

Structured Annotations for 2D-to-3D Modeling

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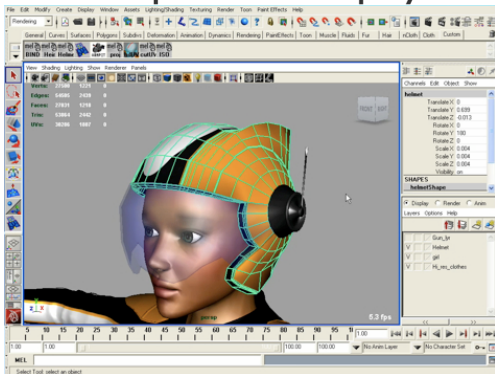
Denis Zorin (*New York University*)

Pencil and Paper Sketches



Traditional Expert Systems

Concept artwork plays no direct role



[Maya]



[Mudbox]

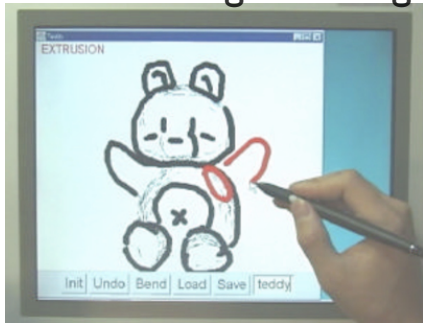


[Thormählen and Seidel 2008]

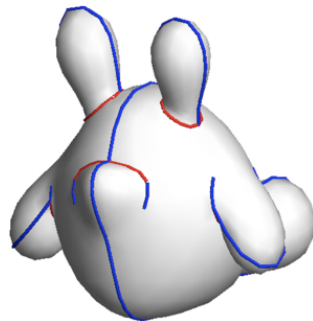
Novice Systems

Can't trace a guide image

(See [Olsen et al. 2008]
for a recent survey.)



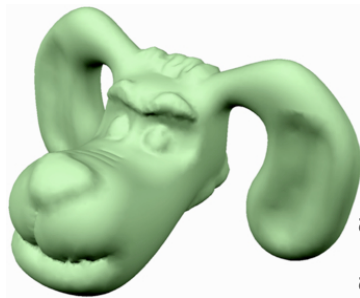
Teddy [Igarashi et al. 1999]



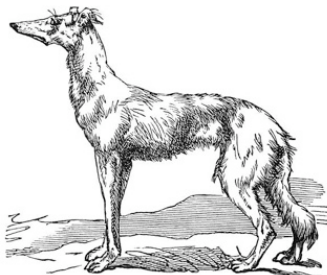
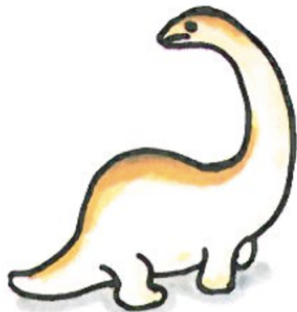
FiberMesh [Nealen et al. 2007]



Spore [Maxis 2008]



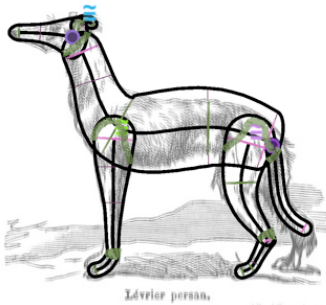
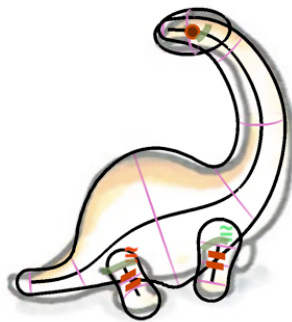
ShapeShop
[Schmidt et al. 2005-8]



Lévrier persan.

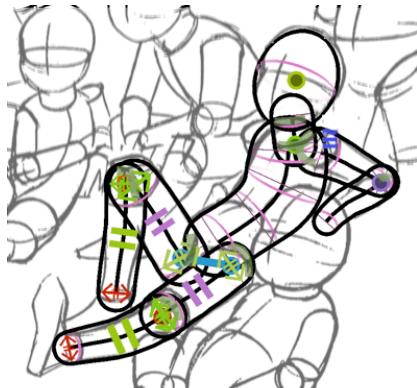
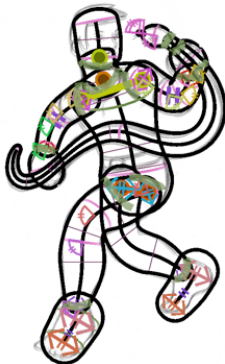
oldbookillustrations.com

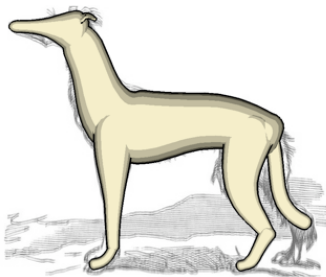




Lévrier persan,

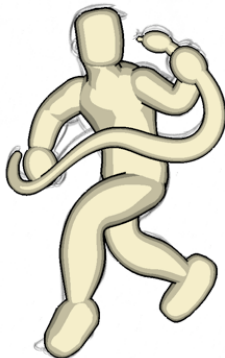
dribbble.com





Lévrier persan,

allbookillustrations.com



Overview

Interface

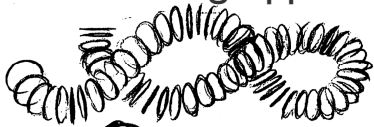
Results & 2 User Studies

Implementation Details

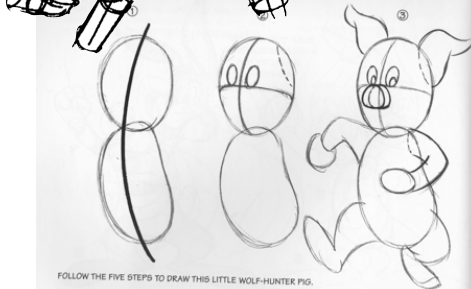
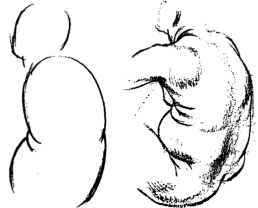
Conclusion

Inspiration

2D Drawing Approaches



[Vilppu 1997]



FOLLOW THE FIVE STEPS TO DRAW THIS LITTLE WOLF-HUNTER PIG.



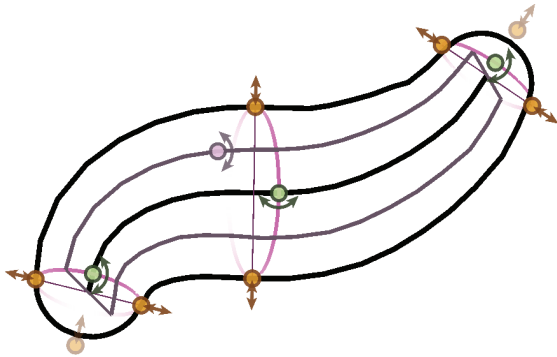
[Blair 1994]

Primitives

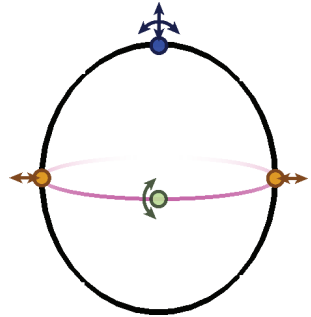
Generalized Cylinders & Ellipsoids



Primitives



Generalized Cylinder



Ellipsoid

Primitive: Generalized Cylinder

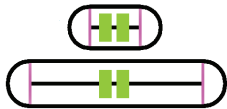
Generalized Cylinder

Primitive: Ellipsoid

Ellipsoid

Annotations

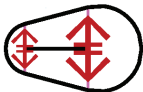
Same-length



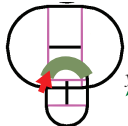
Same-tilt



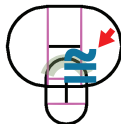
Same-scale



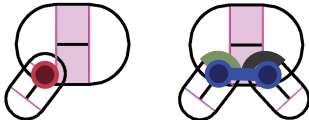
Connection curve



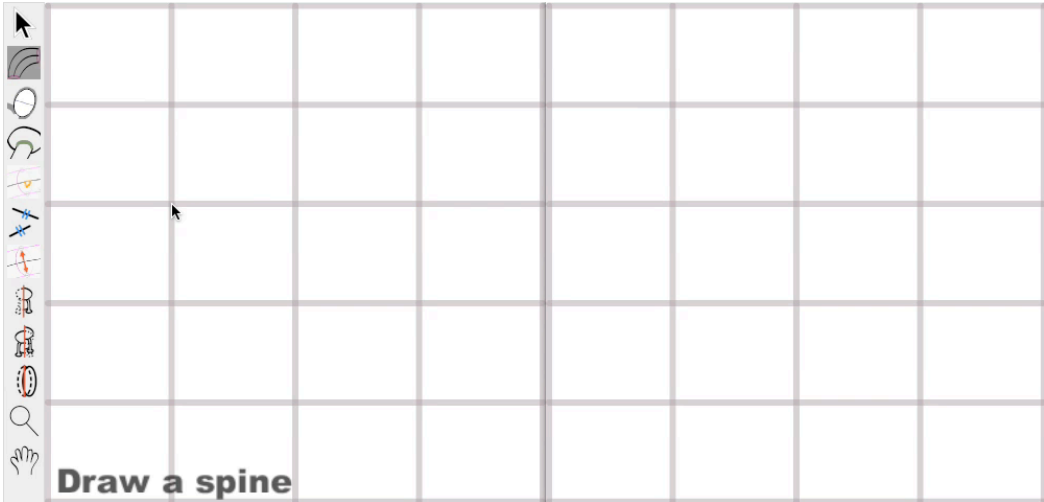
Mirror



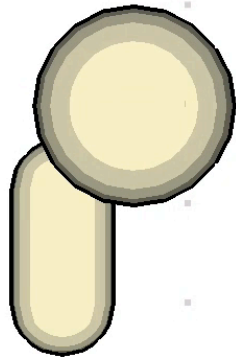
Alignment



Annotations: Connection Curves

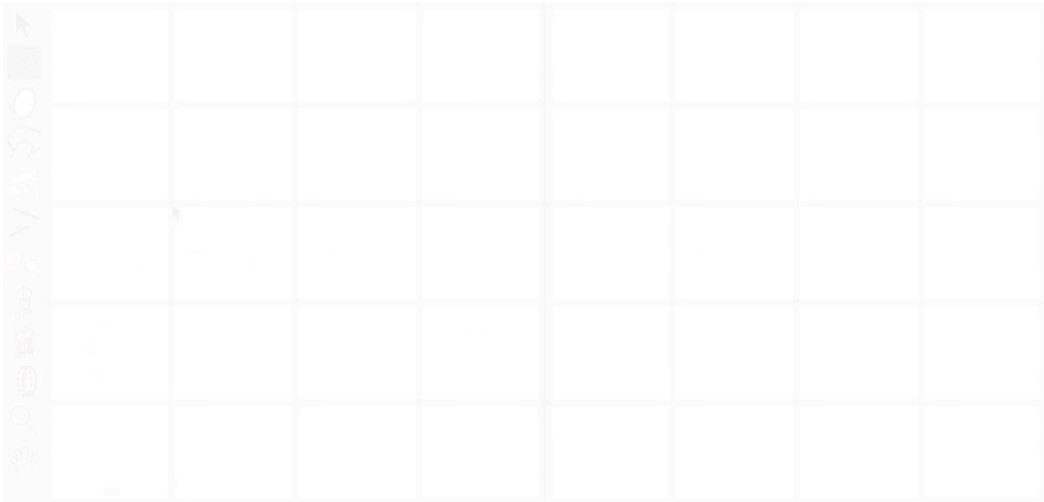


The screenshot shows the 'Connect two shapes' level in the game 'Angry Birds'. The game board is a grid with a large black U-shaped structure on the left and a smaller black U-shaped structure on the right. A green pig is positioned on the right side of the board. A mouse cursor is hovering over a pink line segment that connects the two U-shaped structures. The bottom of the screen displays the text 'Connect two shapes'.

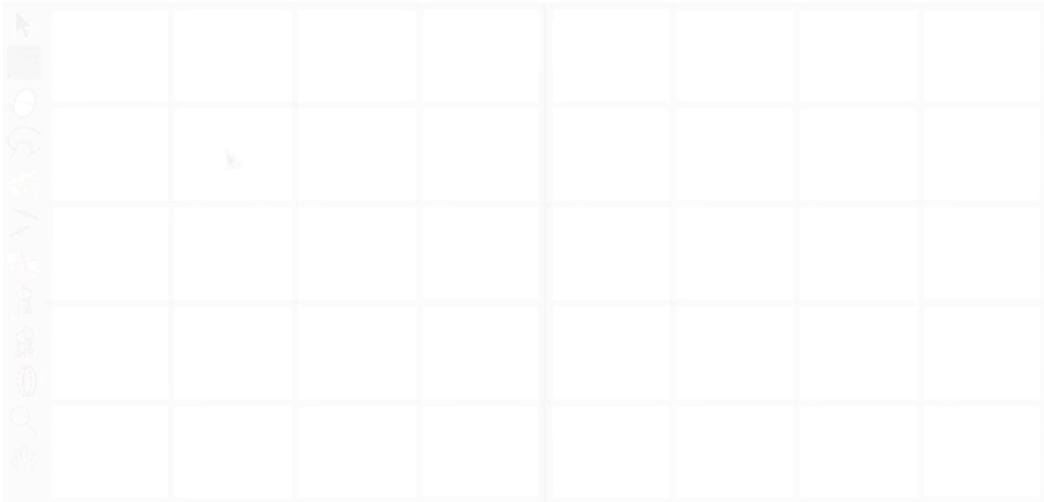


Annotations: Alignment

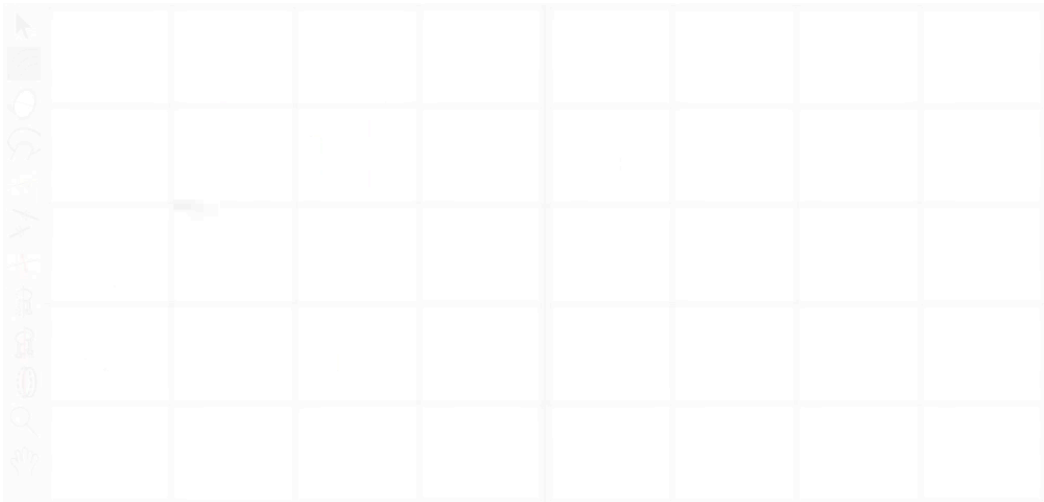
Annotations: Alignment



Annotations: Same-length



Annotations: Same-scale



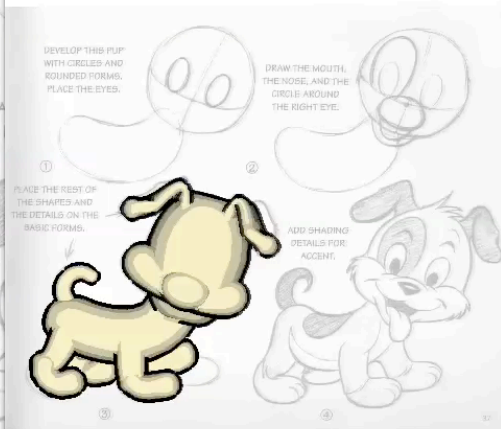
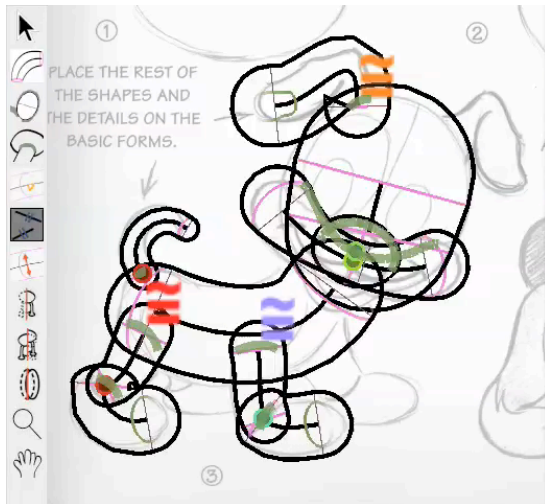
Annotations: Same-tilt

Demo

Modeling Session **5x Speed**

Guide image [Vilppu 1997]

Results



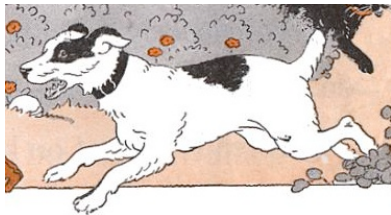
Guide images: [Blair 1994]; © Alex Rosmarin; © Kei Acedera, Imaginism Studios 2008; © Björn Hurri, www.bjornhurri.com; © Alex Rosmarin; © Alex Rosmarin; [Kako 1973]; [Kako 1973]

2 User Studies

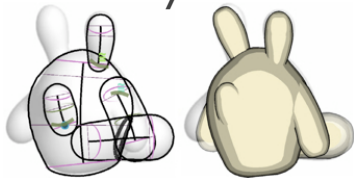
Informal Study

**Models Created by
First-Time Users**

Comparison Study

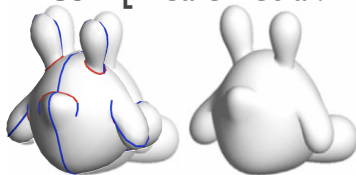


Our system



FiberMesh [Nealen et al. 2007]

vs.



Create 3D model from this dog illustration

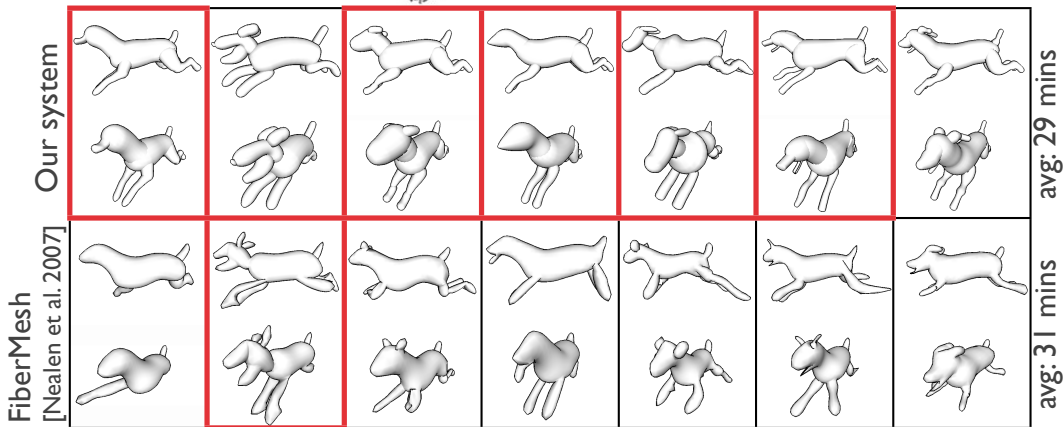
15 minutes of training

7 users, none had 3D modeling experience

Comparison Study



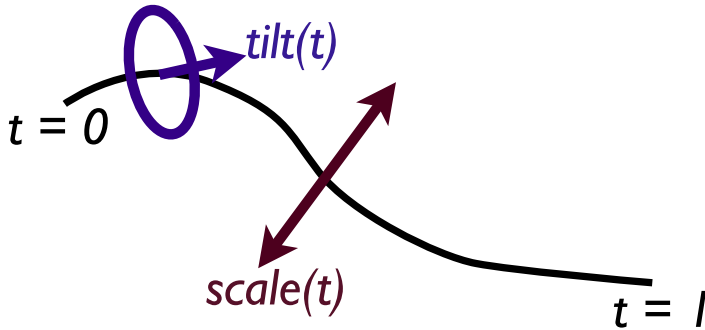
 preferred



Implementation

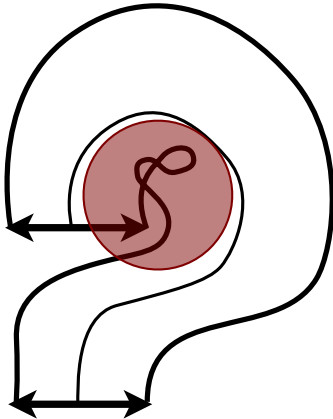
Implementation: Generalized Cylinder

- Parametric



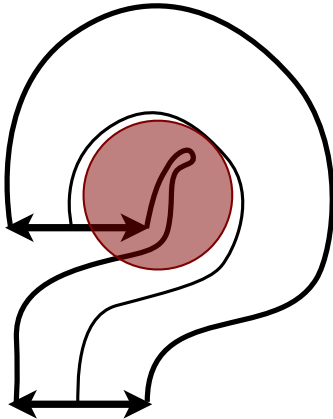
Implementation: Generalized Cylinder

- Parametric
- [Peng et al. 2004] to avoid self-intersections



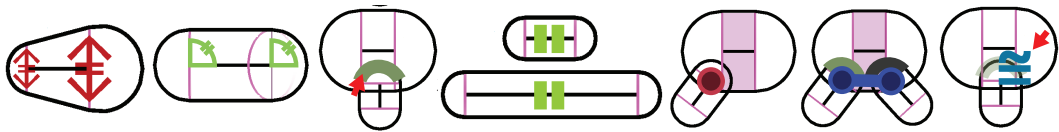
Implementation: Generalized Cylinder

- Parametric
- [Peng et al. 2004] to avoid self-intersections



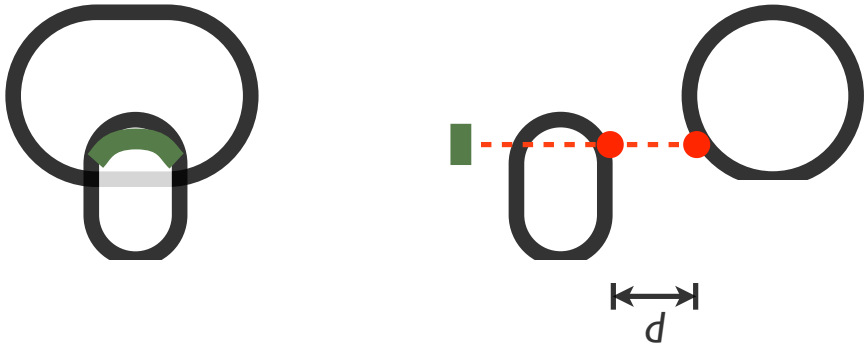
Implementation: Annotations

- Annotations take precedence over primitives' handles
- Annotations are mostly independent, so we apply them procedurally, not via optimization:



Implementation: Connection Curves

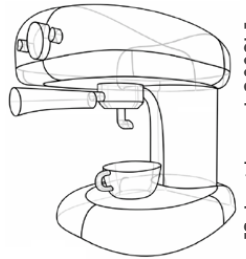
- Solve for depth offset between the two primitives



Contributions

- Interface for modeling by “describing” an existing 2D image with primitives and annotations.
- Usable by novices, including those with poor drawing skills.
- Resulting model is structured and contains semantic information.
- Naturally provide a complete 2D visualization of the 3D model and its structure.

Limitations



[Schmidt et al. 2009b]

- Limited range of models
- Can't be used for certain drawings
- No cycles of connection curves



Future Work

- More primitives and annotations
- Use the underlying guide image [Tsang et al. 2004]
- Different camera models
- Comprehensive user study

Thank You

Alex Rosmarin and the other artists

Satoshi Kako,
Glenn Vilppu,
the estate of Preston Blair,
Chris Onstad,
Kei Acedera (Imaginism Studios),
Björn Hurri (www.bjornhurri.com)

User testers

Questions?

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<http://cs.nyu.edu/~gingold/annotations/>

End