Projects, Navigation/Zooming

Lecture 11 CPSC 533C, Spring 2004

23 Feb 2003

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 Mon Mar 1

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

Software

already covered:
- Java, Flash
- X Windows, vtk,

other useful approaches
- OpenGL
- Geomview, xmdvTool

zoomable toolkits
- Jazz/Piccolo, ZVTM

graph drawing packages
- see resources.html#software

Data

resources.html#data

Navigation/Zooming

Ware Chap 10 (navigation)

Tufte, Macro/Micro

Rapid Controlled Movement

Pad++
Space-Scale Diagrams
Speed-Dependent Automatic Zooming
Smooth and Efficient Zooming

spatial navigation, as time allows

Ware Chapter 10 – Spatial Navigation

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

eye in hand
- explicitly move camera

walking
- terrain following

flying
- unconstrained 6DOF navigation

other: constrained navigation!

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)

Rapid Controlled Movement

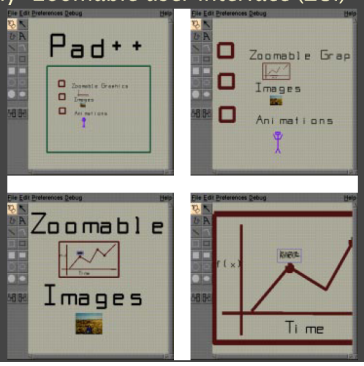
move to selected point of interest
- normal to surface, logarithmic speed

trajectories as first-class objects

[video]

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.

www.cs.umd.edu/hcil/pad++/papers/chi-95-spacescale/chi-95-spacescale.pdf

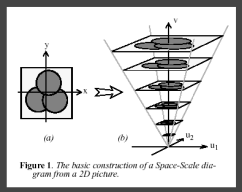
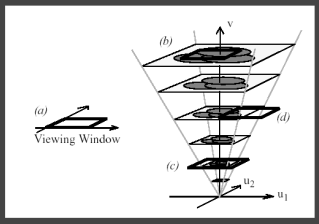
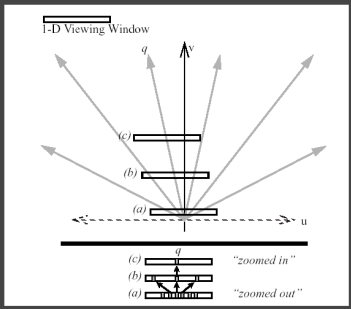


Figure 1. *The basic construction of a Space-Scale diagram from a 2D picture.*

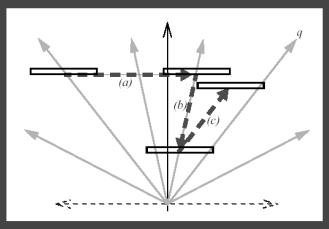
Viewing Window



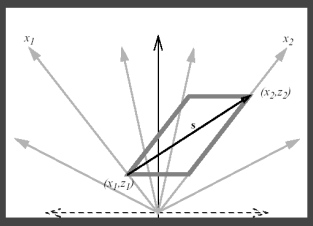
1D Version



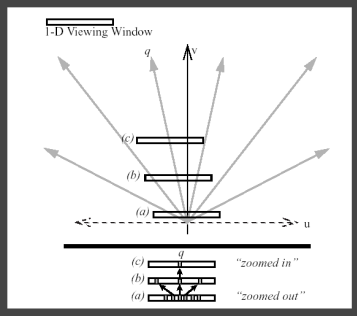
Pan-Zoom Trajectories



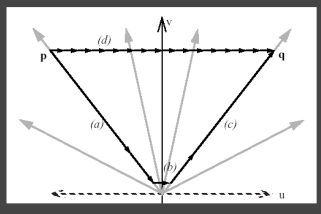
Joint Pan-Zoom Problem



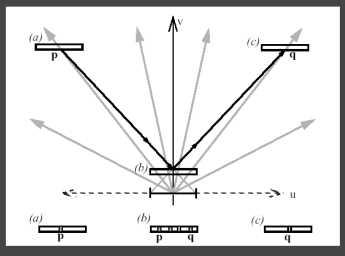
Shortest Path?



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.

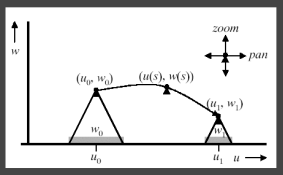
[demo www-ui.is.s.u-tokyo.ac.jp/~takeo/java/autozoom/autozoom.htm]

[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

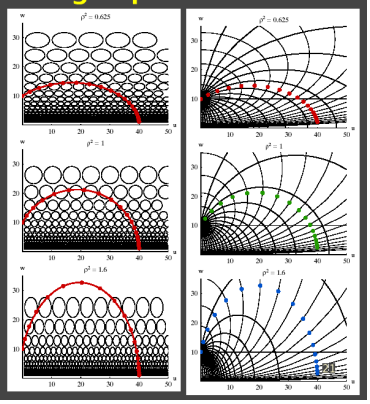
uw space: u = pan, w = zoom
- horiz axis: cross-section through objects
- point = camera at height w above object
- path = camera path



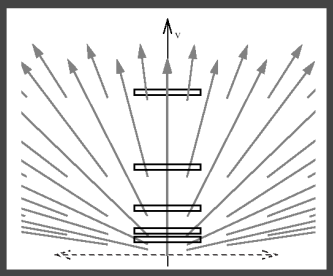
Optimal Paths Through Space

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: traversible 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

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!

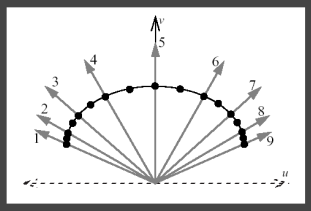
What Kind of Motion?

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

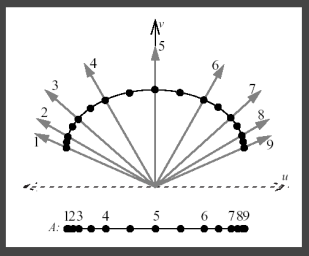
morph/change/distort
- object evolves
  beating heart, thunderstorm, walking person

- multiscale/ZUI
  object appearance changes by viewpoint
- focus+context
  carefully chosen distortion

What's This?



Fisheye Focus+Context View!



preview of Wednesday