Projects, Navigation/Zooming

Lecture 12 CPSC 533C, Fall 2004

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Projects

proposals
  · projectdesc.html#proposals

software
  · resources.html#software

datasets
  · resources.html#data
Proposals

meet with me (at least) once in person first
at least two pages, use HTML
  · submit URL to me by 2pm Fri Nov 5

writeup
  · names/email for all team members
  · describe domain, task, dataset, your expertise level
  · explain proposed infovis solution abstraction!
  · scenario of use
  · illustrations of proposed interface
    scanned hand-drawings or mockups with drawing program
  · proposed implementation approach
    language, platforms, existing toolkits
  · milestones
Data

resources.html#data
Reading

(from before) Ware, Chap 10 [navigation]

Rapid Controlled Movement Through a Virtual 3D Workspace

Design Guidelines for Landmarks to Support Navigation in Virtual Environments
Norman G. Vinson, Proc. SIGCHI 99. (optional)

Tufte, Chap 2: Macro/Micro

Pad++: A Zooming Graphical Interface for Exploring Alternate Interface Physics
Ben Bederson, and James D Hollan, Proc UIST 94.

Space–Scale Diagrams: Understanding Multiscale Interfaces
George Furnas and Ben Bederson, Proc SIGCHI 95.

Speed–Dependent Automatic Zooming for Browsing Large Documents
Takeo Igarashi and Ken Hinckley, Proc. UIST 00, pp. 139–148.

Smooth and Efficient Zooming and Panning.
What Kind of Motion?

rigid
· rotate/pan/zoom
· easy to understand
· object shape static, positions change

morph/change/distort
· object evolves
  beating heart, thunderstorm, walking person
· multiscale/ZUI
  object appearance changes by viewpoint
· focus+context
  carefully chosen distortion
Ware Chapter 10 – Spatial Navigation

world in hand
  · good: spinning discrete objects
  · bad: large-scale terrain

eye in hand
  · explicitly move camera

walking
  · real-world walking
  · terrain following

flying
  · unconstrained 6DOF navigation

other: constrained navigation!
Rapid Controlled Movement

move to selected point of interest
  · normal to surface, logarithmic speed

trajectories as first-class objects

[video]
Spatial Navigation

real navigation only partially understood
  · compared to low-level perception, JNDs

spatial memory / environmental cognition
  · city: landmark/path/whole

implicit logic
  · evolved to deal with reality
  · so we'll learn from synthetic worlds

  · but we can't fly in 3D...

how much applies to synthetic environments?
  · even perception not always the same!
Design Guidelines for VE Landmarks

Ware's derived guidelines

- enough so always can see some
- visually distinguishable from others
- visible and recognizable at all scales
- placed at major paths/junctions

others, only some of of these crossover for infovis!

- need all 5 types of landmarks
  - path, edge, district, node, landmark
- concrete not abstract
- asymmetry: different sides looks different
- clumps
- different from "data objects"
- need grid structure, alignment
Macro/Micro

classic example: map
  · arms–length vs. up–close

paper vs. computer screen
  · 300–600 dpi vs. 72 dpi (legally blind)
  · finally changing

possibly available for projects
  · 22" 200dpi IBM T221 display
  · 9 Mpixels (4000x2000)
Pad++

"infinitely" zoomable user interface (ZUI)
Space–Scale Diagrams

reasoning about navigation and trajectories

Space–Scale Diagrams: Understanding Multiscale Interfaces
George Furnas and Ben Bederson, Proc SIGCHI '95.


Figure 1. The basic construction of a Space-Scale diagram from a 2D picture.
Viewing Window
Pan-Zoom Trajectories
Joint Pan–Zoom Problem
Shortest Path?
Shortest Path
Shortest Path, Details
Speed–Dependent Automatic Zooming

Speed–Dependent Automatic Zooming for Browsing Large Documents
Takeo Igarashi and Ken Hinckley,
Proc. UIST'00, pp. 139–148.

[demo www-ui.is.s.u-tokyo.ac.jp/~takeo/java/autozoom/autozoom.htm]
[video www-ui.is.s.u-tokyo.ac.jp/~takeo/video/autozoom.mov]

automatic zoom
· amount depends on how far to pan
**Smooth and Efficient Zooming**

uw space: $u = \text{pan}$, $w = \text{zoom}$
- horiz axis: cross-section through objects
- point = camera at height $w$ above object
- path = camera path
Optimal Paths Through Space

at each step, cross same number of ellipses

cross minimal number of ellipses total
Multiscale Display
Multiscale Desert Fog

Critical Zones in Desert Fog: Aids to Multiscale Navigation
Susanne Jul, George W. Furnas  UIST 98

environment devoid of navigational cues
  · not just Pad: 6DOF navigation where object fills view

designer strategies
  · explicit world creation – fog not made on purpose
    games – partial counter example
  · island of information surrounded by desert fog

Pad: min/max visibility distances
View–Navigation Theory

Effective View Navigation, CHI 97
George Furnas

characterizing navigability: viewing graph
  · nodes: views
  · links: traversable connections

1. short paths between all nodes
  · true in ZUIs (e.g. speed–dependent zooming)

2. all views have small number outlinks
  · not overwhelmed by choices
Critical Zones

region where zoom-in brings interesting views
  · show with navigation "residue"

unambiguous action choice
  · visible critical zone "residue" of stuff beneath
  · zoom out if see nothing

extension to VN theory
  · 3. all views contain good residue of all nodes
  · 4. all links must have small outlink-info
  · must build support for these into ZUIs

do not have "minsize", always use a few pixels
  · they don't address clutter/scalability
What's This?
Fisheye Focus+Context View!

preview of next time