3D and Usability

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Motivation

- explore usability of 3D interface components
  - mixing with current 2D interfaces
- explore usability of 3D animations
  - may help users understand what is going on
  - feedback for users’ actions
- simple testing of 3D-enhanced interfaces
  - provide appropriate tools
Usability

- ISO 9421-11
- efficiency
  - accuracy and quality of achieved results
- productivity
  - time and effort devoted for achieving a goal
- comfort
  - “pain” a user has to go through
- user’s relation to a product
Virtual Reality vs. 2D

- **virtual reality**
  - mimics the real world - metaphors
  - environment familiar to unexperienced users
  - special input/output devices may be required

- **2D interfaces**
  - designed to be highly effective for particular tasks
  - provide a level of abstraction
  - may contain 3D elements
Interfaces in 3D

- text in 3D is less readable
  - anti-aliasing
- icons are less readable as well
- lower information density
  - not relevant for some applications
VR Input/Output

- **input**
  - Space Pilot
  - Flystick
  - Wiimote
  - gestures

- **output**
  - stereo displays
  - 3D displays

- hard to interact without special HW
Human Factors

• people not always good in 3D
  • may be further influenced by input/output HW
  • in most common tasks people need only 2D

• spacial memory similar in 2D and 3D

• people tend to interact with visible objects
  • very preferred
  • navigation to partly occluded objects

• walking vs. teleporting
Degrees of Freedom

• 6 degrees of freedom unnecessary in most cases
  • full 3D navigation
  • hard use for most users

• 2.5+2 degrees of freedom
  • forward, backward, to sides, jump, crawl, looking around

• 2+2 degrees of freedom
  • flying in constant altitude

• no degrees of freedom
  • user does not move in the scene
Usage of 3D Interfaces

• games
  • HUD overlays

• virtual worlds
  • Second Life, project Wonderland, PlayStation Network etc.

• special tools
  • 3D modeling tools

• VR/AR systems

• general purpose graphic interface toolkits
  • Quartz, Compiz Fusion etc.
Project Looking Glass
Project Looking Glass
Project Looking Glass
Project Looking Glass
Mac OS X
Mac OS X
Linux
Linux
Linux
Windows
Add-ons
Add-ons
Add-ons
Add-ons
Collaboration Tools
Collaboration Tools
Collaboration Tools
Collaboration Tools
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Virtual Worlds
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Current products

- no limitation in technology
  - technology available for years
  - close to photorealistic quality
- world rendered in 3D, but UI mostly in 2D
  - limited usage of 3D in menus etc.
- 3D does not often improve usability
  - more display space used
  - worse orientation
  - additional management of navigation in 3D
Focus

• delivering 3D into user interfaces is not the goal

• exploring use cases in which 3D is useful
  • navigation, feedback etc.

• environment without special hardware
  • commonly available input/output devices
  • 2D display and remote control

• testing difference between 3D and 2D animations
  • additional useful information in 3D
i2home Framework

• **UIProtocol**
  • rapid development of user interfaces
  • separation of user interface, data and application logic
  • platforms agnostic

• **end-user features**
  • animations
  • media
  • maps
  • charts
  • system integration
Future Features

• voice based interfaces
  • already included in UIProtocol specification
  • no implementation yet

• 3D
  • freely combine 2D and 3D
  • embedded 3D models and scenes
  • 2D interfaces rendered as texture
  • 3D animations
Designing 3D UI

- most guidelines used for 2D apply
  - error prevention, error recovery, feedback etc.

- objects floating in the air
  - not common in real world, makes depth perception harder

- interpenetration
  - avoid by collision detection, layout algorithm

- navigating to partially occluded objects
  - very common operation
Evaluation

- integration into i2home
  - easy to add or remove 3D elements and transitions
- user group not experienced with electronics
  - feedback is important
  - understanding navigation is important
- usability testing
  - only way how to know for sure
Conclusion

• 3D interface often less usable than 2D
  • 2D better than limited 3D, limited 3D better than full 3D
  • depends on application
  • see references

• may be useful in some use cases
  • reducing level of abstraction

• may be useful for navigation
  • 2D vs. 3D transitions
Q&A
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Thank you
for your attention
References


• Project Looking Glass
  • http://www.sun.com/software/looking_glass/

• this presentation