Animation

Presented by Sancho McCann

Animation

- Is animation useful?
- Why?
- Principles of animation
- Principles applied

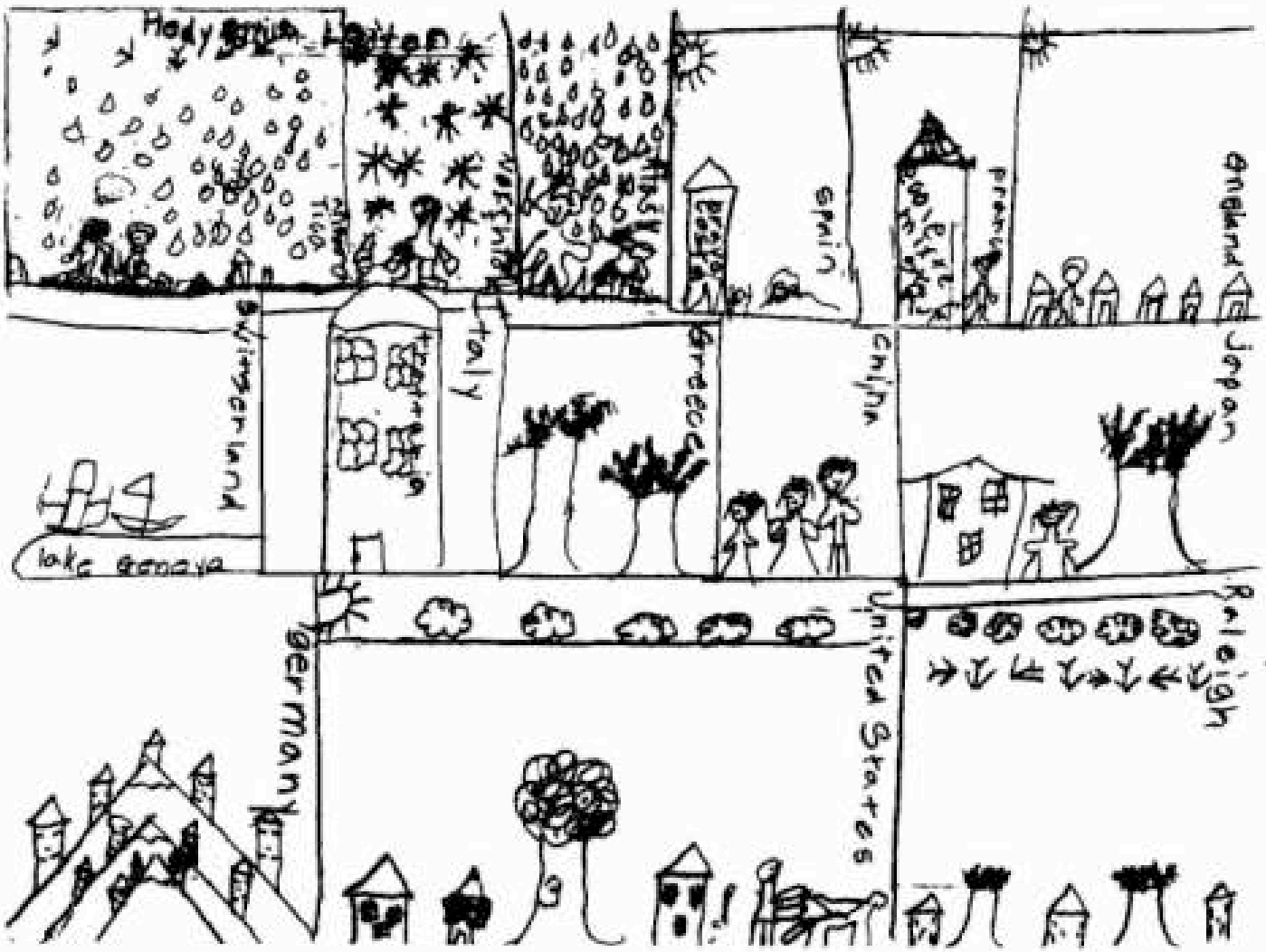
Animation: can it facilitate?

- Does animation help the understanding of changes over time?
- A picture is worth 1000 words; is a 100 frame animation even worth 100 stills?
- “Yes?” - the congruence principle
- “No?” - the apprehension principle

Congruence Principle

- A useful graphic is congruent to the structure and content of the internal representation.

- Either match a users internal representation or,
- Force a useful internal representation.



Hedy Ellis Leiter, age 7, draws the world.

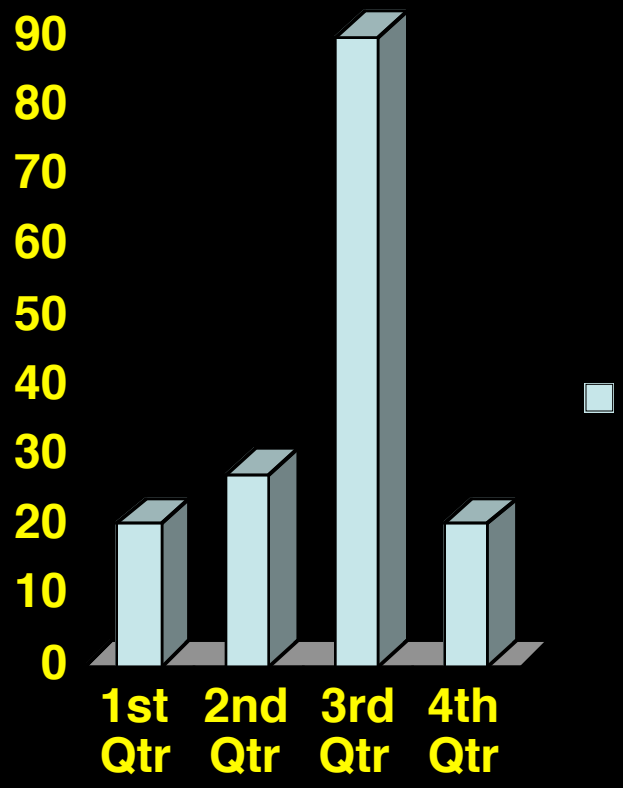
Wood, D. (1992). The Power of Maps.

Maps Work by Serving Interests

The map, from the *Book of Maps* 1885 (p. 114), Wake County Registry, on which lot number 126 is recorded.

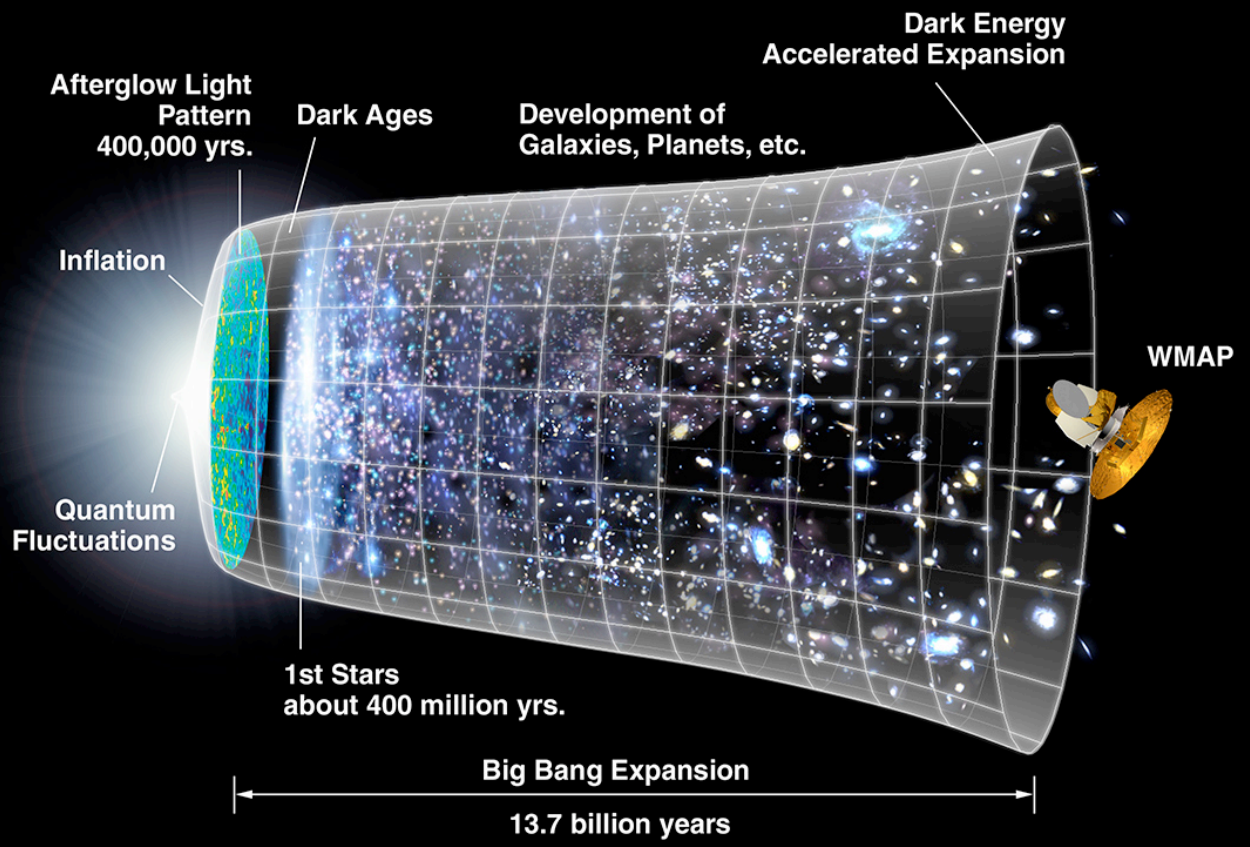
Wood, D. (1992). The Power of Maps.

Congruence Principle Violated

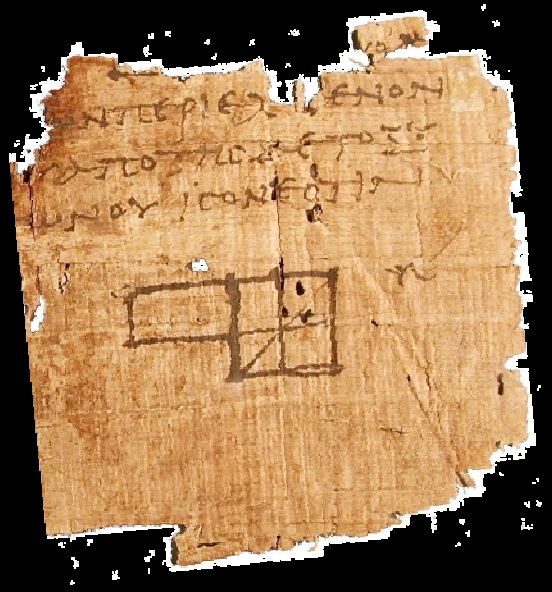


- 3D does not improve congruence;
- 3D does not improve performance, speed, accuracy, or memory.

Congruence Principle Applied



Congruence in Static Graphics



http://www.math.ubc.ca/~cass/Euclid/papyrus/papyrus.html

US Patent 223898

http://www.classicmaps.com

- Using space to portray space has been widely successful for millennia.

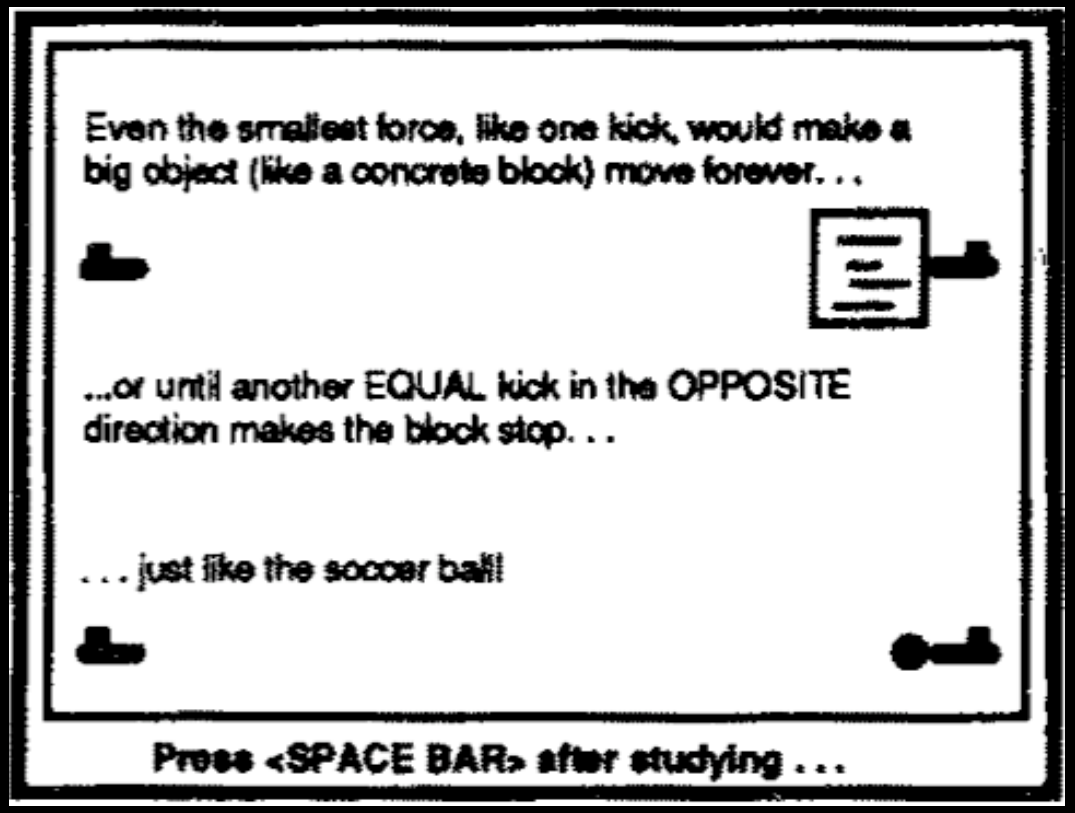
Congruence in Animations

Does Animation Facilitate?

- How could we compare the effectiveness of an animated presentation against a static presentation?

Rieber's Animated Graphic

- Block and ball moved at different speeds



Rieber, L. P. (1991a). Animation, incidental learning, and continuing motivation. *Journal of Educational Psychology*, 83, 318–328.

Rieber's Static Graphic

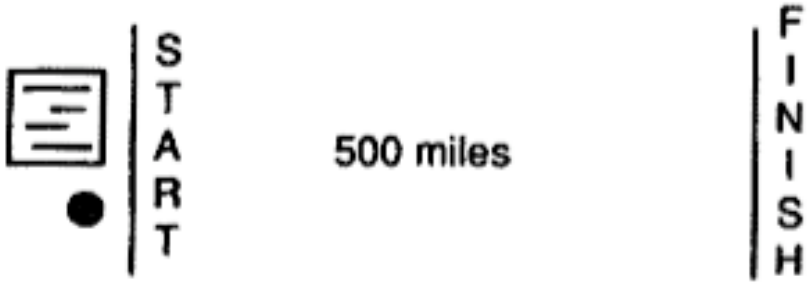
- No information about speeds of the objects was presented, only arrows to indicate direction of motion.

Rieber, L. P. (1991a). Animation, incidental learning, and continuing motivation. *Journal of Educational Psychology*, 83, 318–328.

Rieber's Post Test

Question 12 of 12

Imagine a race in outer space between a ball and a concrete block.



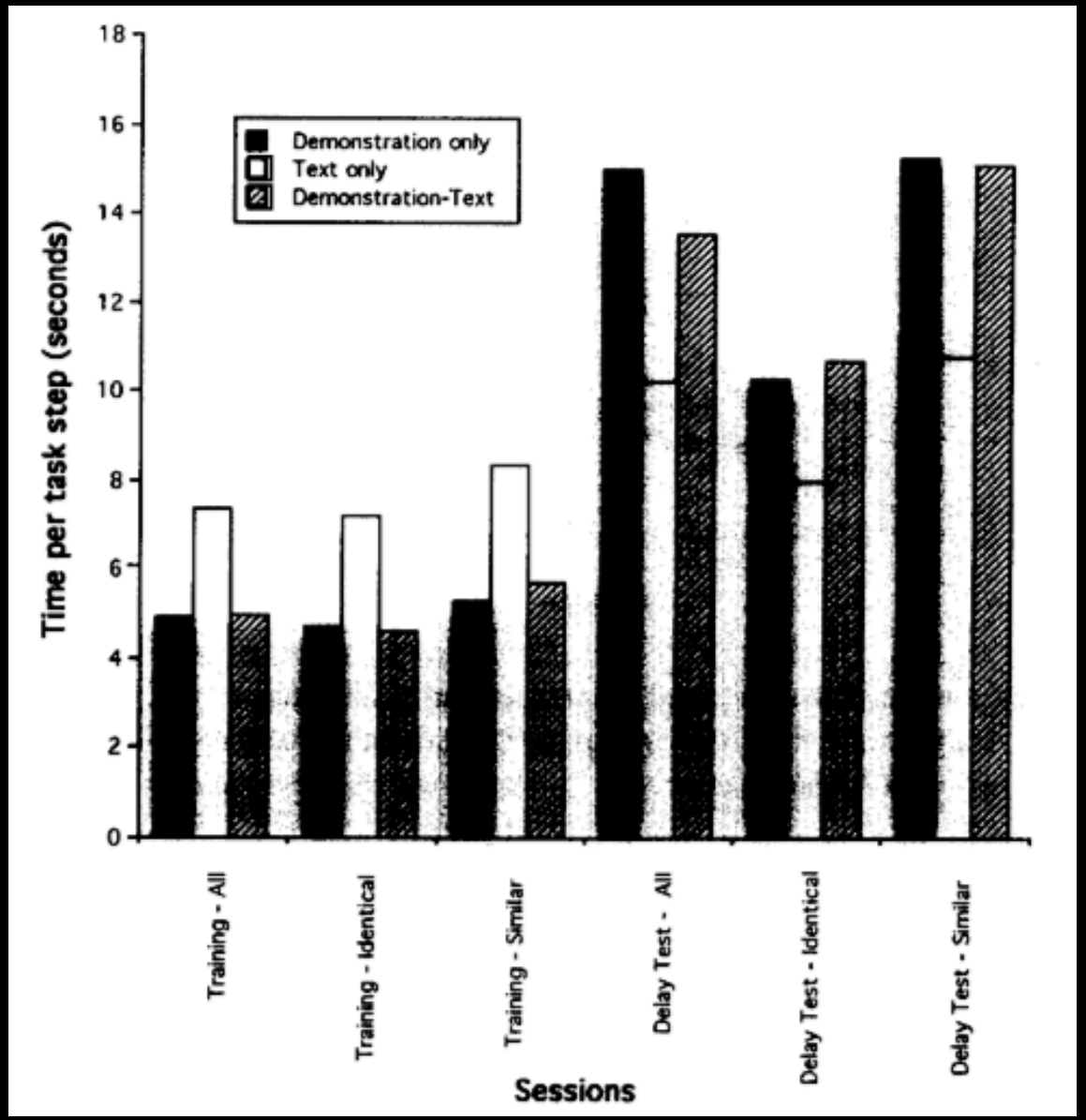
If both are given kicks of the same strength at the start, which of the following is true?

1. It's impossible to know which would win.
2. The race will end in a tie.
3. The block will win the race.
4. The ball will win the race.
5. Both will stop before the finish line.

Rieber, L. P. (1991a). Animation, incidental learning, and continuing motivation. *Journal of Educational Psychology*, 83, 318–328.

Does Animation Facilitate?

- Many of the studies have confounding variables on the results of the test:
  - The animation was interactive
  - The animation showed more information
- Comparison on equal ground:
  - Tutorials based on animation are actually not remembered well



Palmiter, S. & Elkerton, J. (1993). Animated demonstrations for learning procedural computer-based tasks. *Human–Computer Interaction*, 8, 193–216.

Why Not?

- The apprehension principle states that the external representation must be readily and accurately perceived and comprehended.
- Animation violates this principle!

Why Not?

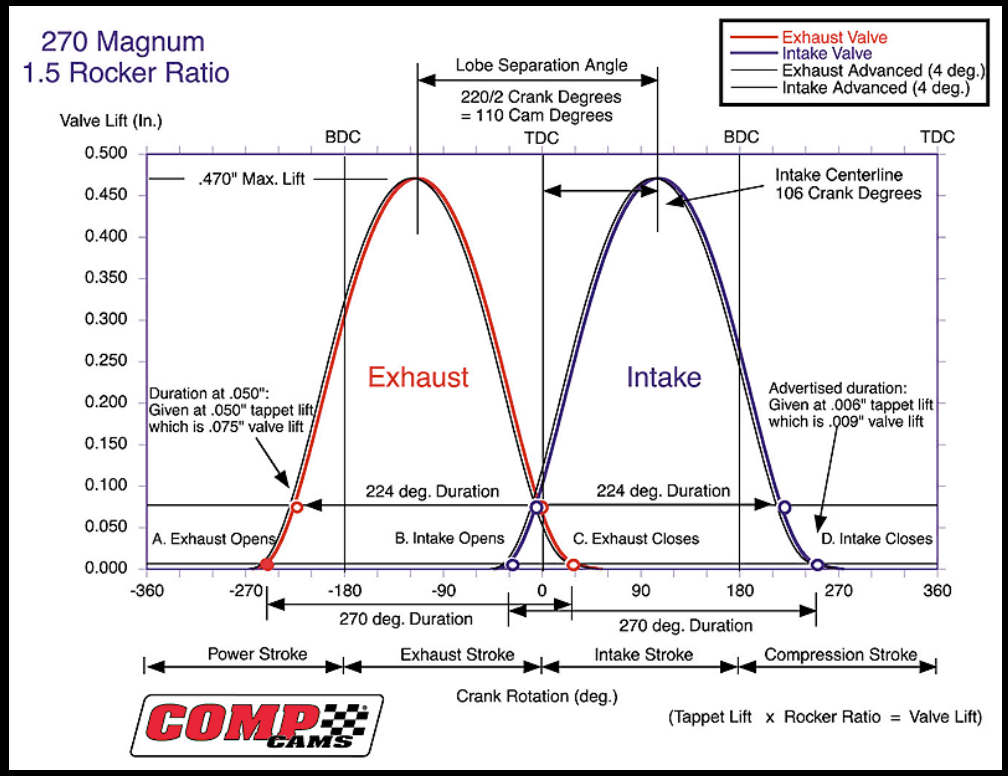
- Minds are not easily forced to hold a continuous representation.
- Animations are comprehended discretely.
- Different viewers will take away different elements from an animation.
- Animation is fleeting.

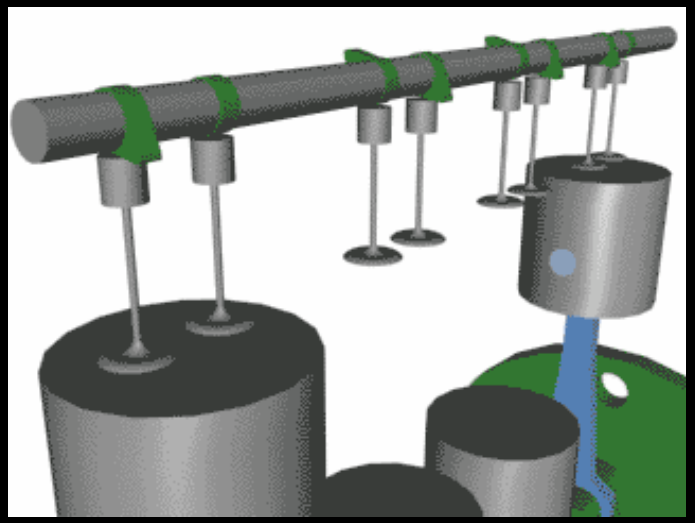
Advice

- Useful when timing is important
- Realism is not important, your information is
  - Slow down animations at critical phases
  - Annotate, highlight, direct attention
  - Eliminate unnecessary information
- Allow interaction

The Music Animation Machine

Animation useful for timing?





Interactive Animation

- Richard Lowe. User-Controllable Animated Diagrams: The Solution for Learning Dynamic Content?

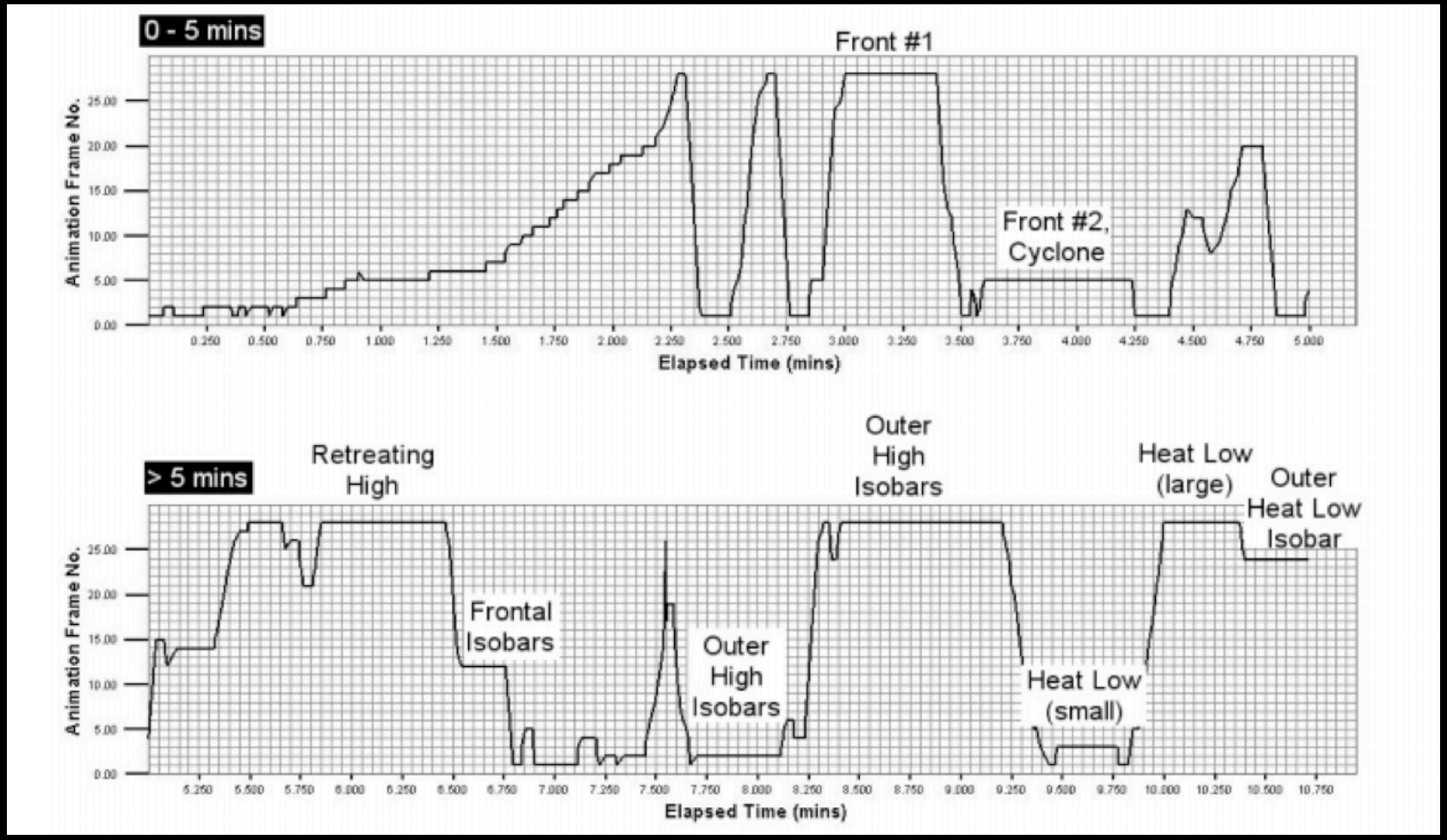
Interactive Animation

- Animation is not fleeting
- Animation is not overwhelming
- View animation at any speed
- Extract fine and coarse grained information

Interactive Animation

- Given:
  - 28 frame user-controllable weather map representing a 7 day period
  - Another “Original” weather map
- Task:
  - Use patterns learned in the animation to predict the weather map 24 hours after the “Original”

Interactive Animation



Richard Lowe. User-controlled animated diagrams: the solution for learning dynamic content?. In Lecture Notes in Computer Science - Diagrammatic Representation and Inference. Springer-Verlag, 2004.

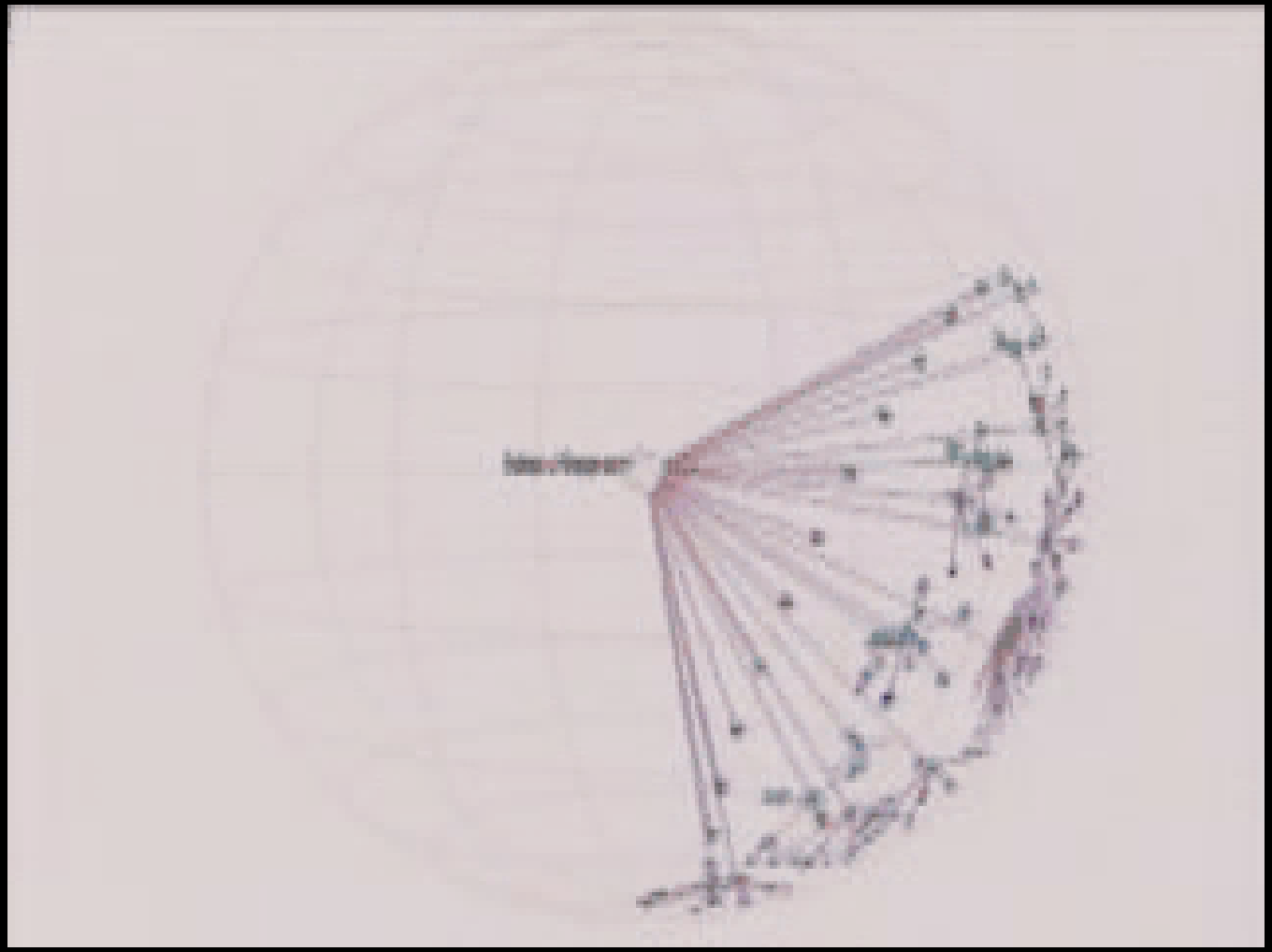
Interactive Animation

- Animation only used for an overview
- Novice users did not use animation to learn temporal relations between features; they didn’t know to look!
- The animation degraded to a flip-book of images

Animated Interaction

- Animation does aid understanding of interactive and dynamic changes to an interface.

Animated Interaction



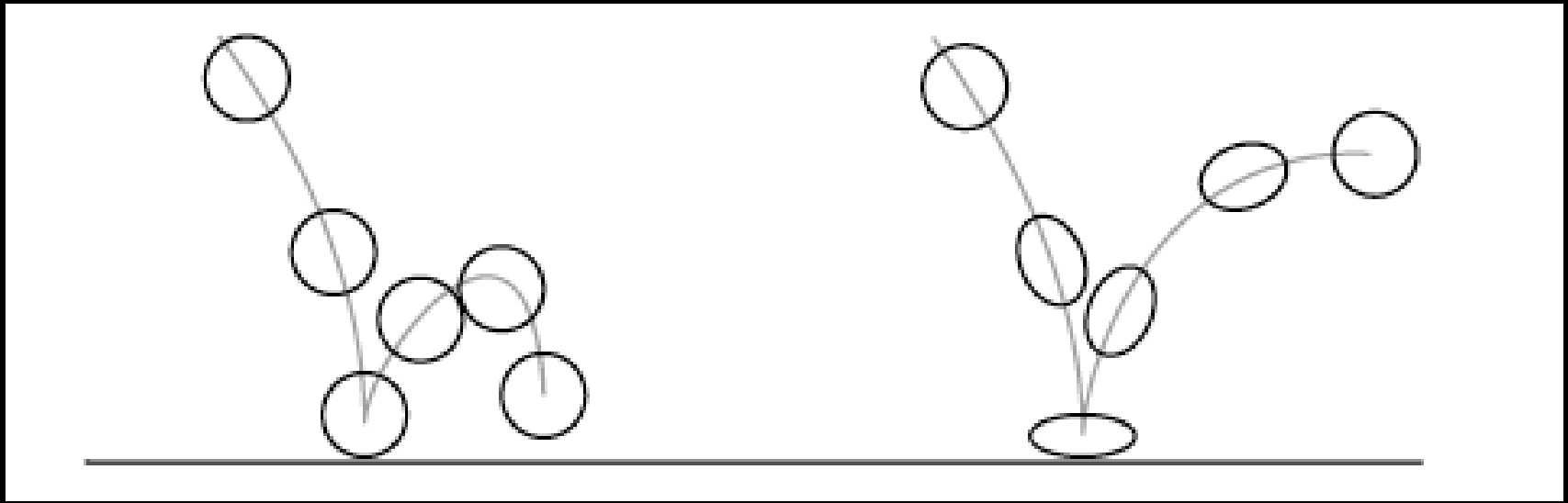
Principles of Animation

- John Lasseter. Principles of Traditional Animation Applied to 3D computer Animation. 1987.

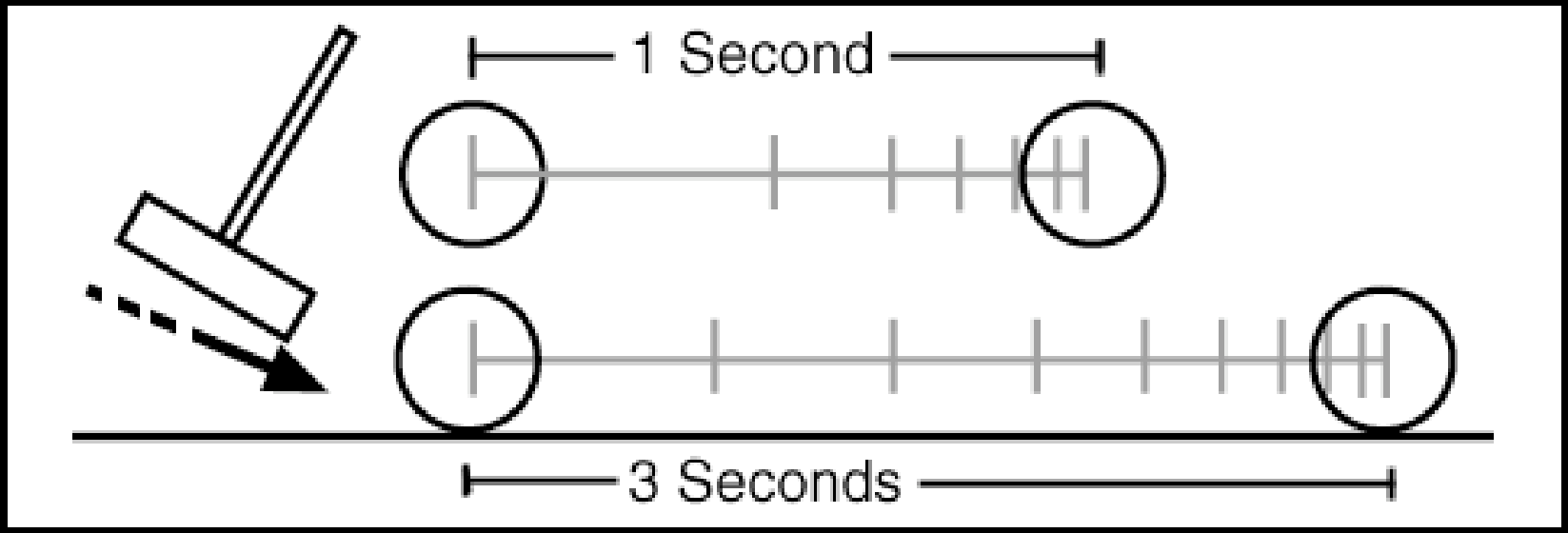
Principles of Animation

- From classes promoted by Walt Disney in the 1930s, The 11 Principles arose

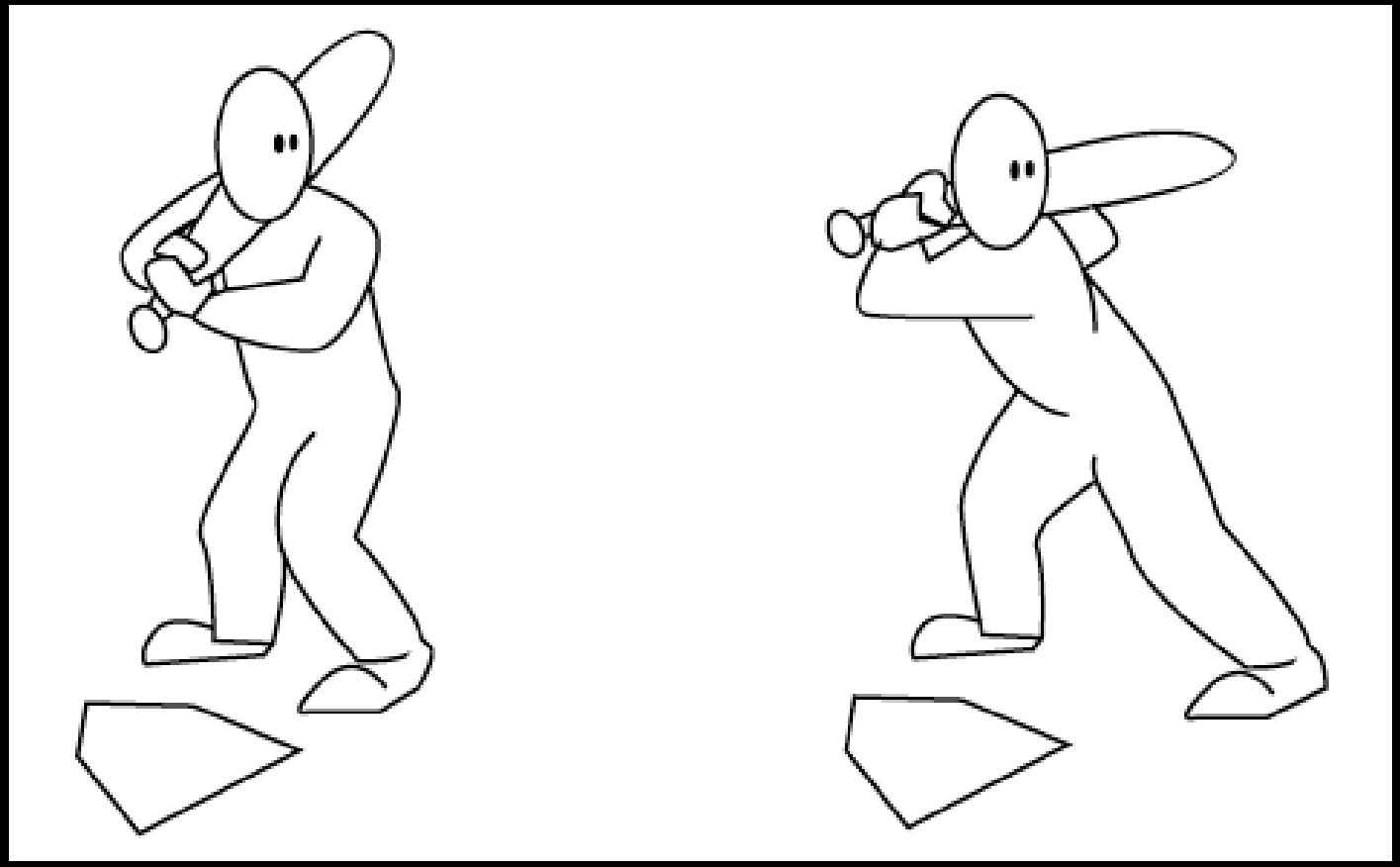
Squash and Stretch



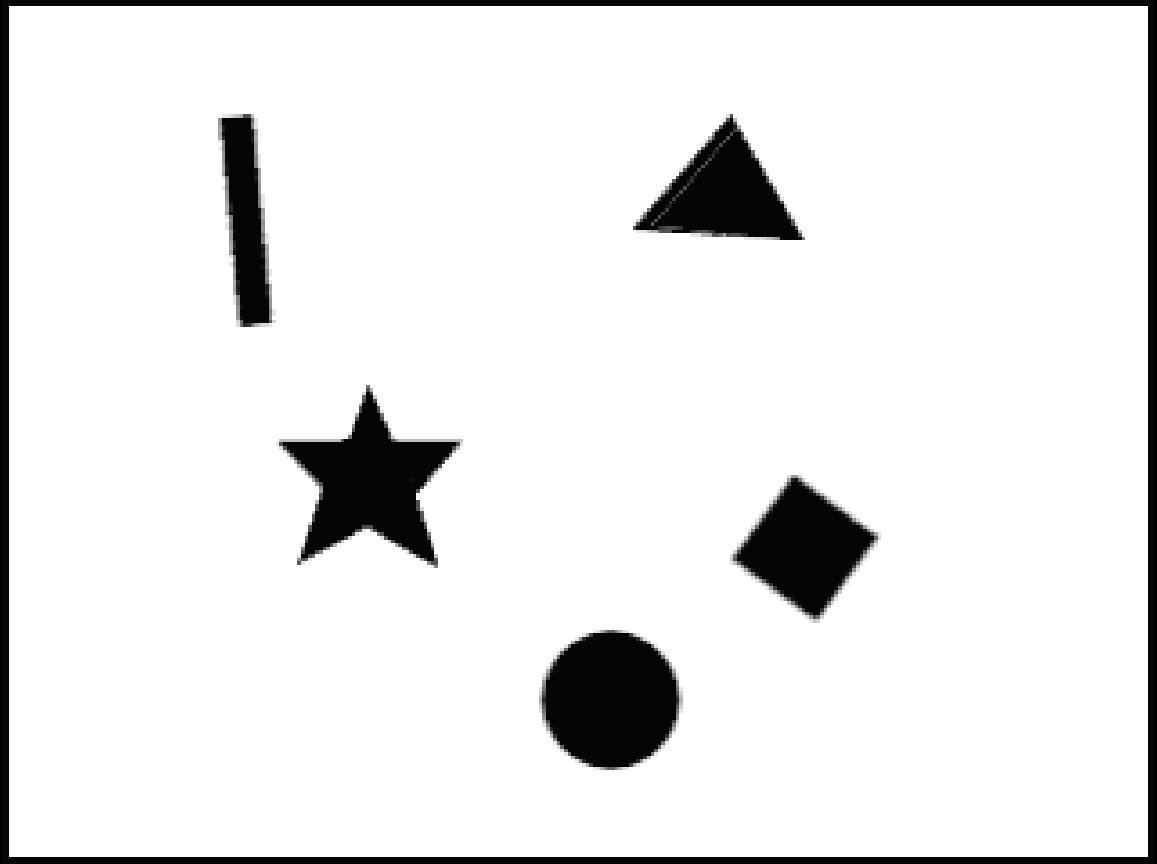
Timing



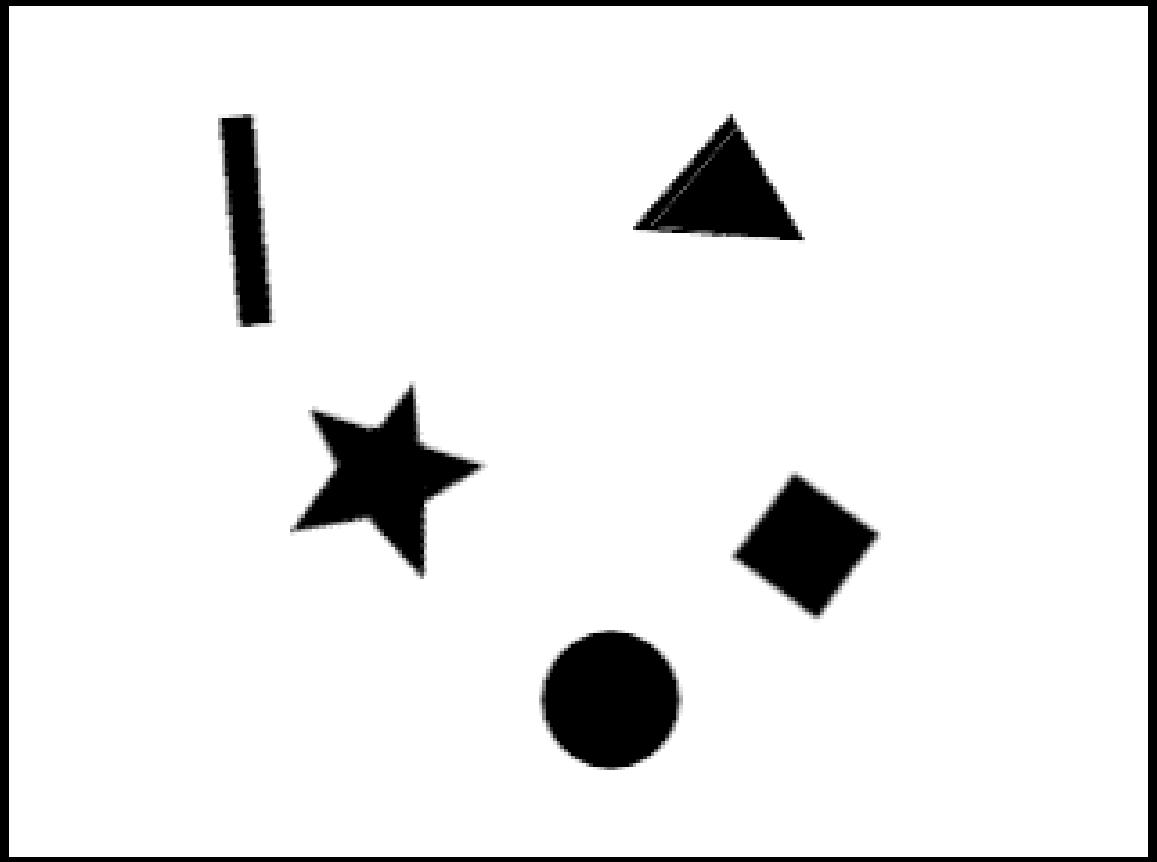
Anticipation



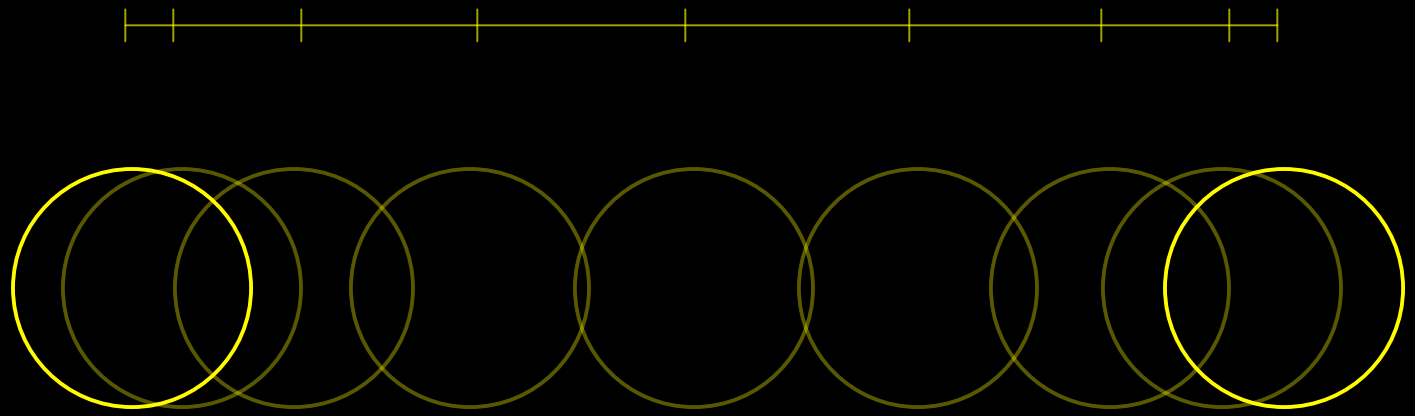
Staging



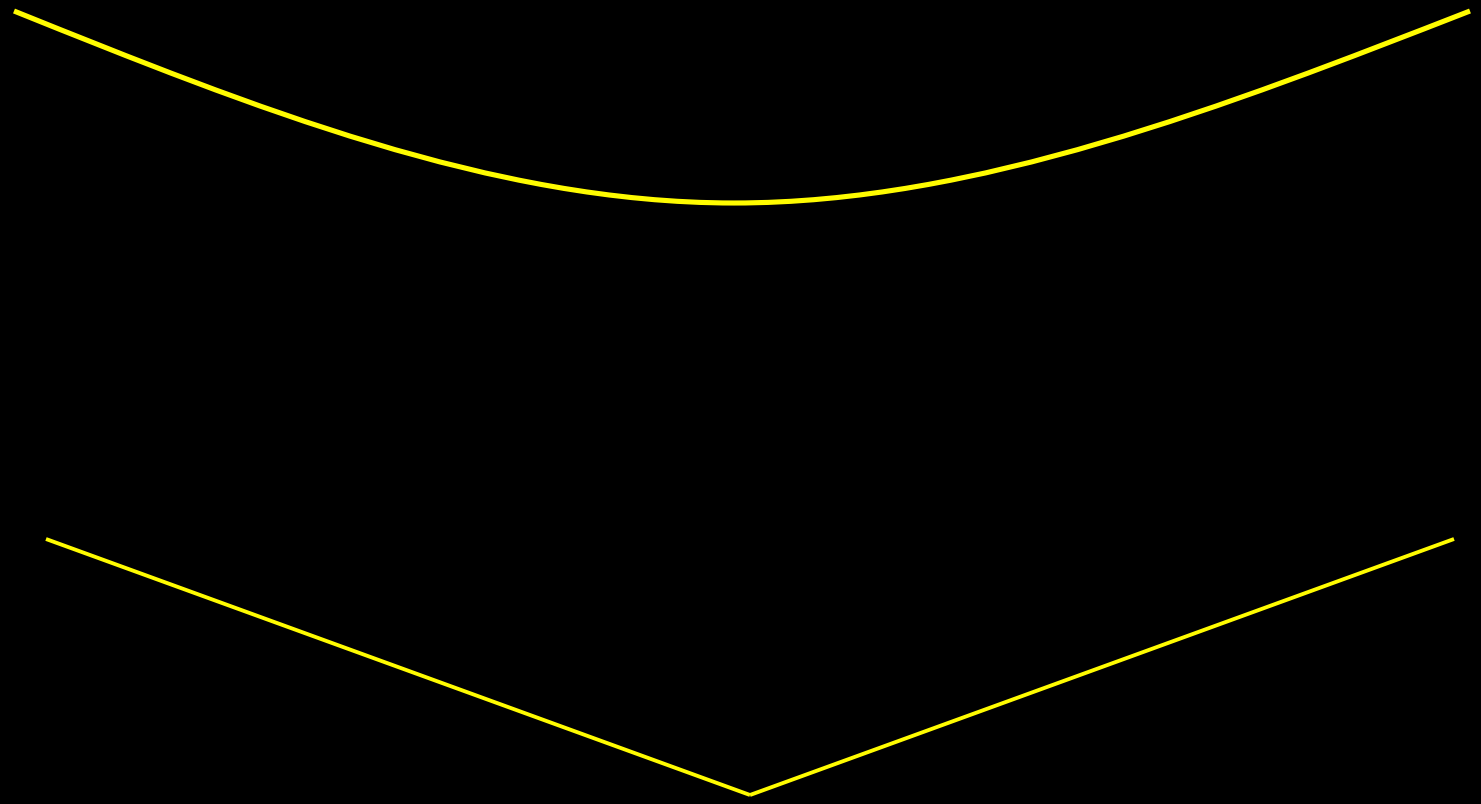
Staging



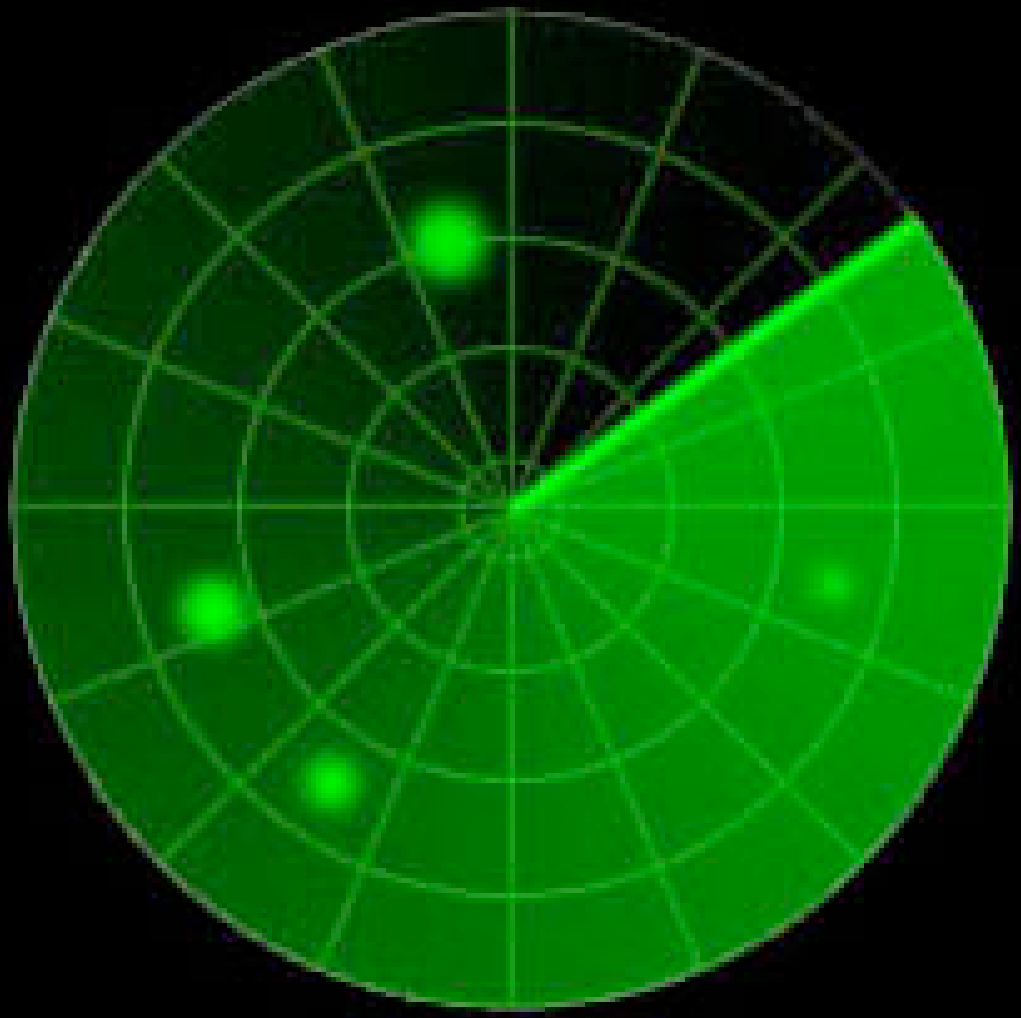
Slow-In Slow-Out



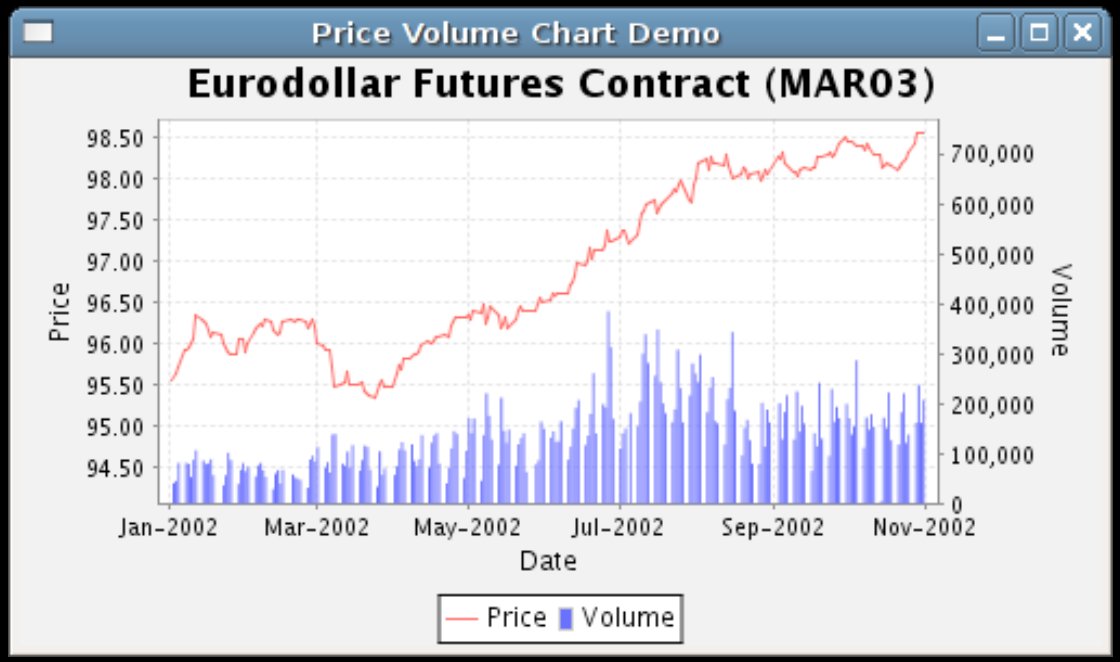
Arcs

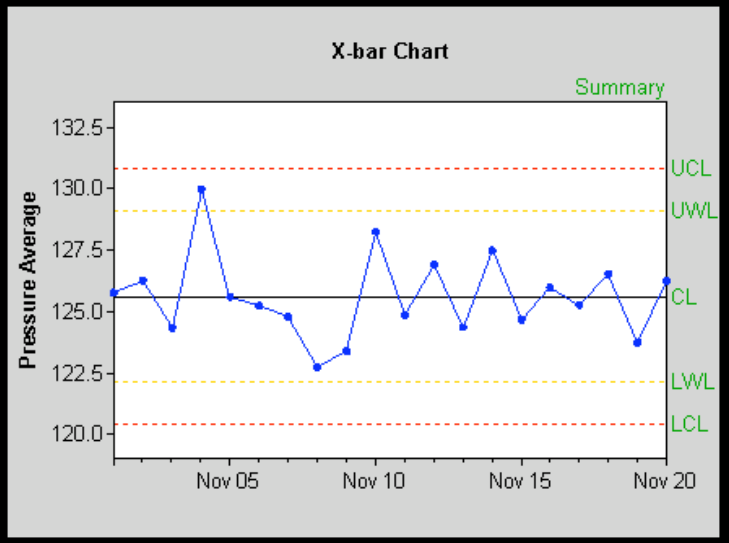


Exaggeration



Appeal

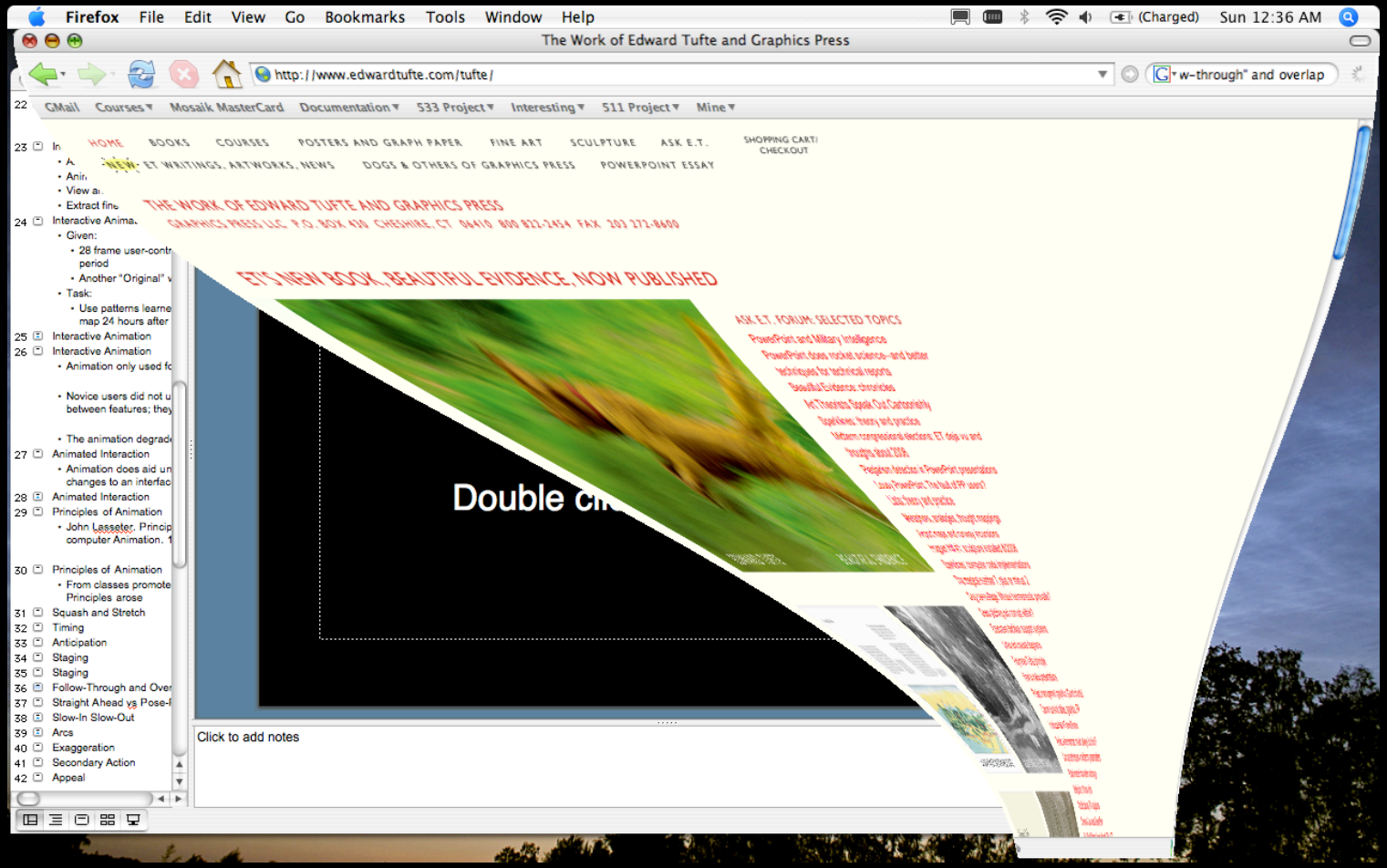

Price Volume Chart Demo
Eurodollar Futures Contract (MAR03)
98.50
98.00
97.50
97.00
96.50
96.00
95.50
95.00
94.50
Price
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Volume
Jan-2002
Mar-2002
May-2002
Jul-2002
Sep-2002
Nov-2002
Date
Price
Volume


X-bar Chart
Summary
132.5
130.0
127.5
125.0
122.5
120.0
Pressure Average
UCL
UWL
CL
LWL
LCL
Nov 05
Nov 10
Nov 15
Nov 20

Three Other Principles

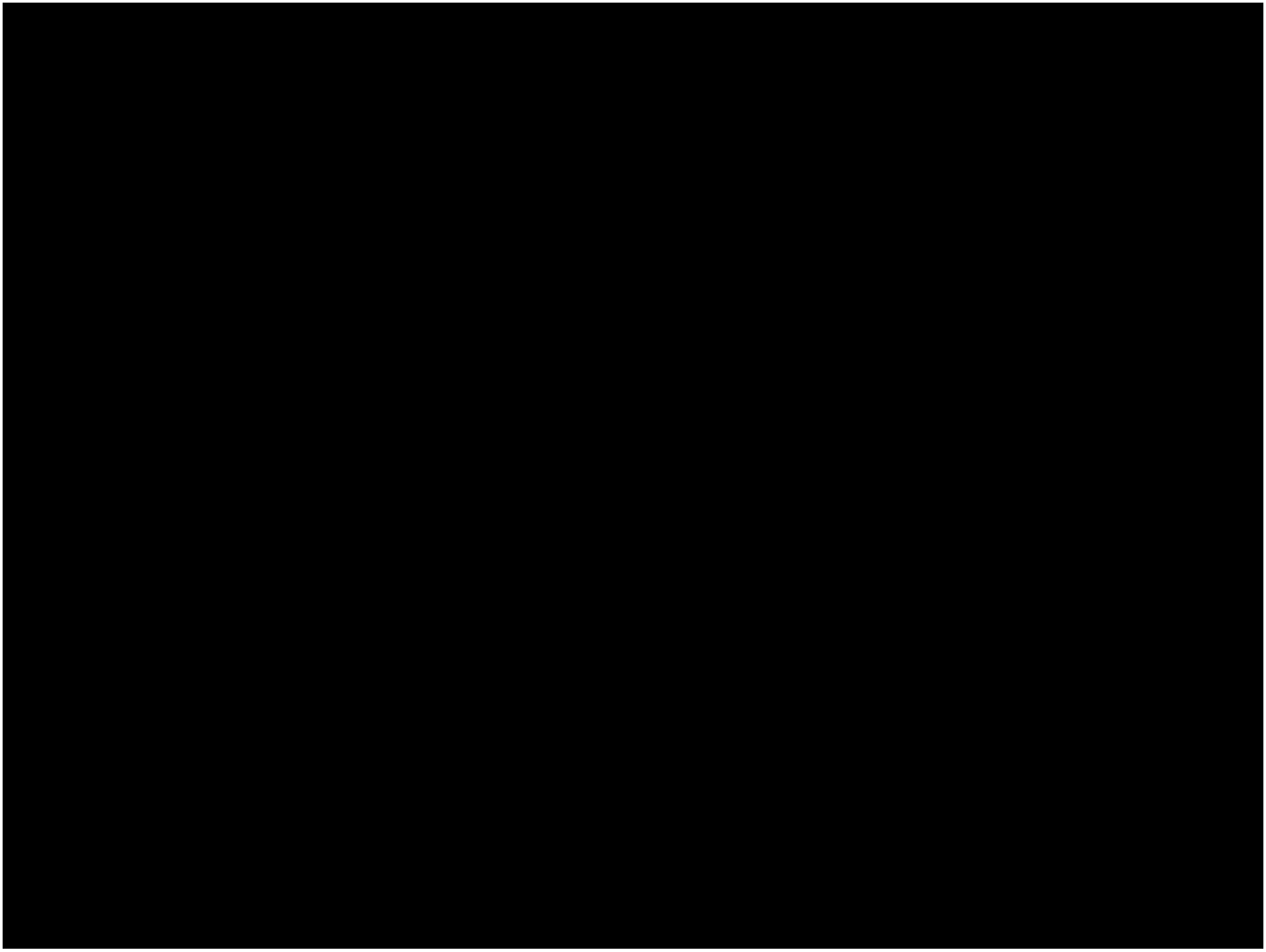
- Follow-through and Overlapping Action
- Straight Ahead or Pose-to-Pose
- Secondary Action

Principles Applied



An Application

- David Carr and Matja_ Kljun. The Effect of Animated Transitions on User Navigation in 3d Tree-Maps. *Proceedings of the 9th Intl. Conference on Information Visualization (IV 2005)*.



An Application

- How is staging applied?
- How is anticipation applied?
- What other principles are applied?
- What principles could have been applied?

Discussion

- Animation did allow for different types of navigation - short-cuts
- The short-cuts were not effective - users got lost.

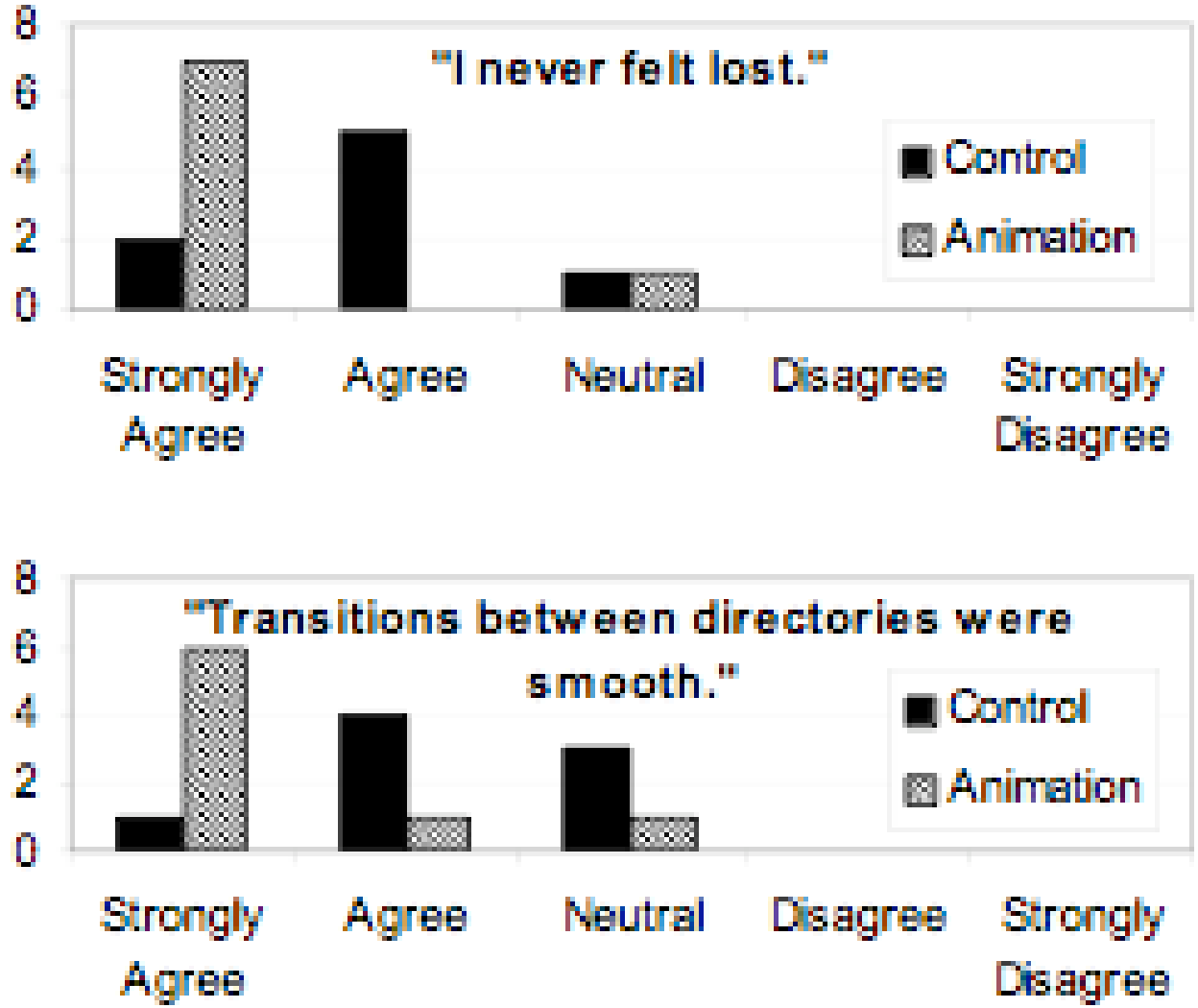


Figure 3.4. Responses to selected questionnaire statements.

Summary

- Animation is deceivingly attractive
- Interactive animation *might* help
- Animated interaction does help

Papers

- Barbara Tversky, Julie Bauer Morrison and Mireille Betrancourt. Animation: can it facilitate?. In International Journal of Human-Computer Studies, 57 . Elsevier Science Ltd, 2004.
- Richard Lowe. User-controlled animated diagrams: the solution for learning dynamic content?. In Lecture Notes in Computer Science - Diagrammatic Representation and Inference. Springer-Verlag, 2004

Papers

- John Lasseter. Principles of traditional animation applied to 3D computer animation. In ACM Journal of Computer Graphics, 21 - 4, July 1987.
- Bladh, T., Carr, D. A., and Kljun, M. 2005. The Effect of Animated Transitions on User Navigation in 3D Tree-Maps. In Proceedings of the Ninth international Conference on information Visualisation (Iv'05) - Volume 00 (July 06 - 08, 2005). IV. IEEE Computer Society, Washington, DC, 297-305.