Animation

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Today

- Animation
  - Purposes
  - Some recent examples
  - Techniques derived from cartooning
  - Animation vs. sequences for comprehension
Definitions of Animation

- “The quality or condition of being alive, active, spirited, or vigorous” (dictionary.com)

- “A dynamic visual statement that evolves through movement or change in the display”

- “… creating the illusion of change by rapidly displaying a series of single frames” (Roncarelli 1988).
We Use Animation to...

- Tell stories / scenarios: cartoons
- Illustrate dynamic process / simulation
- Create a character / an agent
- Navigate through virtual spaces
- Draw attention
- Delight
An Important Distinction

Animation vs. Interaction
Animation to Augment Actions

• Helps the user retain context, see the response to an action.

• Examples:
  – Closing a window: it no longer just disappears; rather, it leaves a trail behind.
  – Show animations during waiting times to indicate that processing is happening.
    • Airline flight search application
    • File download application
Example: Gap Minder

Animating scatter plots, and linking them to a story

http://www.gapminder.org/
http://www.gapminder.org/world/
Animation + Interactivity

Secret Lives of Numbers by Golan Levin

Animated Visualizations at Digg

http://labs.digg.com/

Diggers fall from above and stack up on popular stories. Green stories have more diggs.

Stack
real-time activity

Kazaa downloads cost one man $750 per song in RIAA suit
40% of all spam comes from just one source
20 Hilarious Pranks and Pwns Caught on Tape [Videos]
Dalai Lama: "I Won't Stop the Tibet Protests"
Disfigured woman's plea to die rejected!
Stunning Images Of Spring-Nature From Around World
Sub-prime collapse 'beyond the US Federal Reserve'
The Best Places to Watch Documentary Movies Online
Firefox 3 goes on a diet, eats less memory than IE and Opera
Cartoon-Style Animation

- **Main Reference**
  - Chang & Unger, Animation: From Cartoons to the User Interface, UIST ’93

- **Main ideas**
  - Visual change in the interface can be sudden and unexpected
  - User can lose track of causal connection between events
    - Classic example: closing/opening windows
    - This is now remedied via animation in standard windows interfaces

- **People have no trouble understanding transitions in animated cartoons**
  - They grow and deform smoothly
  - They provide visual cues of what is happening before, during, and after a transition.
Cartoon Animation in User Interface Design

• User Cartooning Principles to Enhance Animations
  – Replace sudden transitions with smooth ones

• Some Principles
  – Solidity (squash and stretch)
    • Motion blur
    • Dissolves
    • Arrival and departure (from off-screen)
  – Exaggeration
    • Don’t just mimic reality
    • Anticipation
    • Follow through
  – Reinforcement
    • Slow in and slow out
    • Arcs
    • Follow through
Animation to Improve Data Navigation: Gnutellavision


- Visualization of Peer-to-Peer Network
  - Hosts (with color for status and size for number of files)
  - Nodes with closer network distance from focus on inner rings
  - Queries shown; can trace queries

- [http://people.ischool.berkeley.edu/~ping/gtv/](http://people.ischool.berkeley.edu/~ping/gtv/)
Layout - Illustration
Animation in Gnutellavision

Goal of animation is to help maintain context of nodes and general orientation of user during refocus

• Transition Paths
  – Linear interpolation of polar coordinates
  – Node moves in an arc, not straight lines
  – Moves along circle if not changing levels
  – When changing levels, spirals in or out to next ring
Animation in Gnutellavision (continued)

• Transition constraints
  – Orientation of transition to minimize rotational travel
    • (move former parent away from new focus in same orientation)
  – Avoid cross-over of edges
    • (to allow users to keep track of which is which)
Transition Constraint – Retain Orientation of Edges
Transition Constraint –
Retain Ordering of Neighbors
Gnutellavision (continued)

• Animation timing
  – Slow in Slow out timing (allows users to better track movement)

• Small usability study
  – Participants preferred version with animation for larger graphs
Animation in Instruction

• Morrison & Tversky
  – Julie B. Morrison, Barbara Tversky The (in)effectiveness of animation in instruction CHI ’01 extended abstracts.
  – Found animation did not aid (nor harm) instruction
  – Potential reasons
    • Hard to perceive (too fast/complex)
    • May be comprehended discretely
    • Lacking appropriate interactivity
  – They point out that studies that show animation benefits often have extra info over the diagrams
    • My question: if the diagrams have everything the animations do, maybe they are just slow animations?
Animation in Instruction

• Stasko et al.
  – Did a series of studies on algorithm animation
  – Initially did not find effects either way
  – Changed the study
    • From lab/exam-oriented to homework-oriented
    • Rich observations of how different tools were used together
    • Perhaps a more appropriate application of viz
      – For understanding of complicated steps in binomial heap algorithms
  – Positive results
    • Best when animation and explanation are simultaneous
    • Students need to be able to step through, control speed
    • Students were more accurate and enjoyed the work more with animation.
Animation vs. Sequences of Stills


• Question: Does animation improve understanding of complex processes over a sequence of stills?
  – Reviews the literature of animation studies
  – Most of those with positive results don’t do a fair comparison to a sequence of stills.
  – Most that do a fair comparison don’t get positive results over alternatives,

• It’s hard to see and comprehend details when they move quickly.
  – Example of the running horse

• (My addition): Animation can provide insight when the pattern can only be seen if aided by change and motion.
Animation: Summary

- Is useful to help indicate changes in state in an interface.
- Is captivating, helps tell a story.
- Can give the big picture, but maybe not so useful for comprehension of details compared to well-chosen stills.
- Techniques:
  - Cartoon animation techniques are commonly used and seem natural to understand.