Animation

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Three papers:

- **Animation: Can It Facilitate?**  
  Barbara Tversky et al., Int. J. of Human Computer Studies  
  - Or, “*Animation*, huh, yeah. *What is it good for?* Absolutely nothing.”

- **Principles of Traditional Animation Applied to Computer Animation**  
  John Lasseter, SIGGRAPH ’87.  
  - Or, “*How to look at women and sports cars.*”

- **Interactive Visualization of Genealogical Graphs**  
  - Or, “*Incest throws a wrench into things!*”
Animation: Can it facilitate?

- Review paper, circa 2002
- Seeks to address the following question:
  “This animation thing seems to make sense and everyone’s pretty excited about it, but does it really help?”
Animation: Can it facilitate?

- (Static) graphics are pretty great for things which are:
  - inherently visuospatial (e.g. maps)
  - metaphorically visuospatial (e.g. Org. chart)
So, animation should be naturally great for visuospatial things which vary in time

E.g. complex machinery or CS data structure.

Has this theory been borne out in practice (a.k.a. “the literature”)?
Animation: Can it facilitate?

- Review is in three sections:
  - Incomparable content
  - Incomparable procedures
  - Failures of animation to benefit

- Take home message: Everything is hopelessly confounded by extra information, interactivity, etc.
Animation: Can it facilitate?

- A telling quote:
  
  “The continuous animation depicted all the lower level actions, while that information had to be inferred from both of the other graphics.”

- If a medium is so well-suited to showing these lower level actions that they keep entering the studies, maybe that’s not a bad thing?
Principles of Trad. Animation

- Time for some fun!
- Framed in terms of character animation, but still applies to visualization
  - We’re still telling a story
  - We face the same limitations of audience perception as animators do
- Lists 11 key principles, mention a few here
Squash and stretch

- Maintain volume
- Accentuates sense of speed
- Prevents strobing
Principles of Trad. Animation

- **Timing**
  - Keep audience’s attention
  - Gives feeling of weight to objects

- **3 stages:**
  - Anticipation of the action
  - The action itself
  - Reaction to the action (follow through and overlapping action)

Principles of Trad. Animation

- **Timing**: Inbetweens ("tweens") are frames between the start pose and end pose

- **NO inbetweens**: The Character has been hit by a tremendous force, his head is nearly snapped off.

- **FOUR inbetweens**: The Character is giving a crisp order, "Get going!" "Move it!"

- **SIX inbetweens**: The Character sees a good looking girl, or the sports car he has always wanted.

- **TEN inbetweens**: The Character stretches a sore muscle.
Principles of Trad. Animation

- Slow In and Out
  - i.e. 2\textsuperscript{nd} and 3\textsuperscript{rd} order continuity of motion
  - Use splines
  - Expressivity
  - Make things easier to follow

FIGURE 9. Timing chart for ball bounce.
Principles of Trad. Animation

- Arcs
  - Very few things in nature move in straight lines
  - Arcs make animation smoother and less stiff
  - Again, use splines
Principles of Trad. Animation

Russ’ Notes:

- Be careful when applying these principles to visualization
  - Mostly involve distorting “true” poses.
  - If tweens may be treated as data points, this won’t work!
  - Be clear that only “poses” are “real”
Vis. Of Genealogical Graphs

Graph of an actual family, 600+ people over 400+ years
Vis. Of Genealogical Graphs

- Variety of different representations
- E.g. “marriage node”
- Possibly multiple marriages per person
**Vis. Of Genealogical Graphs**

**Problems**

- Long edges (close relatives drawn far away)
- Edge-crossings
- Crowding
- Intermarriage (pedigree collapse)
  - Type 1 (consanguine): spouses are also cousins
  - Type 2 (conjugal): cycle containing another marriage
  - Might not be able to draw generation on one line
**Vis. Of Genealogical Graphs**

- Hourglass chart: ancestor tree and descendant tree from same node

- Dual tree: ancestor tree and descendant tree from different nodes
Vis. Of Genealogical Graphs

- Make $x$ left-most node of $D(y)$, and $y$ right-most node of $A(x)$
Vis. Of Genealogical Graphs

- Used staged animation to manage transitions
  - Fade out nodes no longer needed
  - Move new “x” or “y”
  - Fade in new nodes
  - Staging makes it easier/possible to track the moving nodes as clutter is reduced
Animation

Questions?