and medical applications, developing techniques for designing 3DUIs has become an important issue. In addition, rapidly-developing fields such as mixed and augmented reality, tangible computing, and haptic interfaces have also been expanding into new hardware platforms such as cell phones.

In this course, the presenters will discuss in detail the workings of fundamental 3D interaction techniques and complete, real-world 3D user interfaces. The course will cover not only “traditional” HCI research in 3DUI techniques but will also survey the use of 3DUIs in a wide range of applications. We will provide a basic overview of 3D interaction techniques, discuss the newest directions in 3DUIs, and describe the use of 3DUI technology in new areas such as robotics and large, real-world spaces like building facades. We will discuss the issues in designing 3DUIs for general users, interfaces for video games and art, and more specific issues that are related to industrial applications. The final part of the course will discuss the design of physical interfaces, including haptics, tangible and actuated interfaces. Throughout the course, the topics addressed will be illuminated by carefully selected examples of effective 3DUIs from research and industry. Furthermore, the main design principles will be summarized as basic design guidelines to ensure a high practical value of the presented material for the audience.

Why this course?

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Important area

- ▶ 3DUI area grown out of its infancy
- ▶ Interest of huge user groups (games)*
- ▶ Not only „lab business“ anymore!

Lots of R&D done since our last courses

- ▶ Innovation, evaluation, ...
- ▶ Courses by others

Still lot of potential to increase performance, usability and usefulness of many techniques



Courtesy of Nintendo

now: around 23.26 million!

*as of Oktober 2007, over 12 million Wii stations have been sold (<http://www.vgchartz.com>)

ernst kruijff | welcome, introduction & roadmap

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The field of 3D user interfaces has evolved from a niche research area to a full-blown issue: since the rise of the Sony EyeToy and the Nintendo Wii, there is a huge interest in spatial interfaces, which is especially good for getting your hands on affordable devices.

Hence, lots has happened since we taught the last courses, not only by work we have done ourselves, but luckily also by many others. Still, there are a considerable amount of open issues. As a result, within this course, we hope to identify both the advances that have been made, and the areas that still need to be explored further.

Learning objectives

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Learning objectives

- ▶ Understanding 3D interaction in desktop / console, large screen, augmented reality, and virtual reality setups
- ▶ Exploring 3DUI applications: research and real-world interactive scenarios, from living room to urban scenarios
- ▶ Learning the details of fundamental 3D interaction techniques, including the latest evaluation results
- ▶ Becoming familiar with I/O hardware for 3D user interfaces
- ▶ Learning about advanced 3D interaction techniques, metaphors, and design strategies
- ▶ Exploring 3DUI new directions and applications of spatial interfaces for the end-user: interfaces for/video games, robotics, ubiquitous computing
- ▶ Understanding the latest trends in tangible / haptic interfaces
- ▶ Obtaining practical tips for developing re-usable hardware interfaces
- ▶ Applying 3D interfaces to one's own area of research or practice



Related areas

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In the course, we will be touching upon at least the following areas:

- ▶ General HCI issues
- ▶ Virtual / mixed / augmented reality
- ▶ Human factors and ergonomics
- ▶ Usability / evaluation
- ▶ Ubiquitous computing
- ▶ Mobile user interfaces
- ▶ Design
- ▶ Haptic interfaces
- ▶ Robotics
- ▶ Hardware interfaces and systems design
- ▶ ...



Roadmap

who | topics | **roadmap**

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Four 90-minute blocks

Block 1 - 3DUI Introduction

- ▶ Welcome, introduction, & roadmap
- ▶ 3DUIs in a nutshell

9.00 - 10.30

Kruijff – 15 minutes
Bowman – 75 minutes

Block 2 - 3DUI New Directions

- ▶ 3DUI new directions introduction
- ▶ New directions I
- ▶ New directions II

11.30 - 13.00

Poupyrev – 15 minutes
Bowman – 35 minutes
Kruijff – 40 minutes

Block 3 - 3DUI and Video Games

- ▶ Video Games: 3DUIs for the Masses

14.30 - 16.00

LaViola / Poupyrev - 90 minutes

Block 4 - 3DUI: Body and Soul

- ▶ Beyond Visual: shape, haptics and actuation in 3DUI
- ▶ From Hack to Pack
- ▶ Conclusion

16.30 - 18.00

Poupyrev – 40 minutes
LaViola – 35 minutes
Kruijff – 15 minutes

Other important stuff

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Try things out!

- ▶ We have installed some demo hardware

Visit our website afterwards for additional material

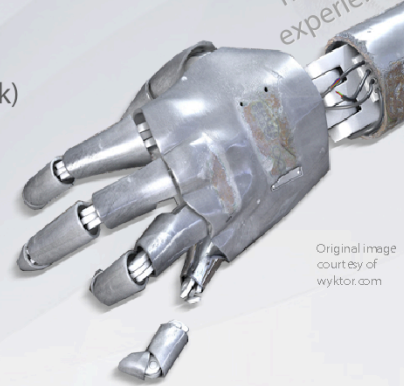
- ▶ www.3dUI.org
- ▶ Holds course notes of older / other courses
- ▶ 3DUI annotated bibliography

Don't be afraid to ask questions (also in the break)

Feel free to mail us

... and read our book!*

*shameless plug



Original image
courtesy of
wyktor.com

There is only a limited amount of time we can spend on getting a good overview of the field. Please take some time to take a look at our educational material during and after the course, and invest the recommended reading we provide throughout the slides. And if you have any questions, please feel free to get in touch with us.

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Coming up next...

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▶ 3DUIs in a nutshell

Introduction to 3D User Interfaces:
techniques, devices, and evaluation results

