

Animation

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Spring 2010

Acknowledgments

- Thanks to Marti Hearst for the slides

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/>

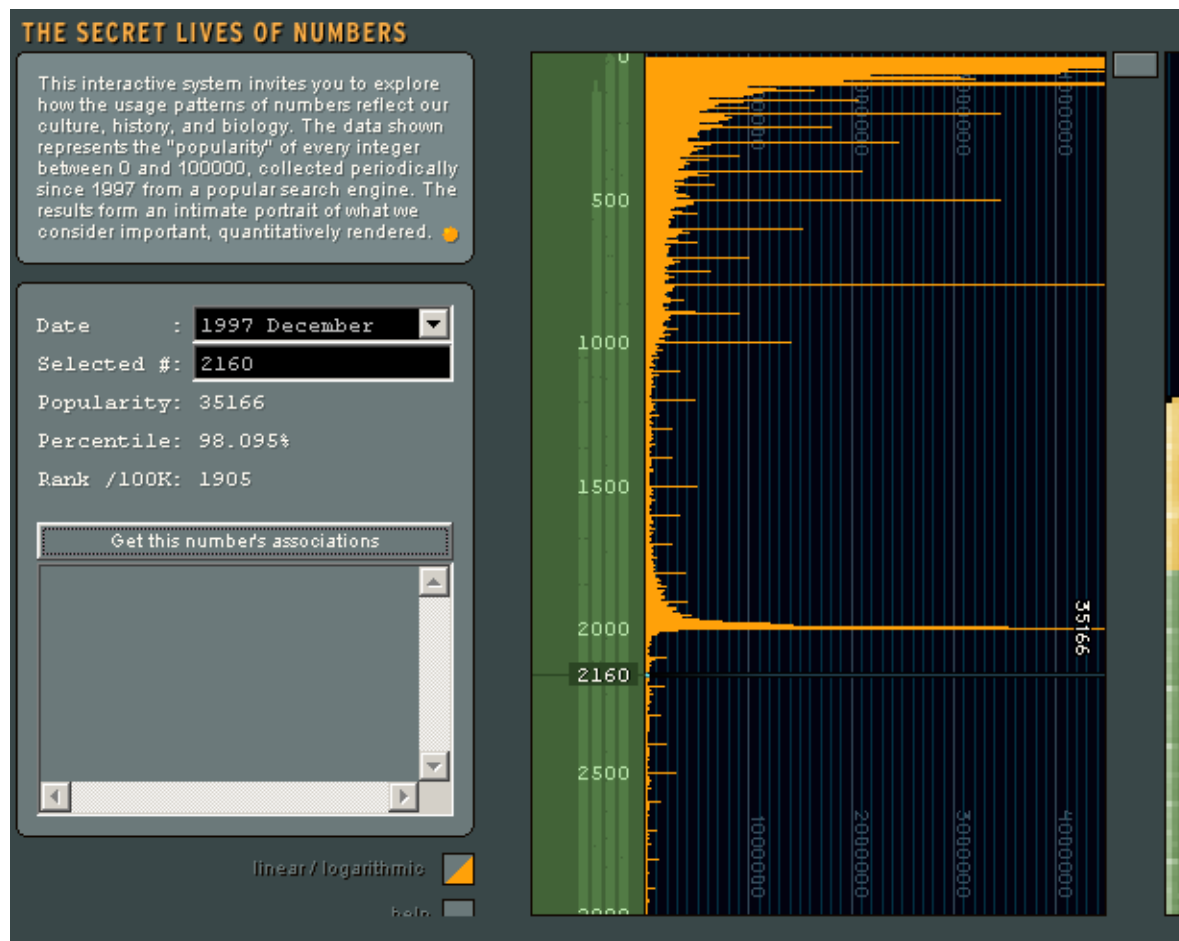
<http://www.gapminder.org/world/>



Animation + Interactivity

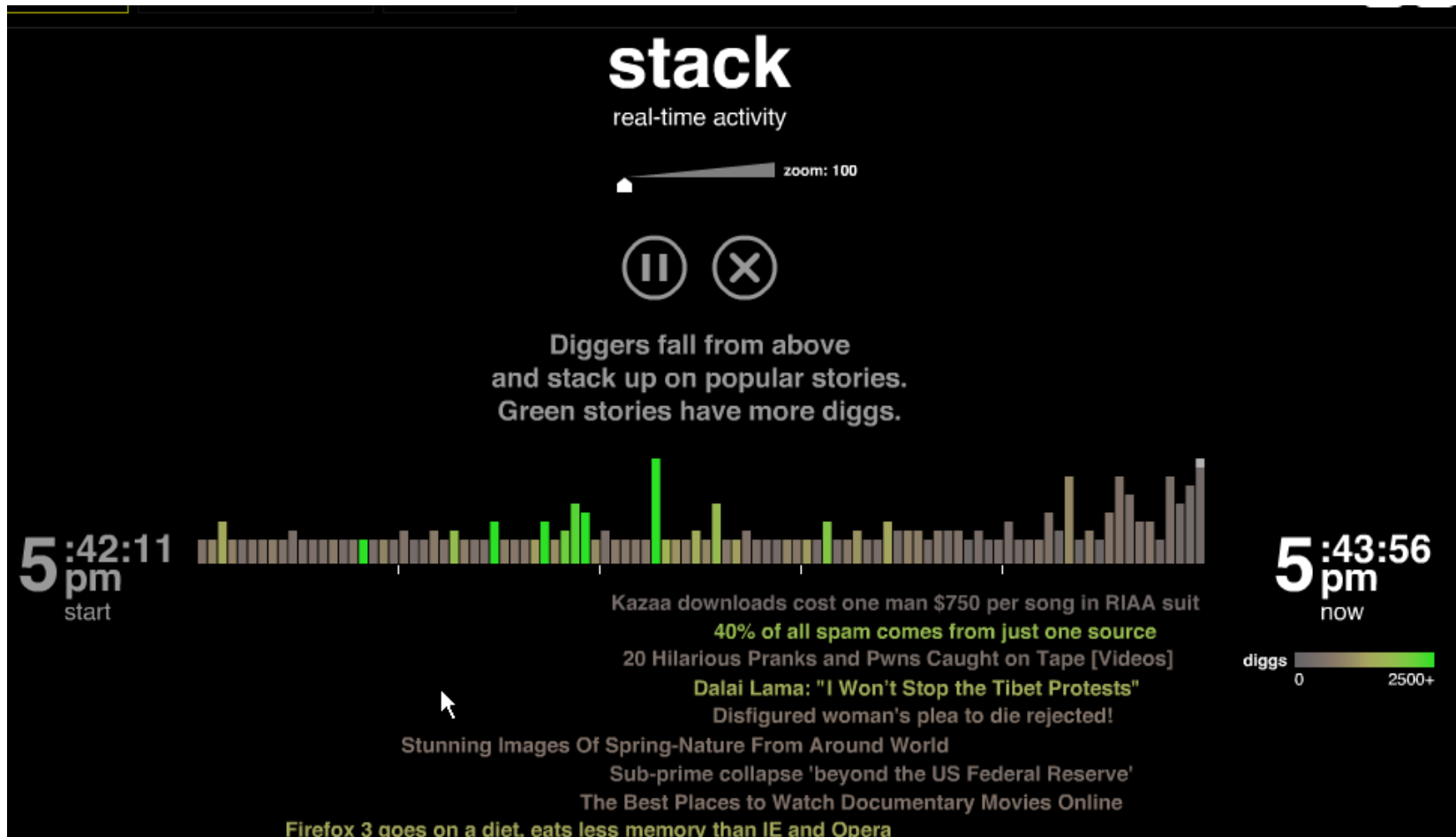
Secret Lives of Numbers by Golan Levin

- <http://www.turbulence.org/Works/nums/applet.html>



Animated Visualizations at Digg

<http://labs.digg.com/>



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.

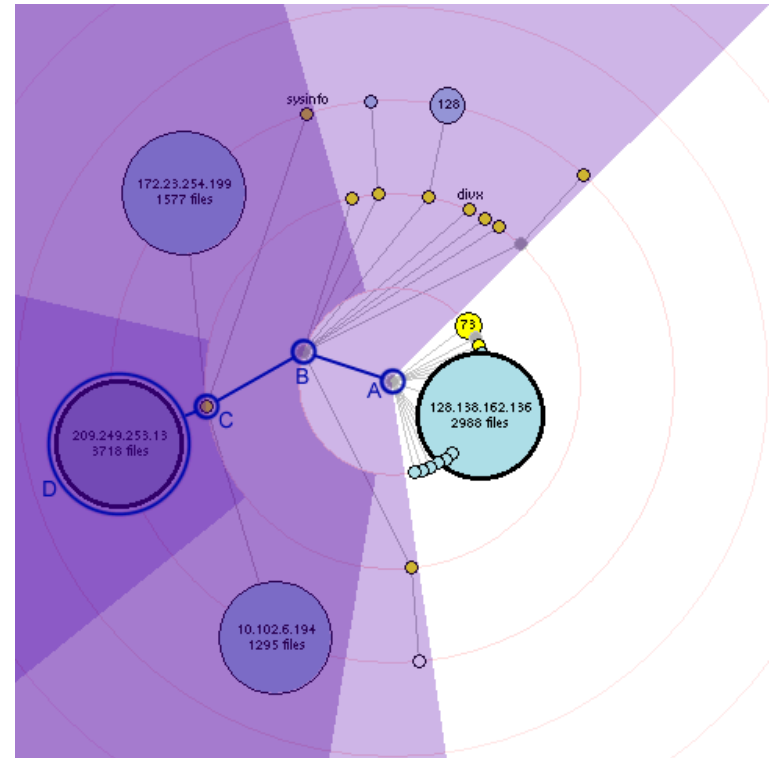
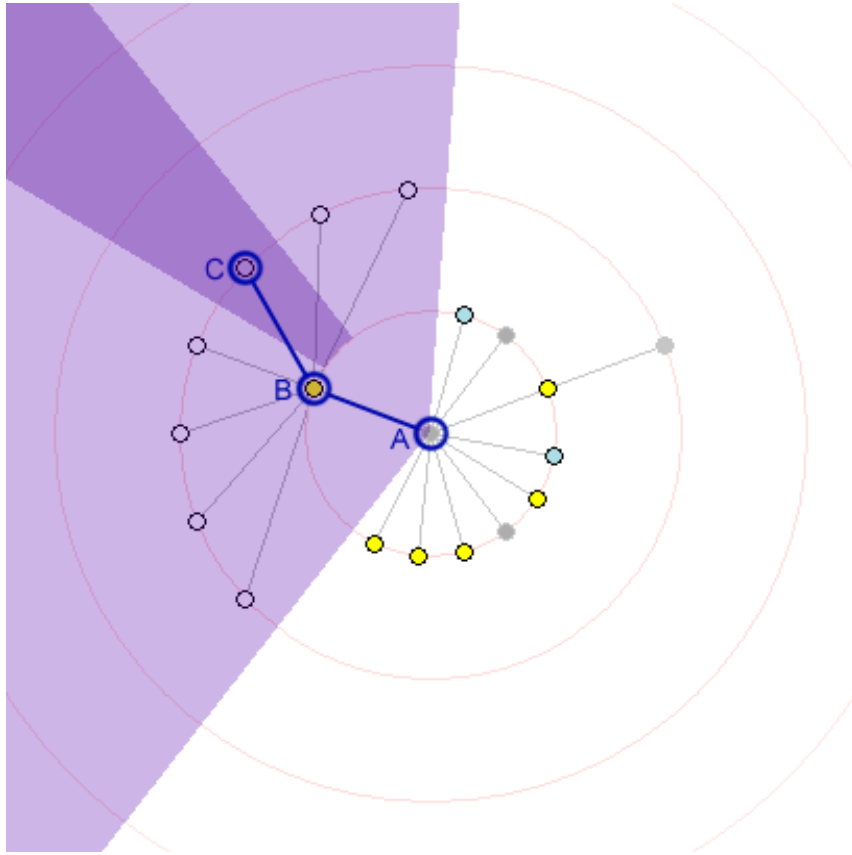
Cartoon Animation in User Interface Design

- 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

- **Animated Exploration of Graphs with Radial Layout**, Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst, in *IEEE Infovis Symposium*, San Diego, CA, October 2001.
- 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/>

Layout - Illustration



Animation in Gnutellavision

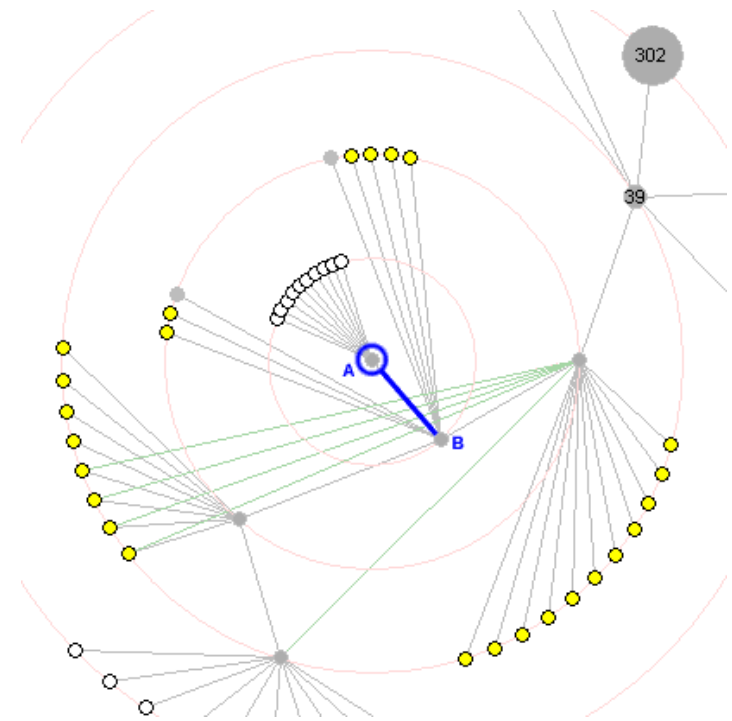
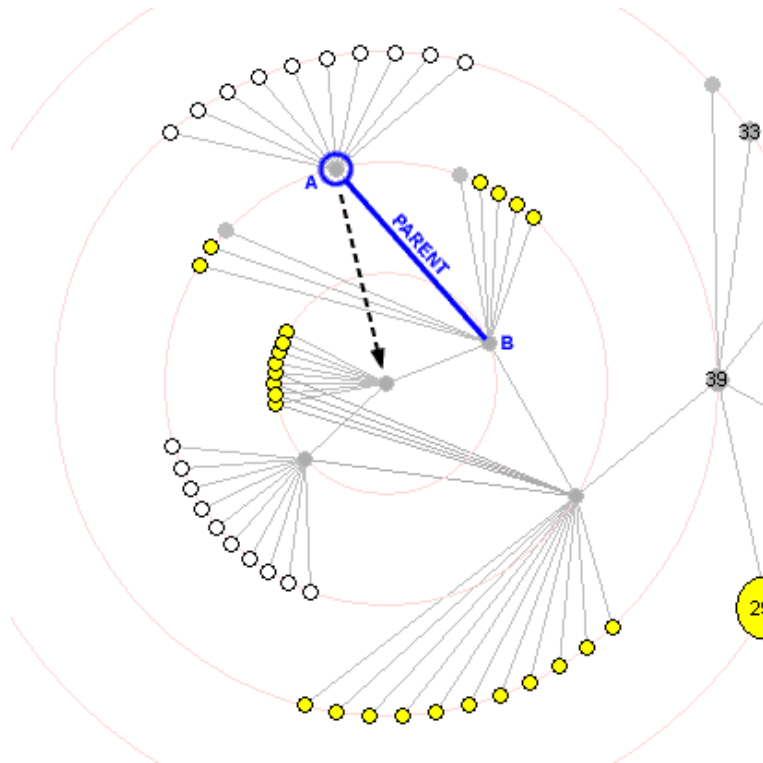
Goal of animation is to help maintain context of nodes and general orientation of user during refocus

- 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

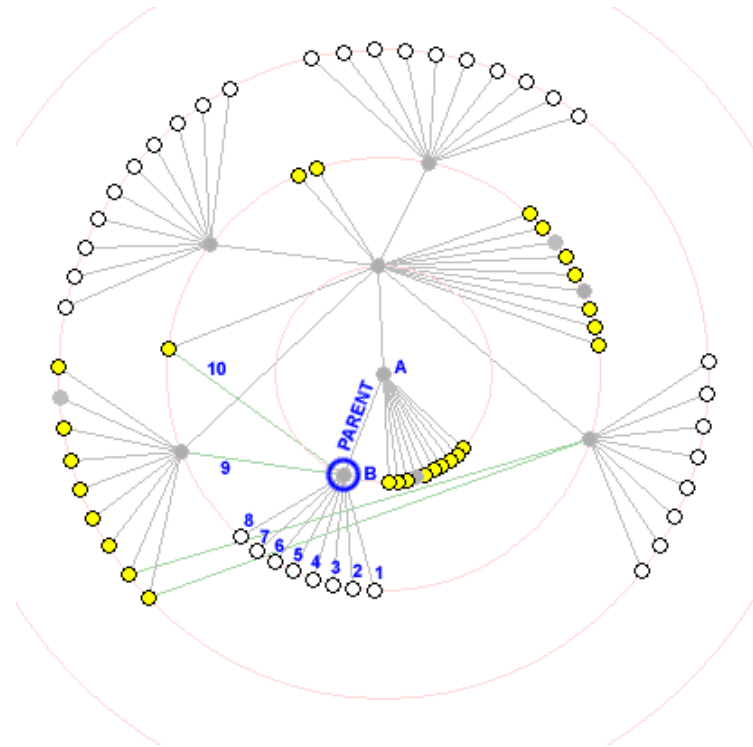
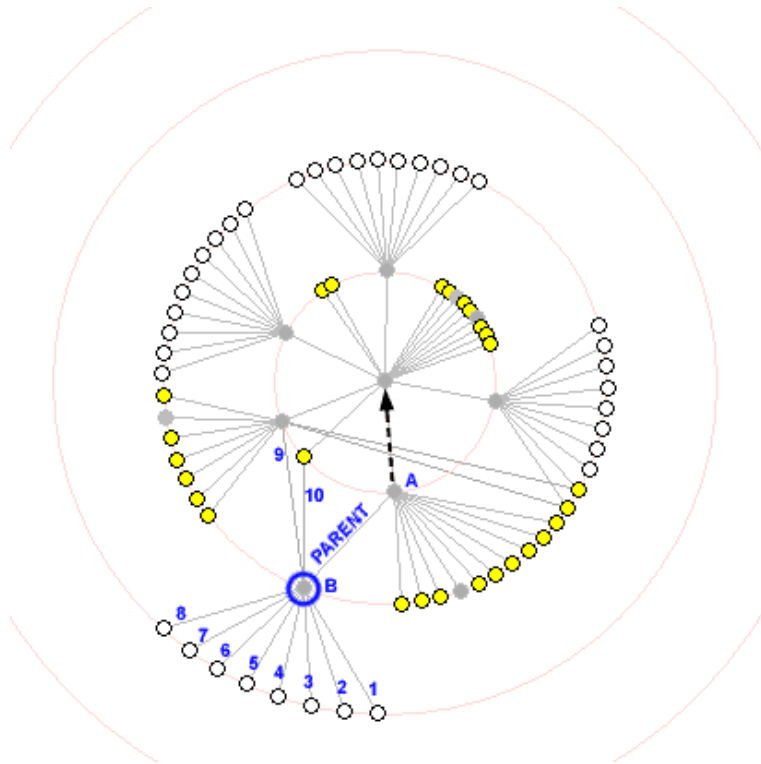
Animation in Gnutellavision (continued)

- 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

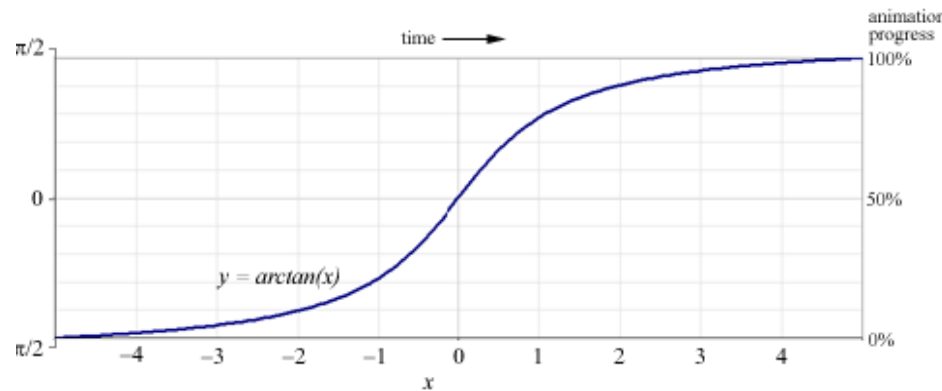


Transition Constraint – Retain Ordering of Neighbors



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.
- Tversky, Morrison, and Betrancourt, Animation: can it facilitate? IJHCS 57, 247-262, 2001.
- 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
 - Kehoe, Colleen, Stasko, John and Taylor, Ashley, "Rethinking the Evaluation of Algorithm Animations as Learning Aids: An Observational Study", International Journal of Human-Computer Studies, Vol. 54, No. 2, February 2001, pp. 265-284
 - 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

- “Animation: Does it Facilitate?” Tversky, Morrison, & Betrancourt, J. Human-Computer Studies, 57, p247-262, 2002.
- 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.