CHAPTER 7:
Direct Manipulation and Immersive Environments

Designing the User Interface:
Strategies for Effective Human-Computer Interaction

Sixth Edition

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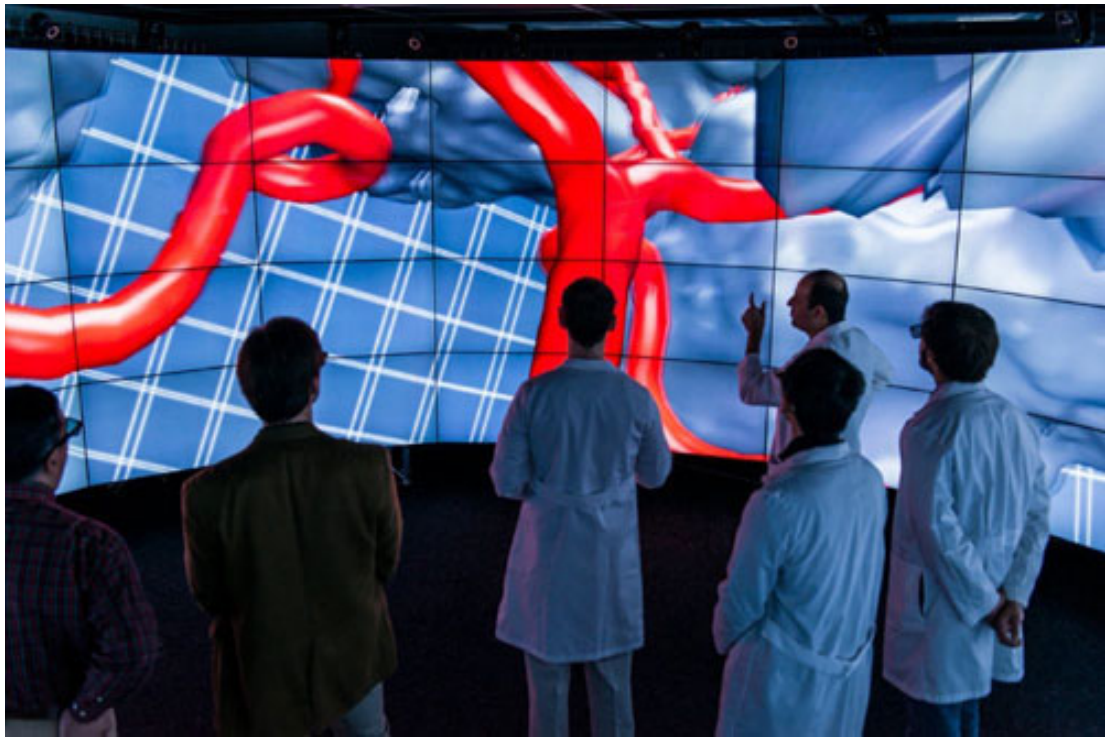
2D and 3D Interfaces

- “Pure” 3D interfaces have strong utility in some contexts, for example:
  - Medical
  - Product design
  - Scientific visualization
- In some situations, 2D may actually be preferable to simplify interactions
- The power of 3D interfaces lies in applying them in the appropriate domain or context where the added dimension provides more understanding and improves task outcomes

3D Interfaces

- By using a medical simulation inserted into a large scale visualization (using CAVE technology), physicians were able to find a solution, that would not have been possible without doing the actual surgery



3D Interfaces (continued)

Features for effective 3D

- Use occlusion, shadows, perspective, and other 3D techniques carefully
- Minimize the number of navigation steps for users to accomplish their tasks
- Keep text readable
- Avoid unnecessary visual clutter, distraction, contrast shifts, and reflections
- Simplify user movement
- Prevent errors
- Simplify object movement
- Organize groups of items in aligned structures to allow rapid visual search
- Enable users to construct visual groups to support spatial recall

3D Interfaces (continued)

Guidelines for inclusion of enhanced 3D features:

- Provide overviews so users can see the big picture
- Allow teleoperation
- Offer X-ray vision so users can see into or beyond objects
- Provide history keeping
- Permit rich user actions on objects
- Enable remote collaboration
- Give users control over explanatory text and let users select for details on demand
- Offer tools to select, mark, and measure

3D Interfaces (concluded)

Guidelines for inclusion of enhanced 3D features (continued):

- Implement dynamic queries to rapidly filter out unneeded items
- Support semantic zooming and movement
- Enable landmarks to show themselves even at a distance
- Allow multiple coordinated views
- Develop novel 3D icons to represent concepts that are more recognizable and memorable

Teleoperation and Presence

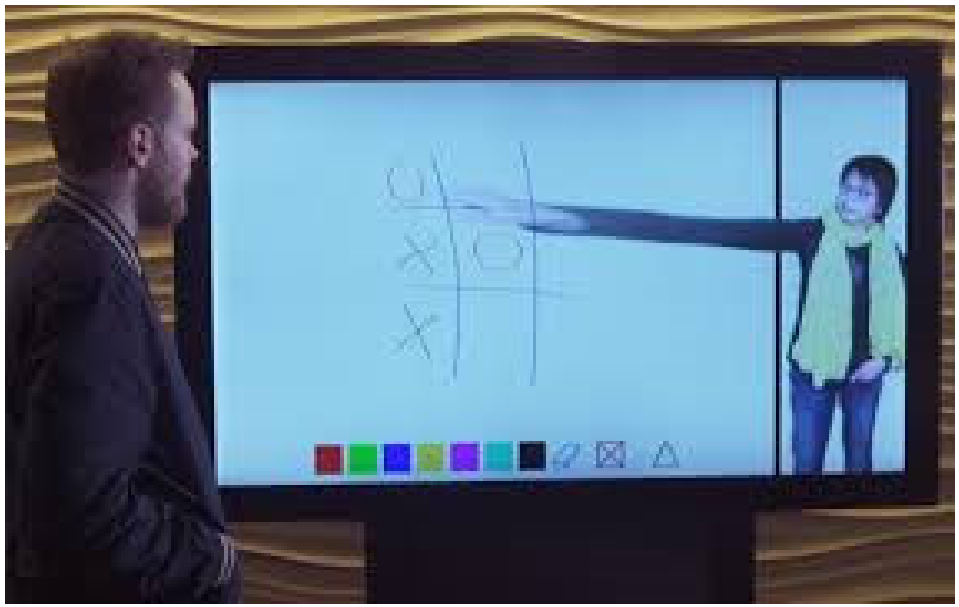
- Two “parents”:
  - direct manipulation in personal computers
  - process control in complex environments
- Physical operation is remote
- Complicating factors in the architecture of remote environments:
  - Time delays
    - transmission delays
    - operation delays
  - Incomplete feedback
  - Feedback from multiple sources
  - Unanticipated interferences

Teleoperation and Presence (example)

- Nurse demonstrates using the Telehealth cart otoscope to conduct a real-time tympanic (ear) membrane exam
- On screen is Physician Assistant who, from a remote location, can see and evaluate the patient and provide an appropriate plan of care

Teleoperation and Presence (example)

- ImmerseBoard allows two users to be co-located and work on the same shared screen

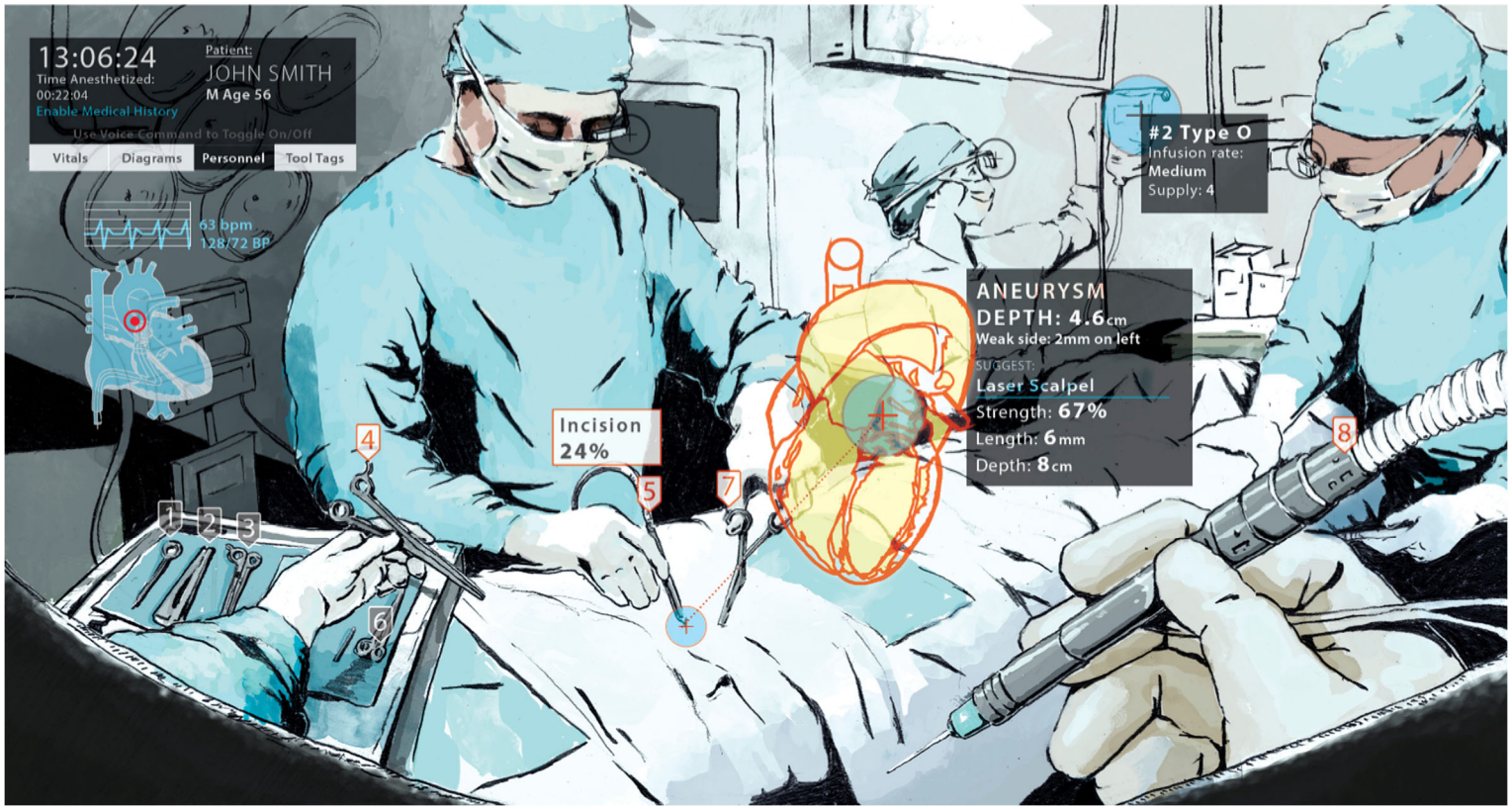


Augmented and Virtual Reality

- Virtual reality breaks the physical limitations of space and allow users to act as though they were somewhere else
- Augmented reality shows the real world with an overlay of additional overlay
- Situational awareness shows information about the real world that surrounds you by tracking your movements in a computer model
- Augmented reality is an important variant
  - Enables users to see the real world with an overlay of additional interaction.

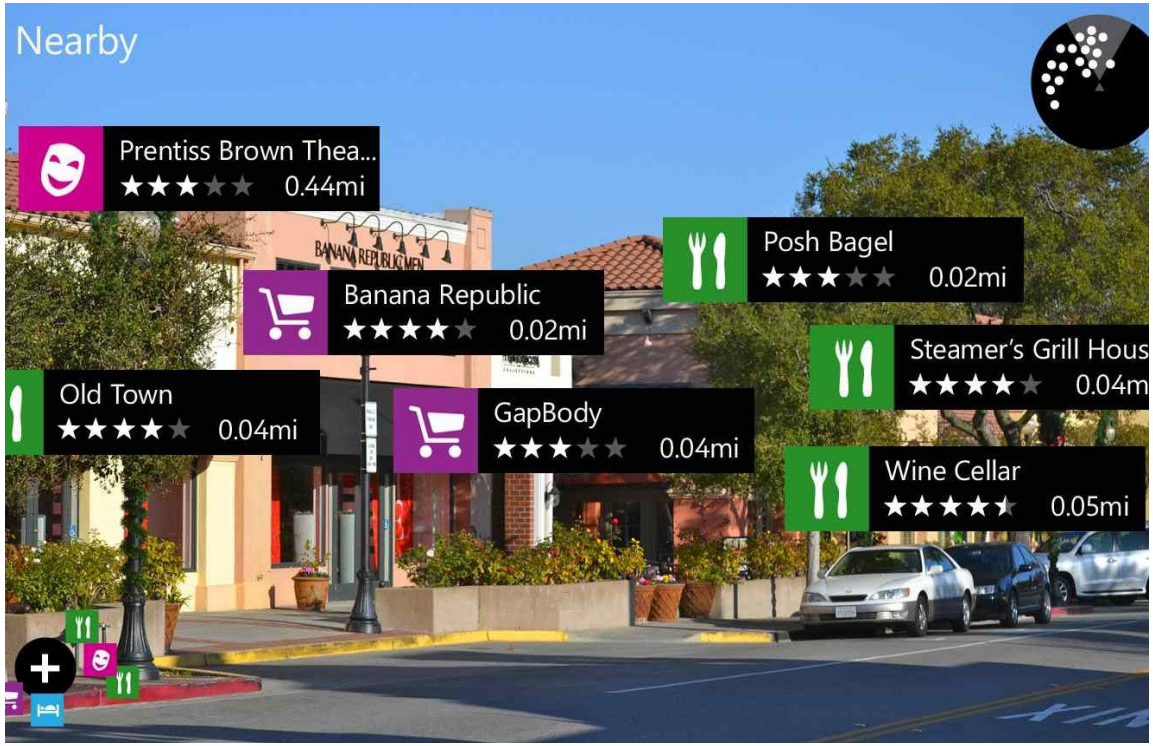
Augmented and Virtual Reality (example)

- Virtual reality might be used to help surgeons or their assistants during surgery, by showing pertinent information superimposed on a view of the real world. http://augmentarium.umiacs.umd.edu



Augmented and Virtual Reality (another example)

- Using augmented reality overlays, various points of interest can be shown on a mobile phone
- Icons represent the type of place (food, shopping, etc.) and distances from the current location
- Links are provided to user reviews



Augmented and Virtual Reality (another example)

- Customers can use their personal mobile devices to pull up objects from the IKEA Catalog and see how the various items would look in their own house

Augmented and Virtual Reality (another example)

- Image of a virtual meditative world that users can use for engaging in meditation activities
  - The virtual world has sounds
  - They change with each chakra (stage) of the meditation process
  - This is an application of positive computing