

Conclusion

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Welcome, Introduction, & Roadmap

3DUIs 101

3DUIs 201

User Studies and 3DUIs

Guidelines for Developing 3DUIs

Video Games: 3DUIs for the Masses

The Wii Remote and You

3DUI and the Physical Environment

Beyond Visual: Shape, Haptics and Actuation in 3DUI

Conclusion

► Course Summary

- What did we talk about
 - theory and practice for 3D interaction in desktop / console, large-screen, augmented reality, or virtual reality setups
 - lab and real-world interactive scenarios, including interfaces for/with video games, robotics, and ubiquitous computing
 - fundamental and advanced 3D interaction techniques, metaphors, and design strategies
 - issues and trends in tangible / haptic interfaces
 - practical tips for developing re-usable hardware interface

This rounds up our course on 3D user interfaces in which we talked about a range of theoretical and practical topics and identified a multitude of new directions.

► Outlook I (short term research agenda)

- Future of interfaces (“safe“ version)
 - many, many more game interfaces with cheap hardware
 - cell phones, cell phones cell phones...
 - more simple spatial interfaces that simply do their job
 - much more computer-vision based work on tracking and recognition
 - general appliance & spatial interface symbiosis (ambient, ...)
 - considerable advances in human-robot interaction

- hopefully: more evaluation

Spatial interaction using 3DUIs is sure to grow further. The game market will most likely continue taking a lead role in popularizing interfaces, and bringing some of the interfaces we see now in the labs to the people in real life. What we also will see is more simple user interfaces, also for cell phones, of which many will very much likely make use of some sort of computer vision method. Furthermore, it may certainly happen that spatial interfaces find their way silently in general appliances too, in ways we do not directly notice. And with the rise of interest in robots, there will be much more work on robot interfaces, a field where still a lot work needs to be done.

► Outlook II

- Future of interfaces (slightly “speculative“ version)
 - Lego goes spatial interface: commercial do-it-yourself „easy toolkits“
 - in-body interfaces: if you like them or not, they’ll come...
 - robots everywhere
 - flexible screening (depersonalization of screens) through screen services
 - unrestricted interaction: true unrestricted indoor and outdoor spatial interfaces

Speculating a bit more, some additional directions can be envisioned. One is the availability of do-it-yourself toolkits like Lego Mindstorms, but then for spatial interfaces. Next, and already coming strong in the medical area, there will be many more in-body (implanted) interfaces, if we like or not. Also, it can be expected that we will see many more robots around, however, and this is why it is speculative, only when we do solve the privacy and social issues. Finally, we may come to some level of depersonalization of interfaces, in which for example screens are embedded in our environment, being accessed on demand – the networked computer goes spatial too... At some point, hopefully, we will have unrestricted spatial interaction, with anything, everywhere.

► The last bits...

- Be sure to visit the website
 - www.3dui.org
- Check the course notes
- Talk to us / mail us with questions or comments



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- And... be creative!*

*for example, start sketching interfaces...

Further reading on new directions in 3D user interfaces

Bowman, D., Chen, J., Wingrave, C., Lucas, J., Ray, A., Polys, N., Li, Q., Haciahmetoglu, Y., Kim, J., Kim, S., Boehringer, R., and Ni, T. "New Directions in 3D User Interfaces", *International Journal of Virtual Reality*, vol. 5, no. 2, 2006, pp. 3-14.

LaViola, J. "Bringing VR and Spatial 3D Interaction to the Masses through Video Games", *IEEE Computer Graphics and Applications*, 28(5):10-15, September/October 2008.

Doug A. Bowman, Sabine Coquillart, Bernd Froehlich, Michitaka Hirose, Yoshifumi Kitamura, Kiyoshi Kiyokawa, Wolfgang Stuerzlinger, "3D User Interfaces: New Directions and Perspectives," *IEEE Computer Graphics and Applications*, vol. 28, no. 6, pp. 20-36, Nov/Dec, 2008