Winter 2013

CSE 190: 3D User Interaction

Lecture #4: Displays

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Announcements

- TA: Sidarth Vijay, available immediately
- Office/lab hours: tbd, check web site
- Homework project 1 due Friday

Calit2 Free Monthly Tour

- No date for next tour posted yet
- Check at:
  - http://www.calit2.net/events/popup.php?id=2026

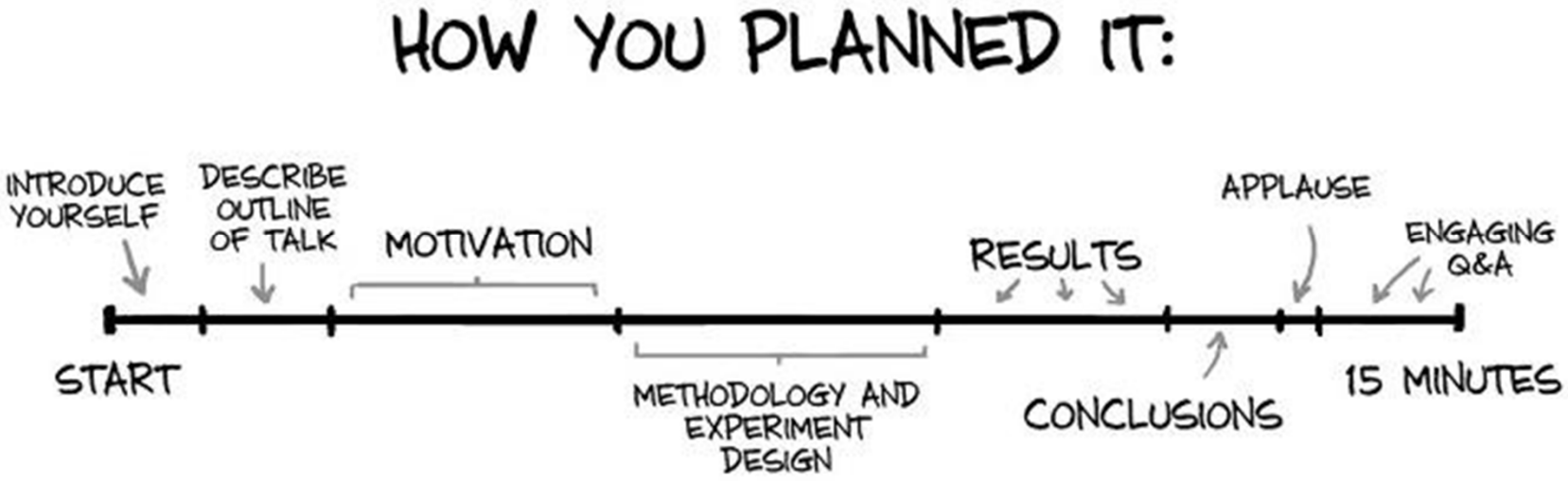
REU Paid Research Opportunity

- REU Opening for undergraduate students
- Topic: ArchaeoSTOR map: publishing archaeological geodata on the web
- Paper: COM.Geo '12 Proceedings of the 3rd International Conference on Computing for Geospatial Research and Applications
  - http://dl.acm.org/citation.cfm?id=2345355
- Contact: Aaron Gidding, agidding@ucsd.edu

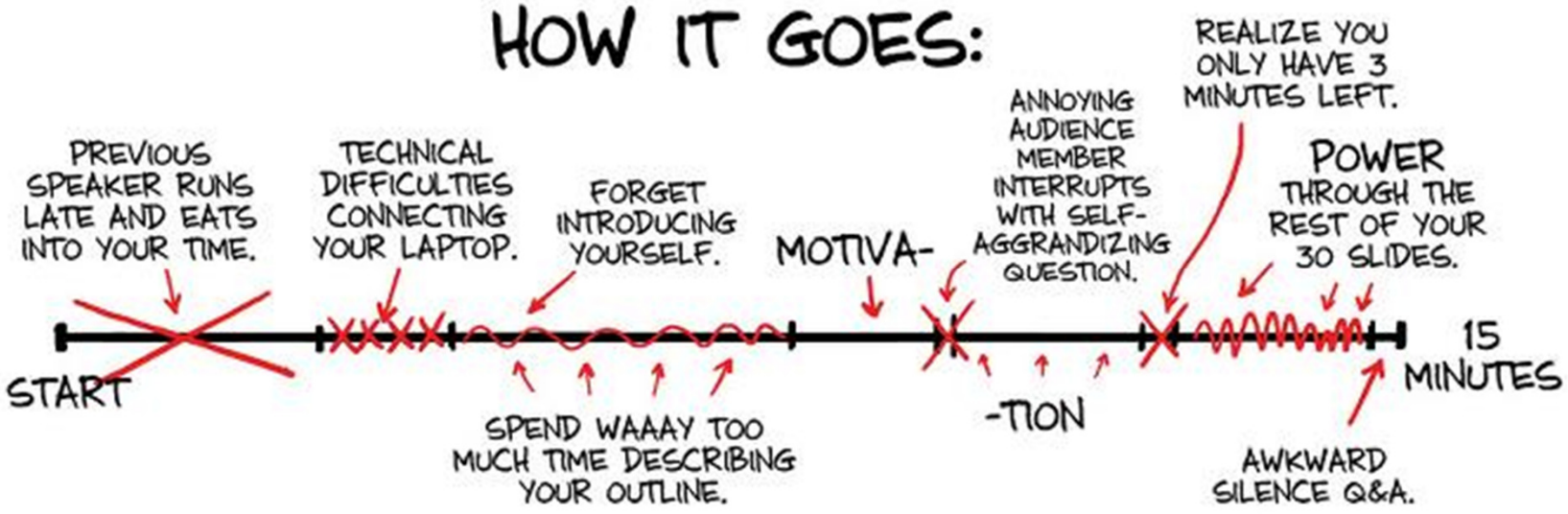
Paper Presentation

- Paper Stats
  - Title
  - Authors
  - Institute
  - Conference/Journal
  - Year
- Outline
- Related Work
- Methodology
- Results
- Conclusions
- Q&A

Paper Presentation



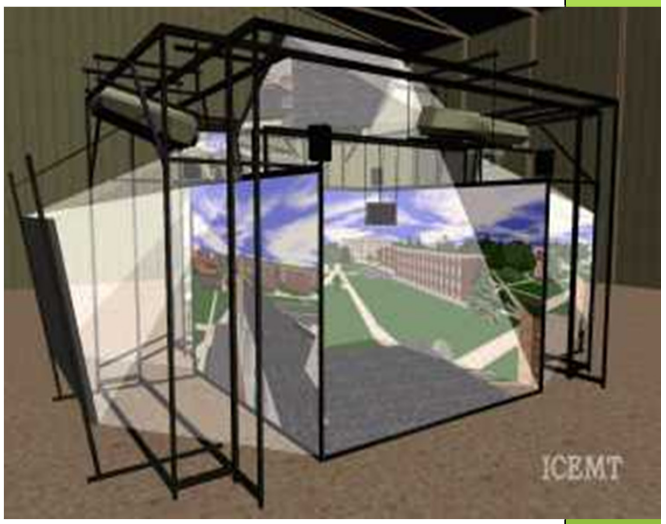
Paper Presentation

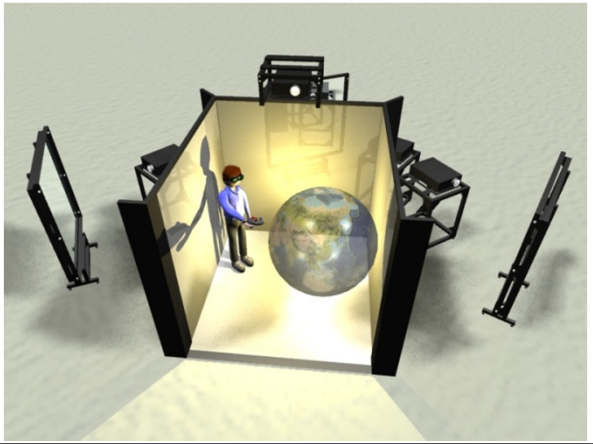


Displays

Surround Screen VE

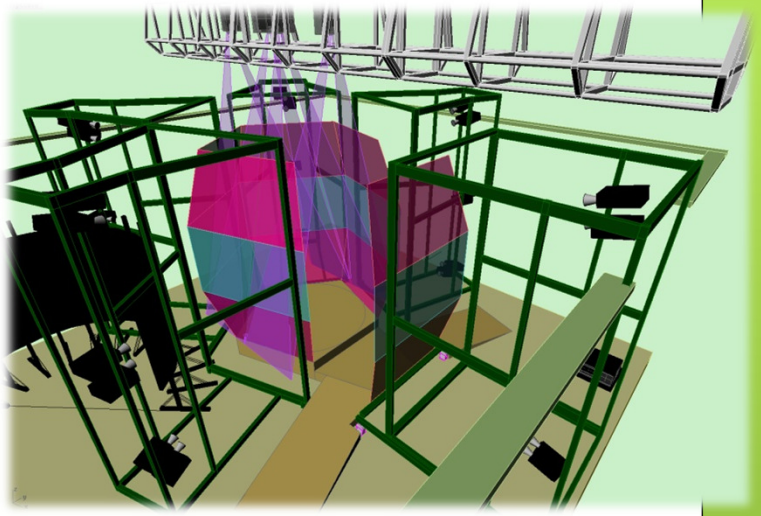
- Has 3 to 6 large screens
- Puts user in a room for visual immersion
- Usually driven by a single or group of powerful graphics engines

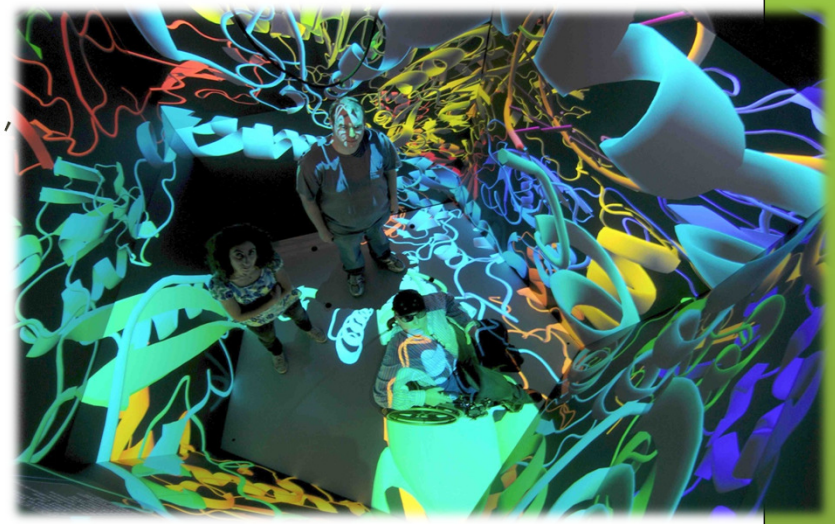




The StarCAVE

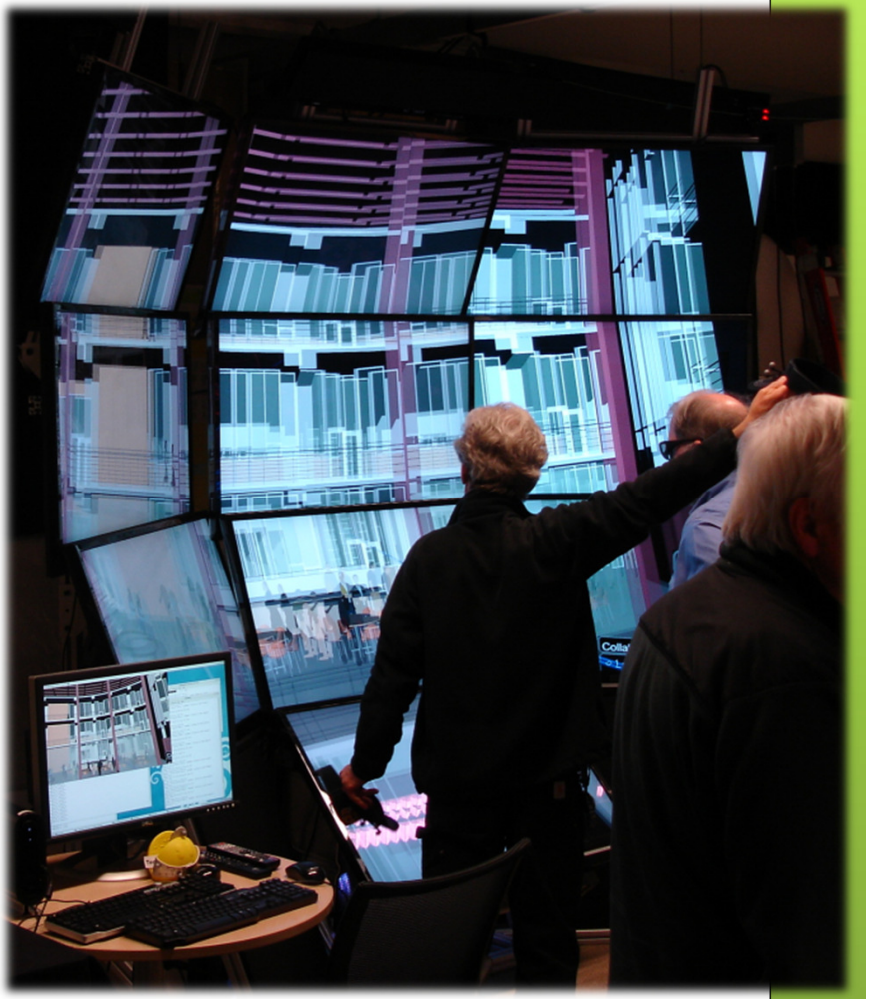
- 18 Dell XPS 710 PCs
- Dual Nvidia GeForce 285 graphics cards
- CentOS Linux
- 34 JVC HD2k projectors (1920x1080 pixels):
  ~34 megapixels per eye
- 360 degrees immersion
- Passive stereo, circular polarization
- 15 screens on 5 walls, ~8 x 4 foot each, plus floor projection
- 4-camera optical tracking system

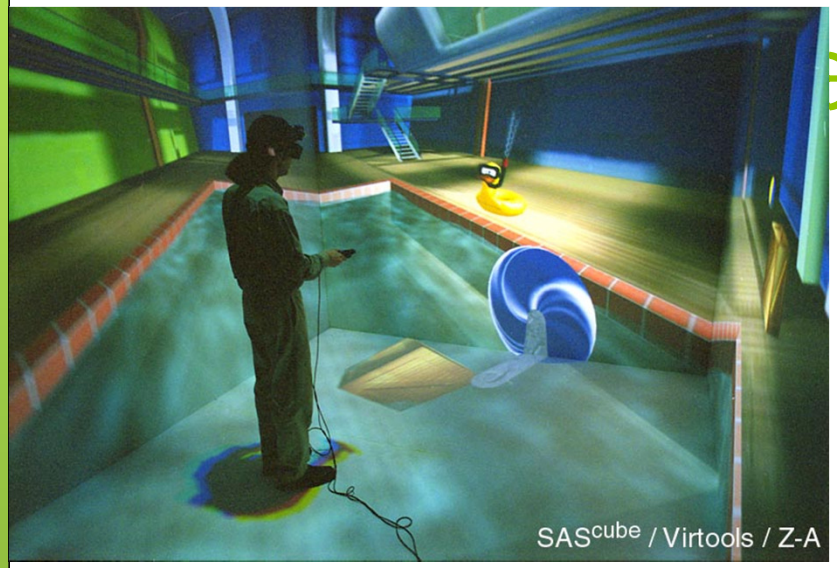


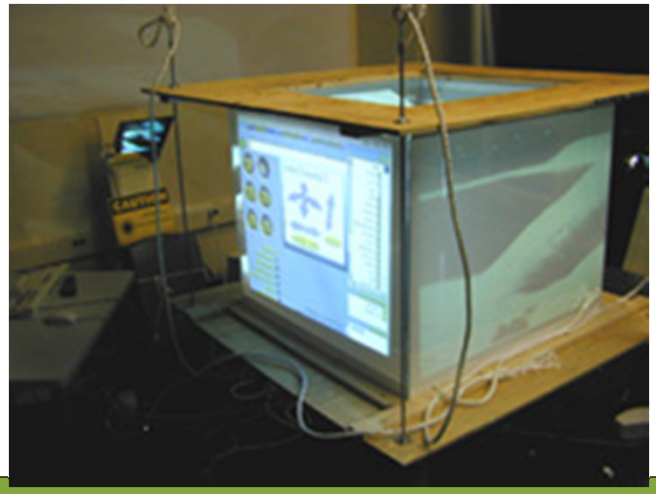


NexCAVE

- 14 42" JVC Xpol displays:
  LCD panels with polarizing filters,
  1920x1080 pixels
- 8 rendering PCs
- Nvidia GeForce 480 GPUs
- 2-camera ART TrackPack optical tracking system




SAScube / Virtools / Z-A



SSVE – Advantages

- Provides high resolution and large FOV
- User only needs a pair of light weight glasses for stereo viewing
- User has freedom to move about the device
- Real and virtual objects can be mixed in the environment
- A group of people can inhabit the space simultaneously

SSVE – Disadvantages

- Very expensive (often ~$1 Million)
- Requires a large amount of physical space
- Projector calibration must be maintained
- Normally only one user head tracked
- Stereo viewing can be problematic (ghosting, focal plane far away)
- Physical objects can get in the way of graphical objects

SSVE – Interface Design

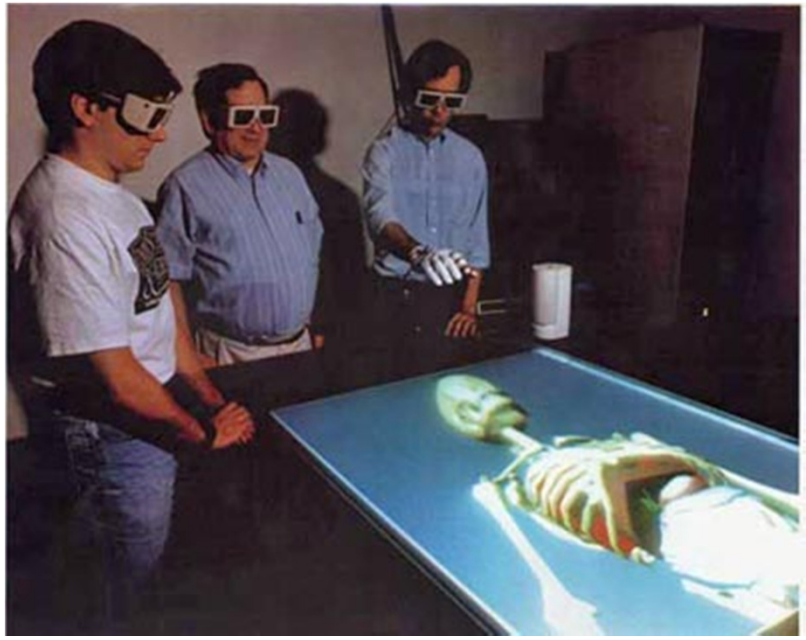
- Do not need to represent physical objects (i.e. hands) as graphical objects
- Can take advantage of the user's peripheral vision
- Do not want the user to get too close to the screens
- Developer can take advantage of the space for using physical props (i.e. car, motion platform)

Workbenches and Variants (1)

- Similar to SSVE but one display (two at most)
- Can be a desk or a large single display (i.e. PowerWall)
- Traditionally a table top metaphor

Workbenches and Variants (2)

Workbenches and Variants (3)



zSpace

- Full HD resolution
- Active stereo screen
- Passive glasses
- Tracked glasses and stylus
- Stylus with infrared markers and gyroscope

Workbenches – Advantages

- High resolution
- For certain applications, makes for an intuitive display
- Can be shared by several users

Workbenches – Disadvantages

- Limited movement
- Typically only one user head-tracked
- No surrounding screens
- Physical objects can get in the way of graphical objects
- Stereo can be problematic

Workbenches – Interface Design

- Ergonomics are important especially when designing interfaces for table displays
- User can take advantage of direct pen-based input if display surface permits
- No need to make graphical representations of physical objects

Head Mounted Displays

- Device has either two CRT or LCD screens plus special optics in front of the users eyes
- User cannot naturally see the real world
- Provides a stereoscopic view that moves relative to the user

HMDs – Advantages

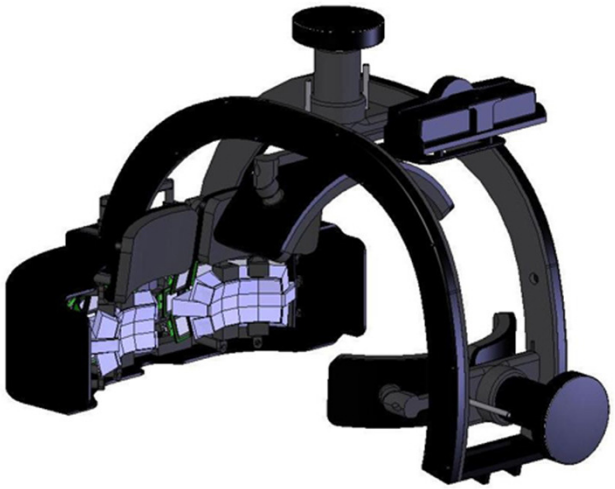
- Provides an immersive experience by blocking out the real world
- Fairly easy to set up
- Does not restrict user from moving around in the real world
- Average quality HMD is relatively inexpensive
- Can achieve good stereo quality

HMDs – Disadvantages

- Average quality HMDs have poor resolution and field of view (FOV)
- Does not take advantage of peripheral vision
- Isolation and fear of real world events
- Good quality devices cost in the $100,000 range
- Heavy and do not fit well

HMDs – Interface Design

- Physical objects require a graphical representation
- Limits the types of input devices that can be used



Oculus Rift

- Recent Kickstarter project
- >90 degrees horizontal field of view
- 110 degrees diagonal field of view
- More than 2x field of view of competition
- 640 x 800 pixels per eye
- 7” display
- 1000 Hz head tracking