

Sketch & sculpt techniques CSC490 Fall 2011

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Sketchpad (Ivan Sutherland 1963)



Creative communication

The transformation of a creative vision into a digital reality, that is easy to refine and reuse.

Why is it challenging?

Humans have an audio IN and OUT,
a video IN but no explicit video OUT!

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a **biased** video IN but no explicit video OUT!

^

we need WYSIWYP instead of WYSIWYG!

"what you see is what you perceive/get"

video IN: Perception

- **Visual field:** one eye looking straight at the horizon, with a narrow cone of vision, while standing still.
- **Visual world:** two eyes looking all around with peripheral vision, while moving dynamically.

[**J. Gibson, 1950.** The Perception of the Visual World, *Houghton Mifflin.*]

video OUT: Sketching

Most children between the ages of about 9-11 have a passion for realistic drawing. They become sharply critical of their childhood drawings and begin to draw certain favorite subjects over and over again, attempting to perfect the image. Anything short of perfect realism may be regarded as failure. ... Perhaps you can remember your own attempts at that age to make things “look right” in your drawings, and your feeling of disappointment with the results. ... Looking at your drawings, you may have said, as many adolescents say, “This is terrible! I have no talent for art. I never liked it anyway, so I’m not doing it anymore.”

[**B. Edwards, 1999.** *The New Drawing on the Right Side of the Brain*, Tarcher/Putnam.]

Issues in Digital Sketching

2D

- **Stroke filtering.** (clothoids, multi-stroke... what are we filtering?)
- **Stroke Processing.** (sketch widgets, gestures...)
- **Strokes and multi-touch.** (gestures, symmetric drawing...)
- Stroke appearance (NPR, neatening...)
- **Stroke dynamics** (pressure, tilt, direction, temporal order...)
- Seamless UI Control (sketch widgets, crossing menus, gestures...)
- **Navigation** (paper manip., onion skinning...)
- **2D curve creation:** (What are desirable curves, how do we perceive them in relation to our design knowledge?).
- **Stroke Perception** (what spatio-temporal information do they convey?)

3D (Additional dimension for 3D design, animation or 2D design explorations)

- **3D Navigation.** (camera tools, single/multi-view, view bookmarks...).
- **3D curve creation:** (2D stroke to 3D curves perception & inference).
- **Animation** (motion trails, evolving shape fronts...)
- Alternate Designs (co-locating them in space...)

Agenda

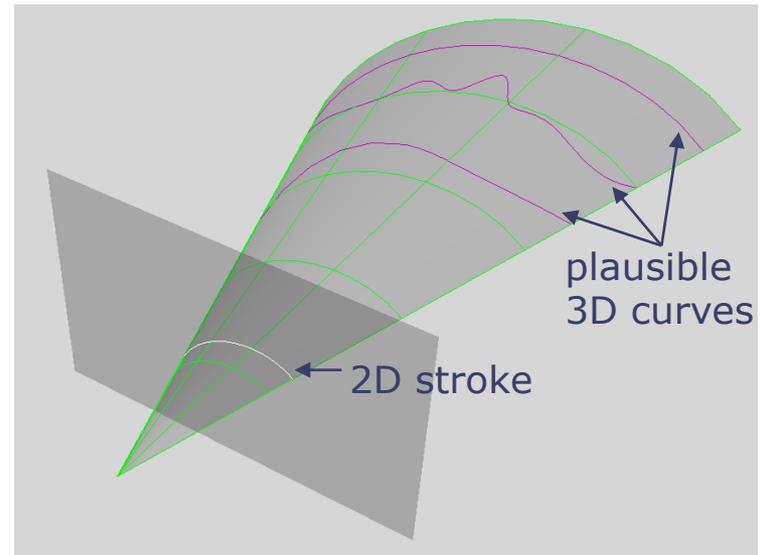
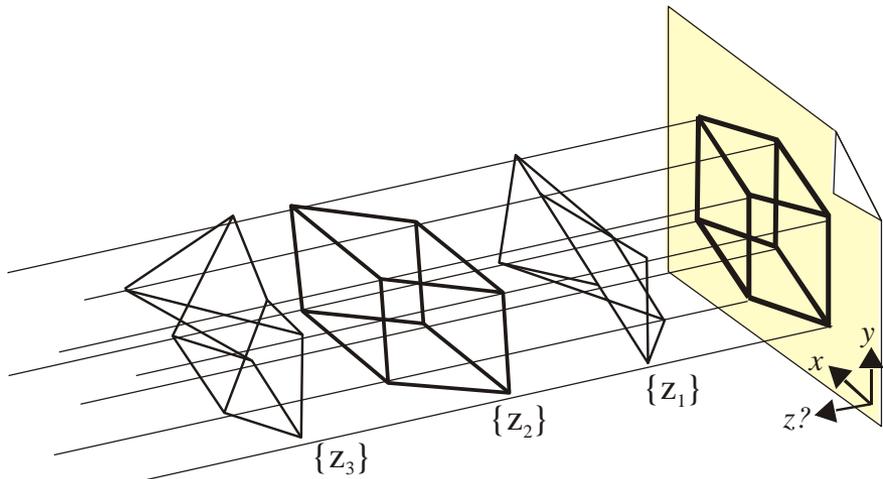
- We will pick an issue almost every week and spend the class discussing it.
- Students should pick a project over the next 10 days in groups of two.
- Students will present a project sketch 2 weeks from today, create a webpage for the project, linked to course page.
- Students will brainstorm ideas every other week.
- Mid-term review.
- Final presentations and report.

Digital sketching & sculpting challenges

- 2D input (mouse, pen tablet) to define 3D.
- 3D input (phantom, mocap) have poorer fidelity, haptics and ergonomics compared to 2D input.
- Inferring 3D shape from 2D input is inherently ambiguous.
- 3D shape is viewed on a 2D display (volumetric and stereo displays have poorer fidelity).

Challenge

2D to 3D: "Depth" component is ambiguous



Human perception †

Combination of

- Visual rules
- Visual memory

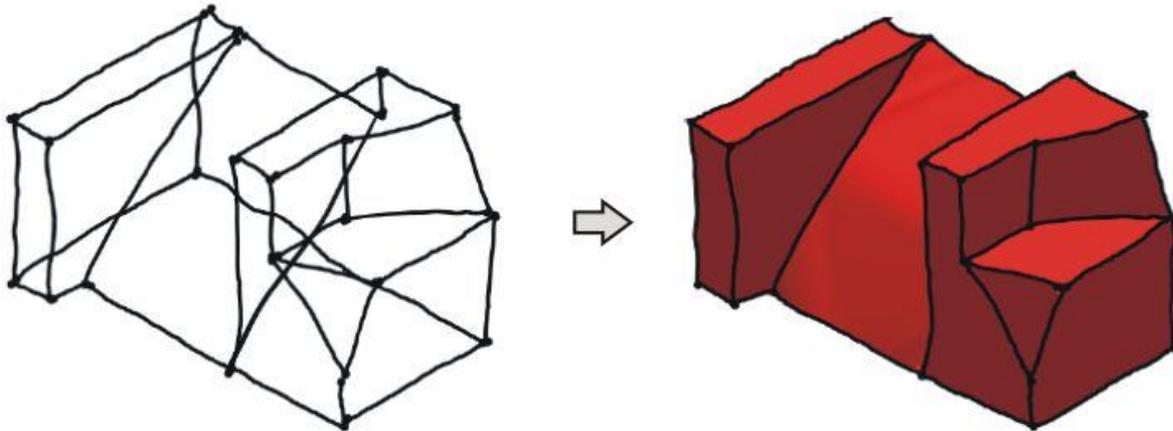
† D. Hoffman, *Visual Intelligence: How We Create What We See*, W.W. Norton & Company, 2000.

Visual rules

...

- Interpret straight/coincident/collinear lines as straight/coincident/collinear lines in 3D.
- Proximity: nearby in sketch -> nearby in 3D.
- Smoothness: Interpret a smooth stroke as smooth in 3D.

...



Visual rules

- May lead to implausible reconstructions

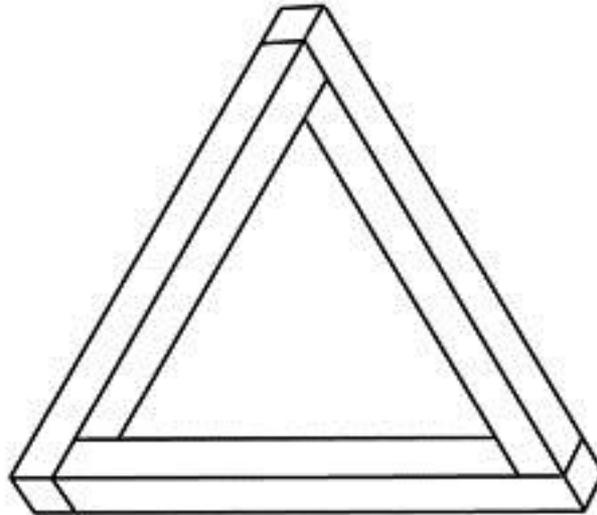


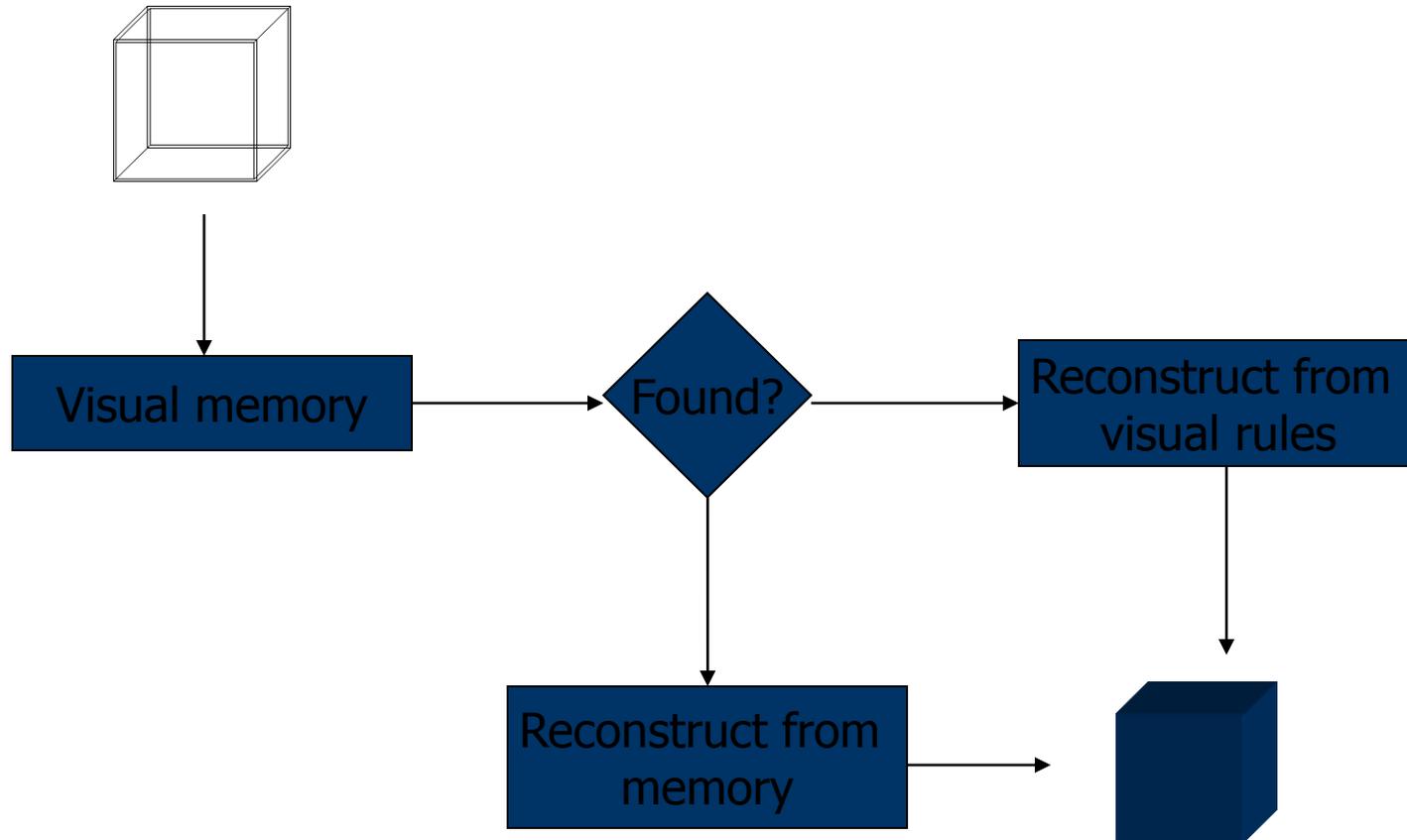
Figure: http://www.at-bristol.co.uk/Optical/ImpossibleTriangle_main.htm
Pictures: <http://im-possible.info/english/articles/real/real3.html>

Visual memory

- Allows for more rich reconstruction
 - How much can we actually see in this image? How much do we infer?



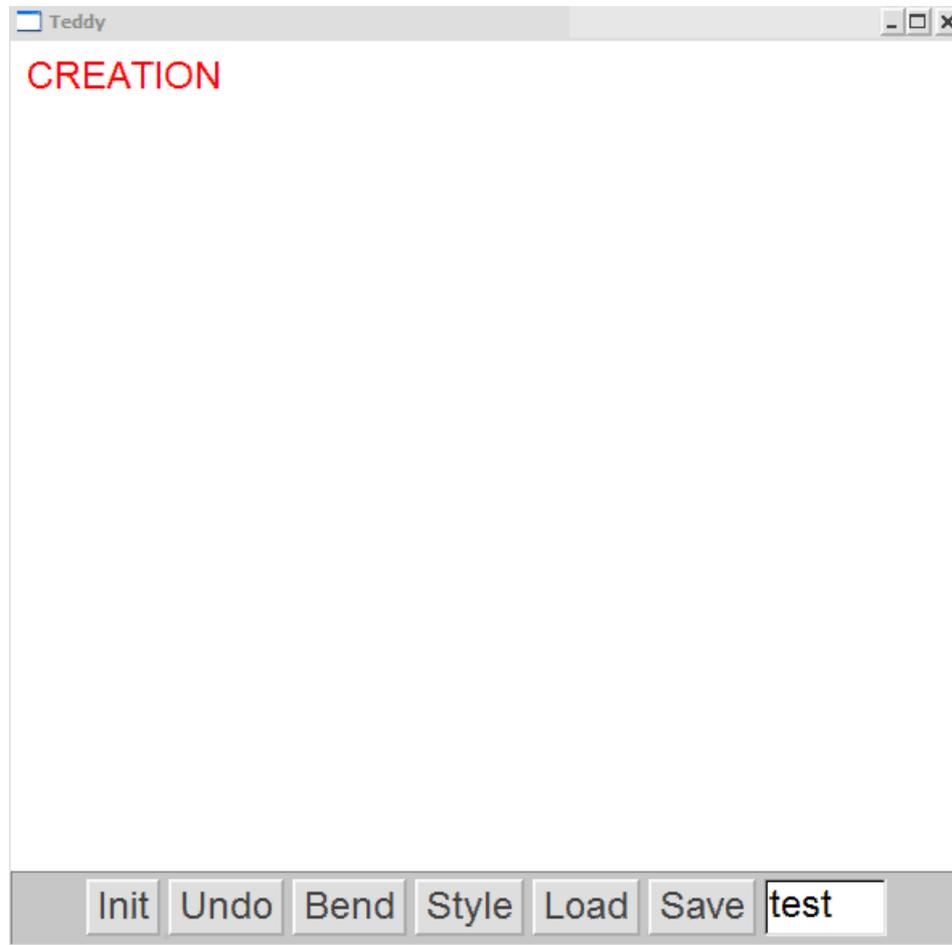
Perception flowchart



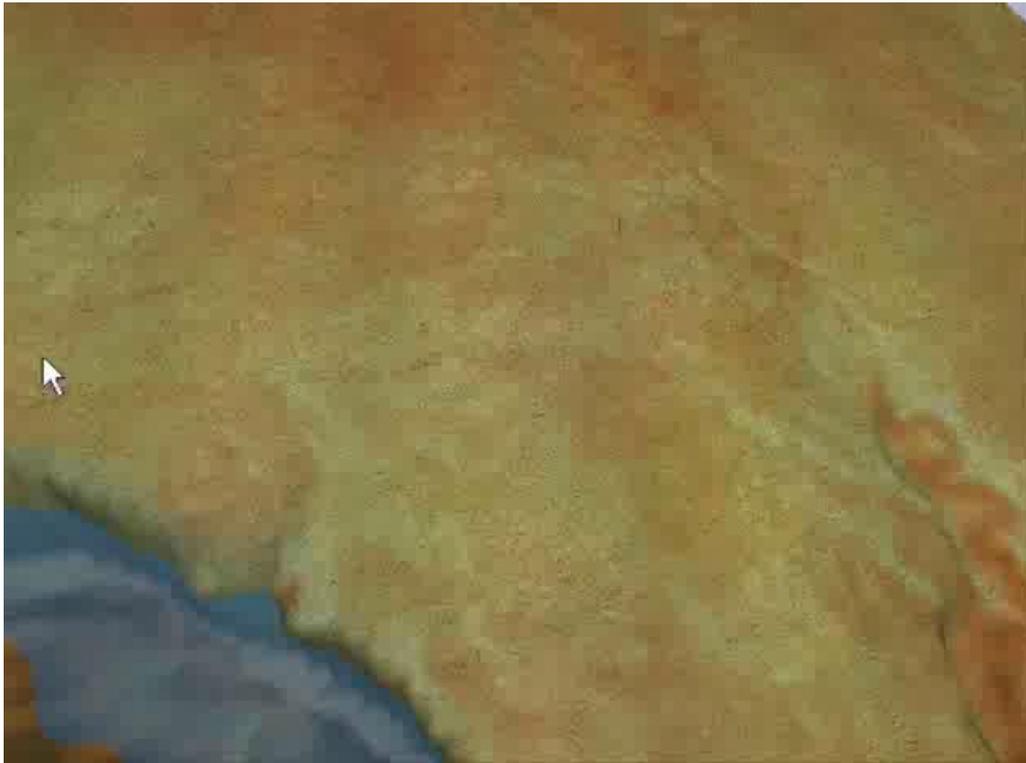
Case Studies

- Teddy
- Drive
- Analytical Drawing
- ILoveSketch
- Meshmixer

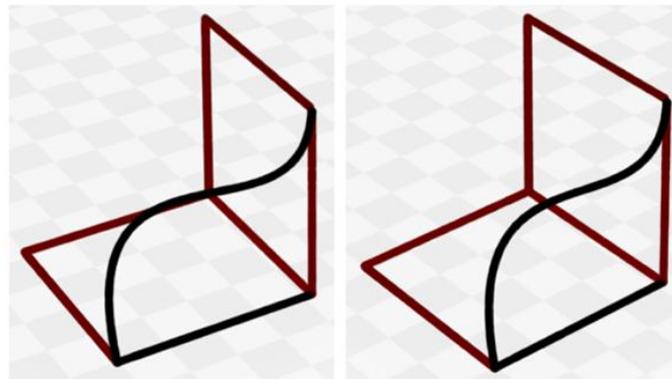
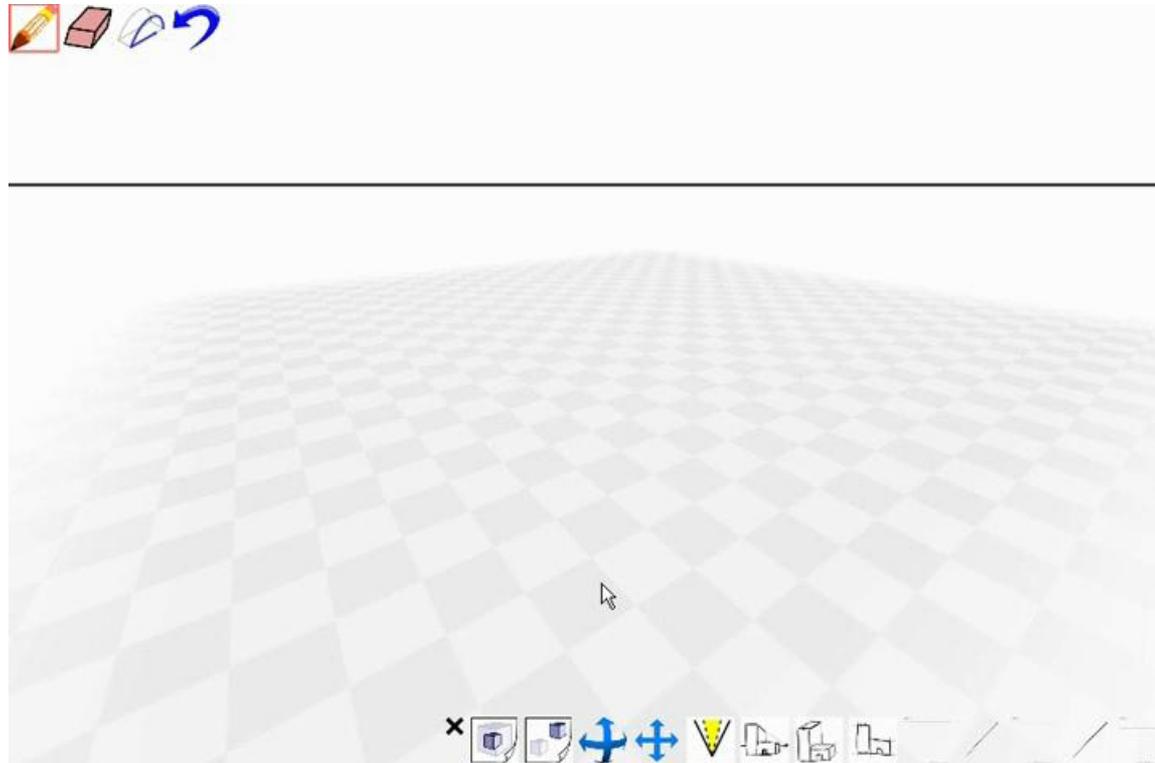
2D to 3D: Teddy



2D on surface to 3D: Drive



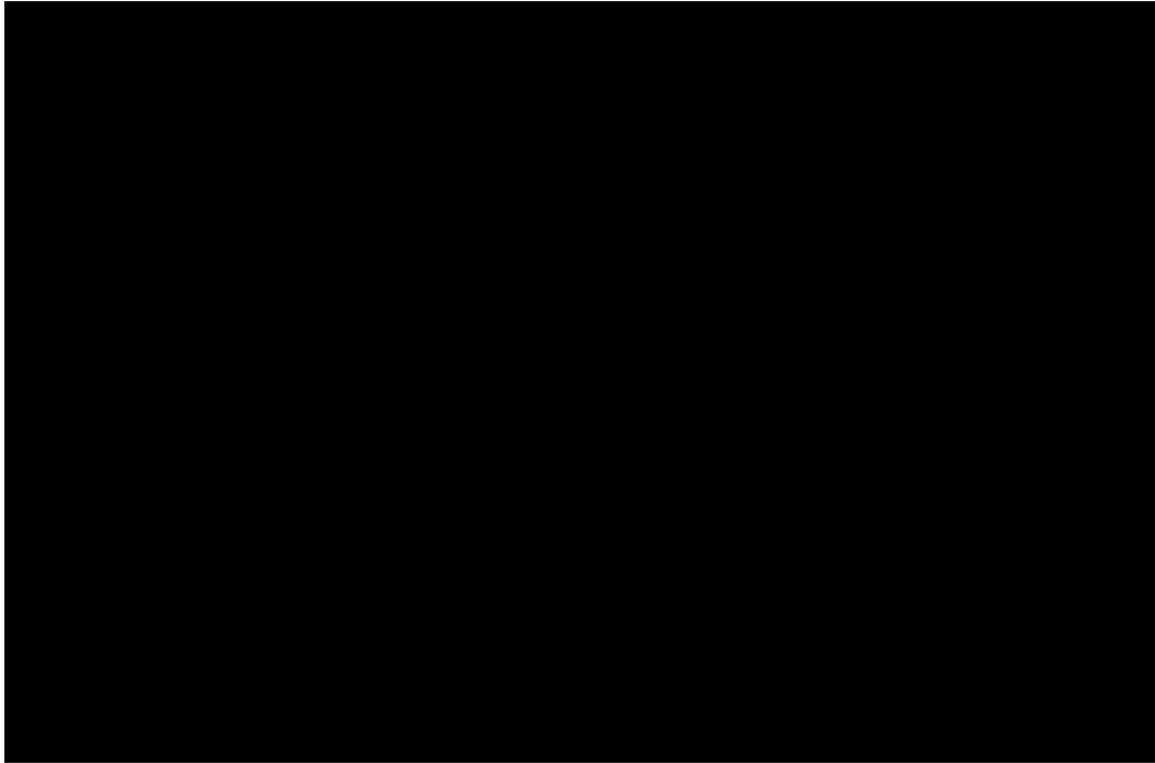
Multi-view vs. Single-view sketching



Multi-view vs. Single-view sketching



Mixing Metaphors



Projects

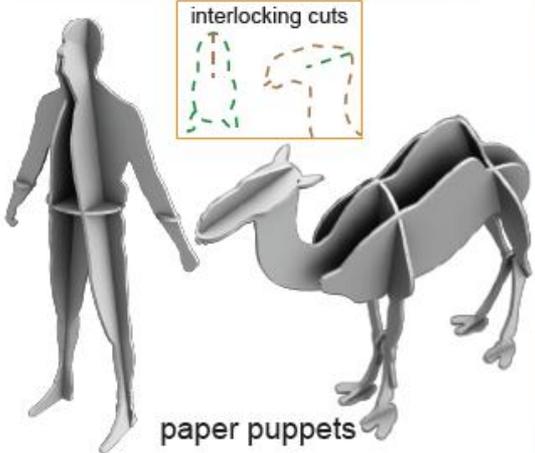
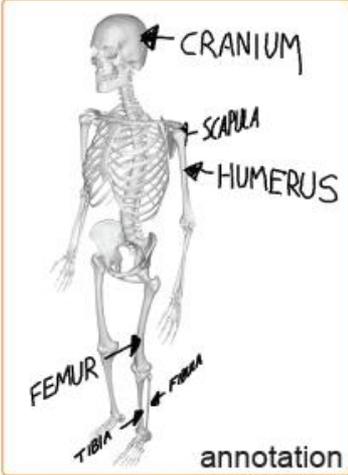
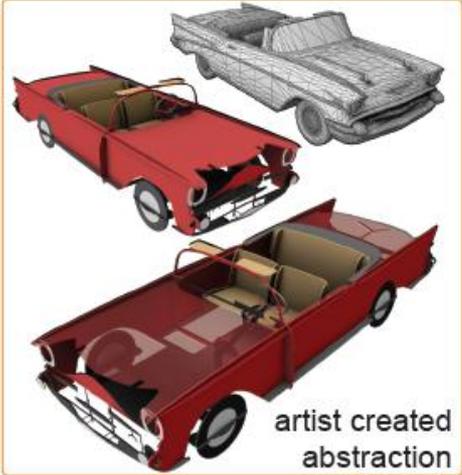
- Speed widgets (use drawing speed to control UI).
- Sketching across 3D canvases.
- Perception of line drawings (Where is the surface in a line drawing?).
- Ergonomics of sketching curves (Given two points and directions how do we connect them?).
- Perception of depth and angle in line drawings.
- Image cloning.
- Flipbooks: sketching for animation.

Projects

- Speed widgets.
 - How many different levels of speed can we control while drawing?
 - Are changes in speed continuous or discrete?
 - Build one or more example applications based on speed widgets.

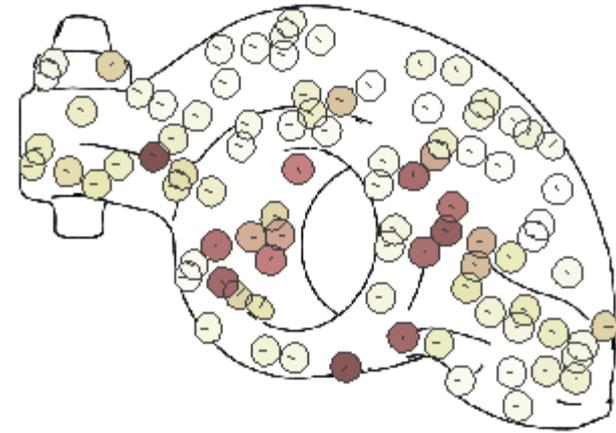
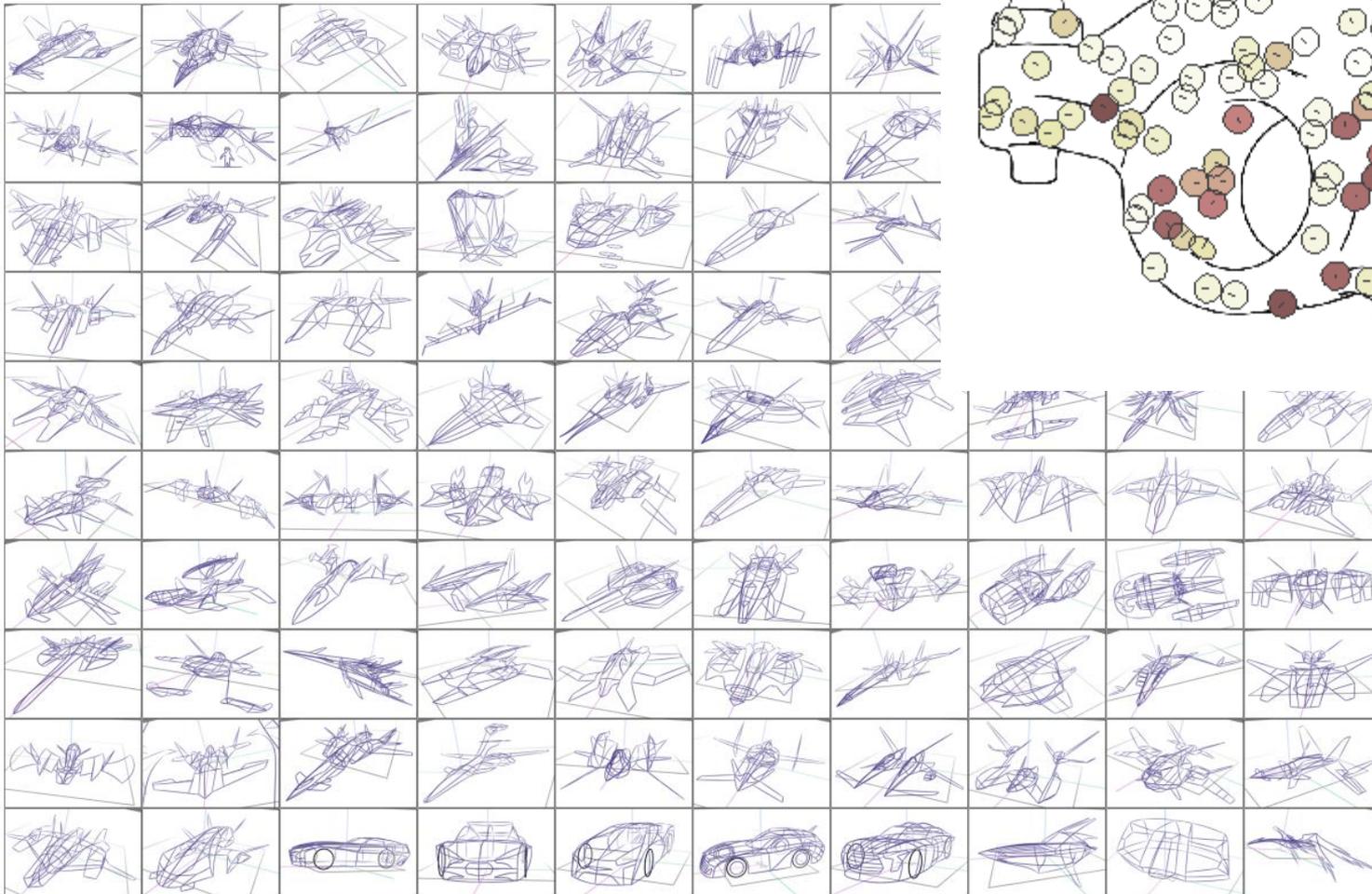
Projects

- Sketching across 3D canvases.



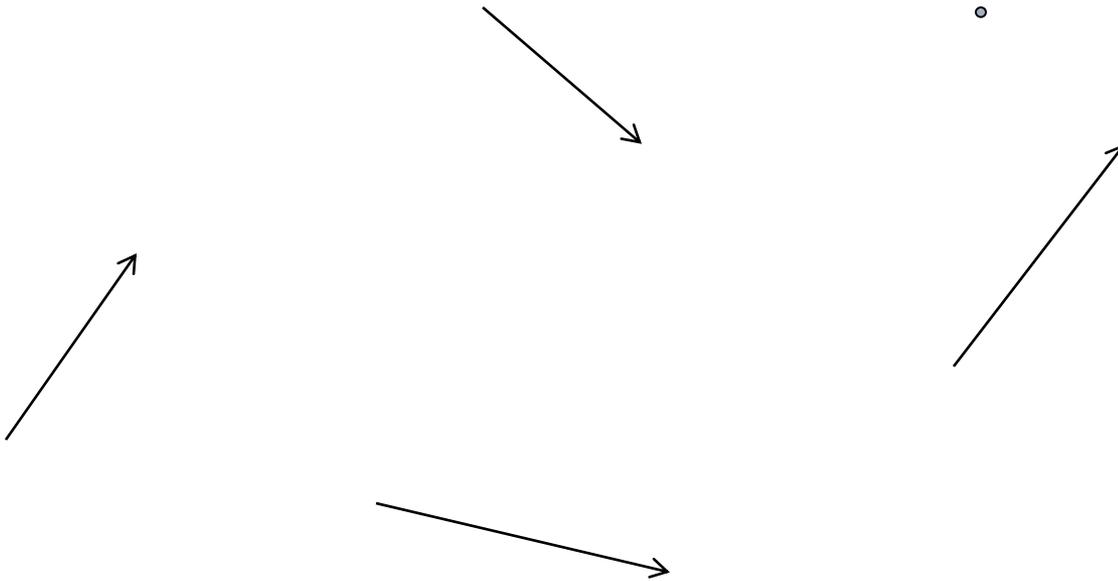
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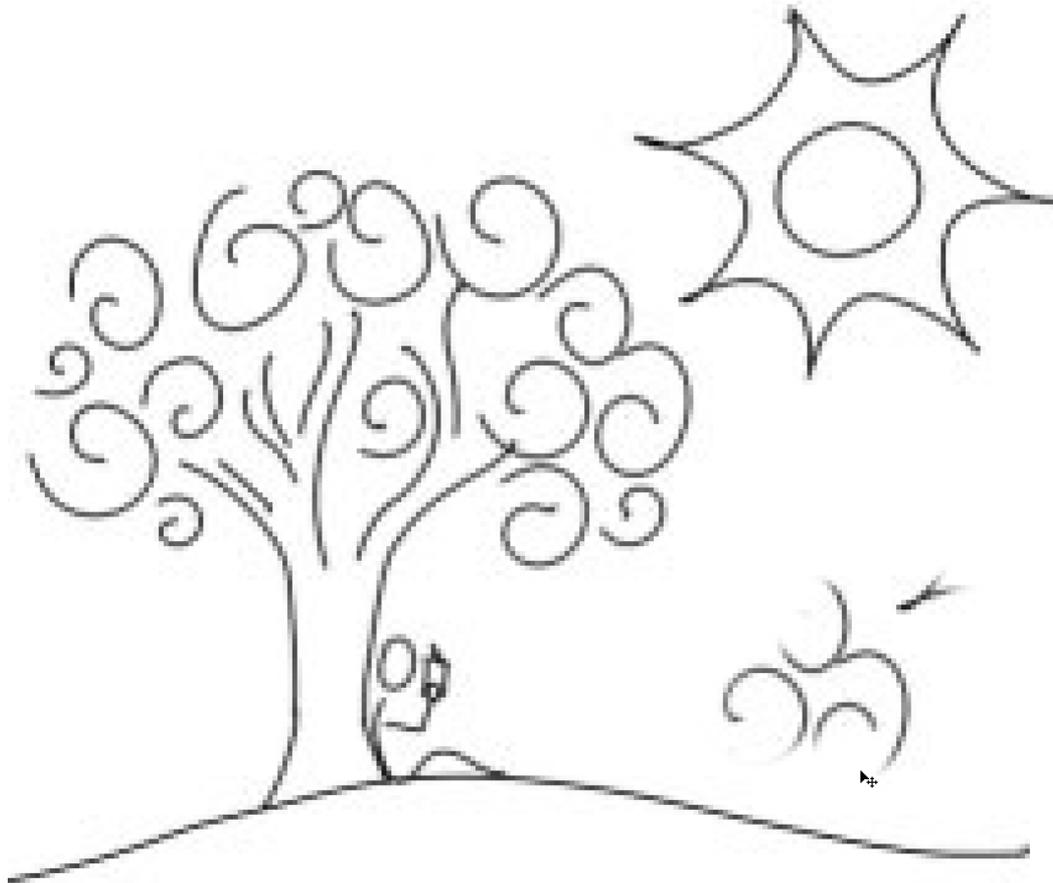


Projects

- Depth and angle perception.

Projects

- Image Cloning.



Projects

- Flipbooks.