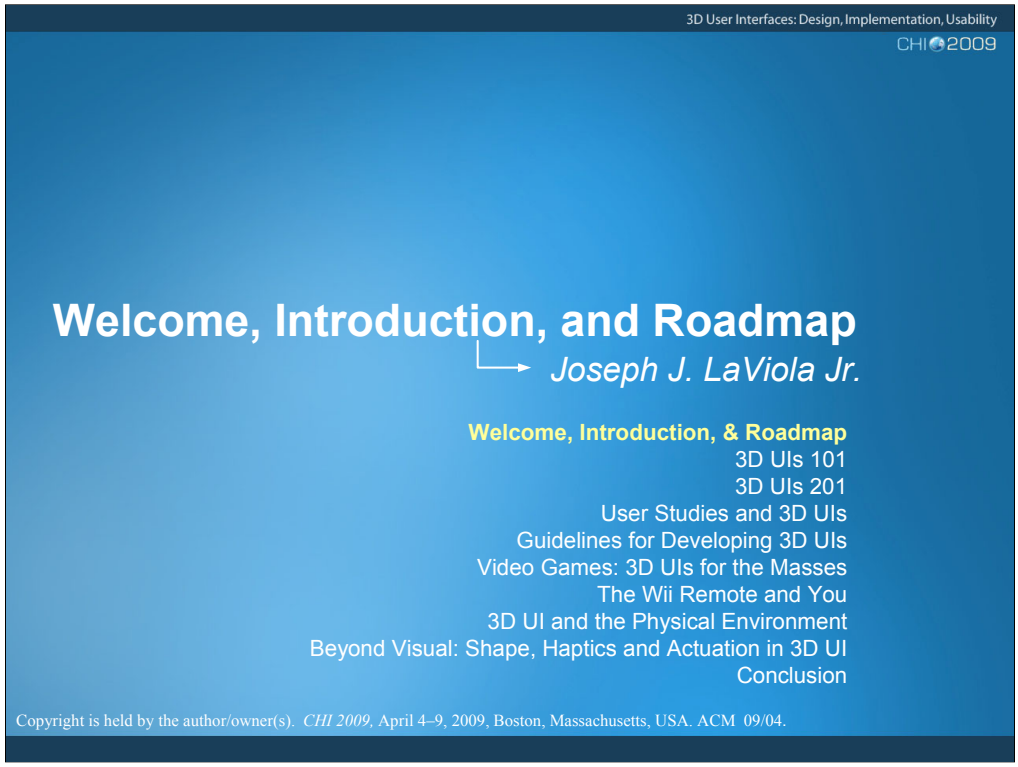


Welcome to the 3D User Interfaces: Design, Implementation, Usabilty course at CHI 2009. Hope you will learn from and enjoy the material we present!

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?

- Joseph J. LaViola Jr.
  - Assistant professor at the University of Central Florida and adjunct assistant research professor at Brown University
- 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
- Ernst Kruijff
  - Senior researcher at the Institute for Computer Graphics and Vision at the Graz University of Technology
- Wolfgang Stuerzlinger
  - Associate Professor at York University

The team in the old days

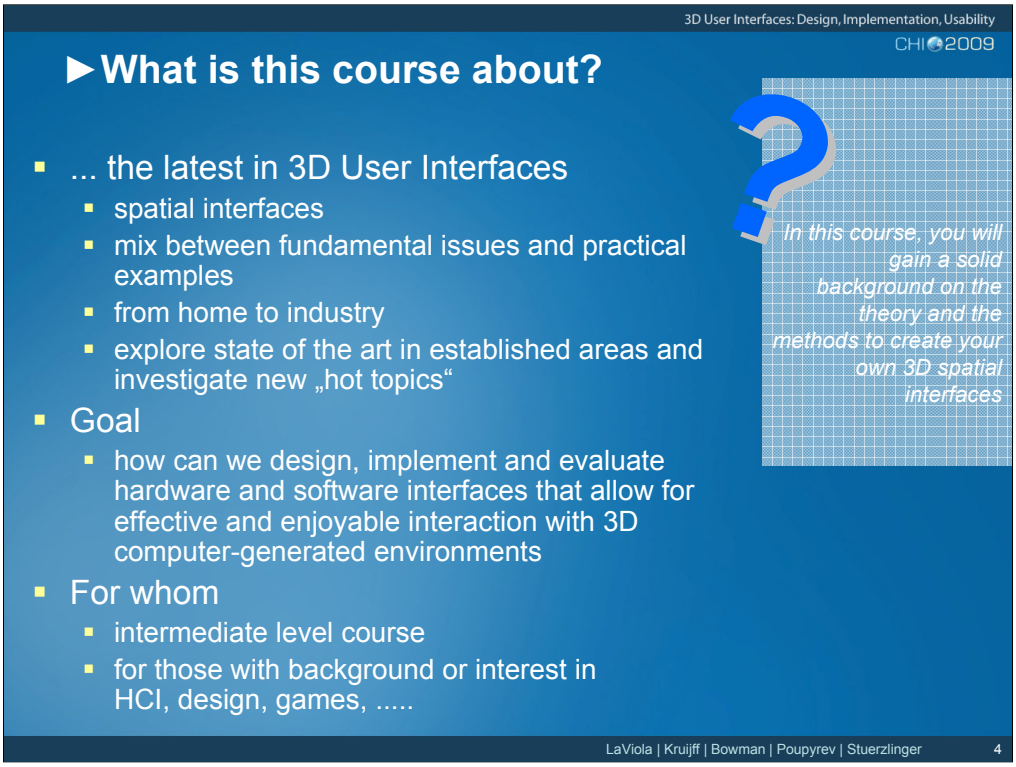
Special Guest Star

►What did we do together

- A brief history...

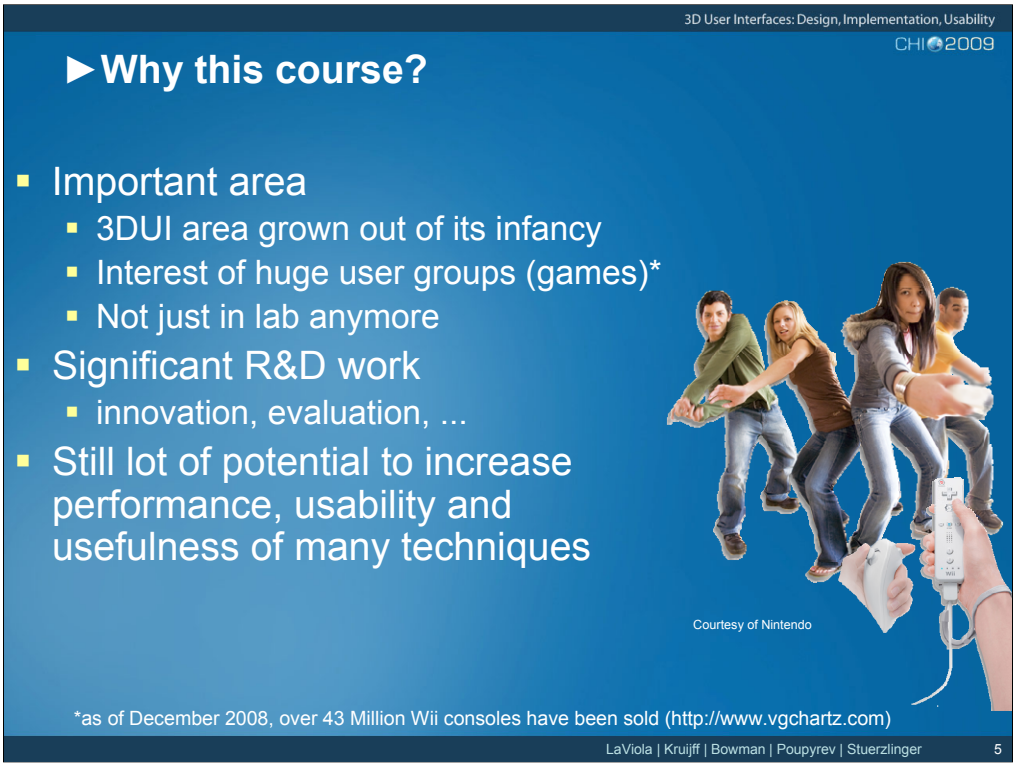
- Team together since the last century (1999)
- Presented multiple courses on 3DUIs
  - IEEE VR, ACM VRST, ACM SIGGRAPH
- Gave similar course at CHI 2008
- Authors of the first comprehensive text/reference book on 3D user interfaces
  - ‘‘3D User Interfaces: Theory and Practice‘‘ Addison-Wesley 2005, 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.



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.



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, 3D user iterfaces are becoming mainstream, no 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

- Learning objectives
  - understand 3D interaction in desktop / console, large screen, augmented reality, and virtual reality setups
  - explore 3DUI applications: from lab to living room to urban scenarios
  - learn details of fundamental 3D interaction techniques, including the latest evaluation results
  - become familiar with I/O hardware for 3D user interfaces
  - learn about advanced 3D interaction techniques, metaphors, and design strategies
  - explore 3DUI for/with video games, robotics, ubiquitous/mobile computing
  - understand the latest trends in tangible / haptic interfaces
  - obtain practical tips for developing re-usable hardware interfaces
  - learn how 3D interfaces can be applied to your own area of research or practice

Courtesy of Universal Press Syndicate

►Related Areas

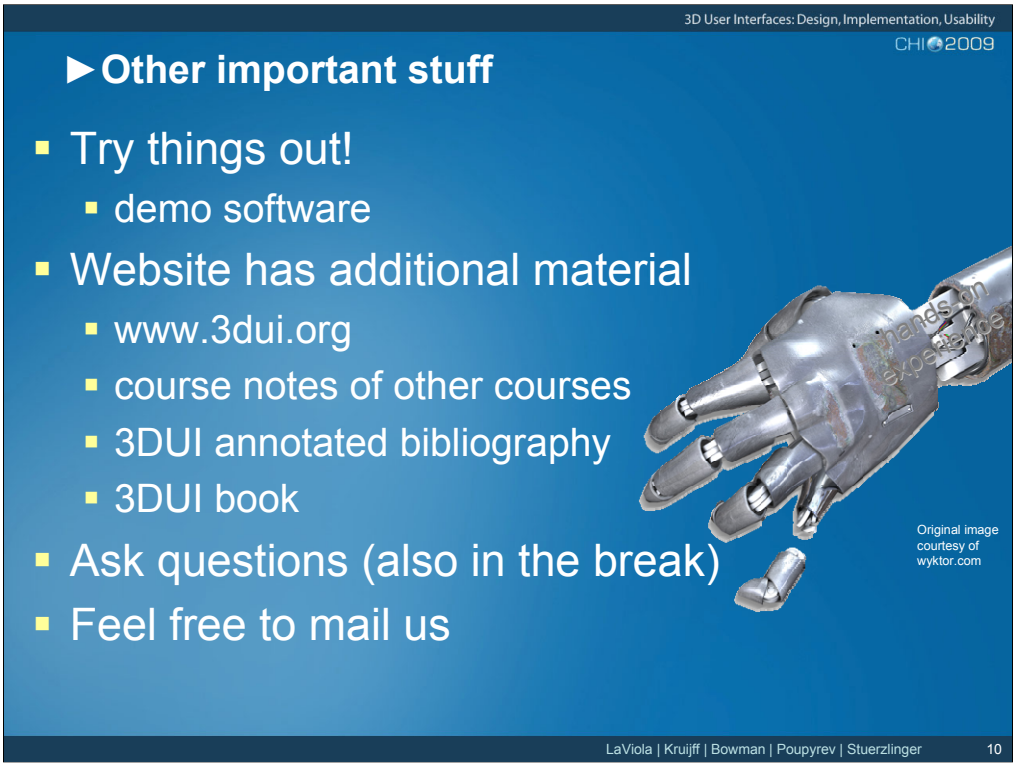
- We will touch upon at least the following areas:
  - general HCI issues
  - virtual / mixed / augmented reality
  - human factors and ergonomics
  - usability / evaluation
  - ubiquitous computing
  - mobile user interfaces
  - design
  - haptic interfaces
  - robotics
  - hardware systems design
  - …

►Roadmap I

- Four 90-minute blocks
- Block 1 - 3D UI Introduction
  - Welcome, Introduction, & Roadmap
    - LaViola – 10 minutes
  - 3D UIs 101
    - Bowman – 45 minutes
  - 3D UIs 201
    - Kruijff – 35 minutes
- Block 2 – 3D UI Usability
  - User Studies and 3D UIs
    - Bowman – 45 minutes
  - Guidelines for Developing 3D UIs
    - Stuerzlinger – 45 minutes

►Roadmap II

- Block 3 - 3D UI and Video Games
  - Video Games: 3D UIs for the Masses
    - LaViola / Poupyrev - 60 minutes
  - The Wii Remote™ and You
    - LaViola – 30 minutes
- Block 4 - 3D UI and the Real World
  - 3D UI and the Physical Environment
    - Kruijff – 40 minutes
  - Beyond Visual: Shape, Haptics, and Actuation in 3D UI
    - Poupyrev – 40 minutes
  - Conclusion
    - LaViola – 10 minutes



There is only a limited amount of time we can spent 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.

Joseph LaViola	jjl@cs.ucf.edu
Ernst Kruijff	kruijff@icg.tugraz.at
Doug Bowman	bowman@cs.vt.edu
Ivan Poupyrev	poup@csl.sony.co.jp
Wolfgang Stuerzlinger	wolfgang@cse.yorku.ca

▶ Coming up next...

- 3D UIs 101

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

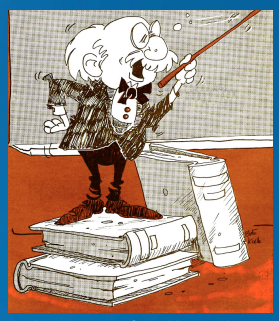


Image courtesy of www.i-heart-god.com