



Structured Annotations for 2D-to-3D Modeling

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Takeo Igarashi (*University of Tokyo / JST ERATO*)

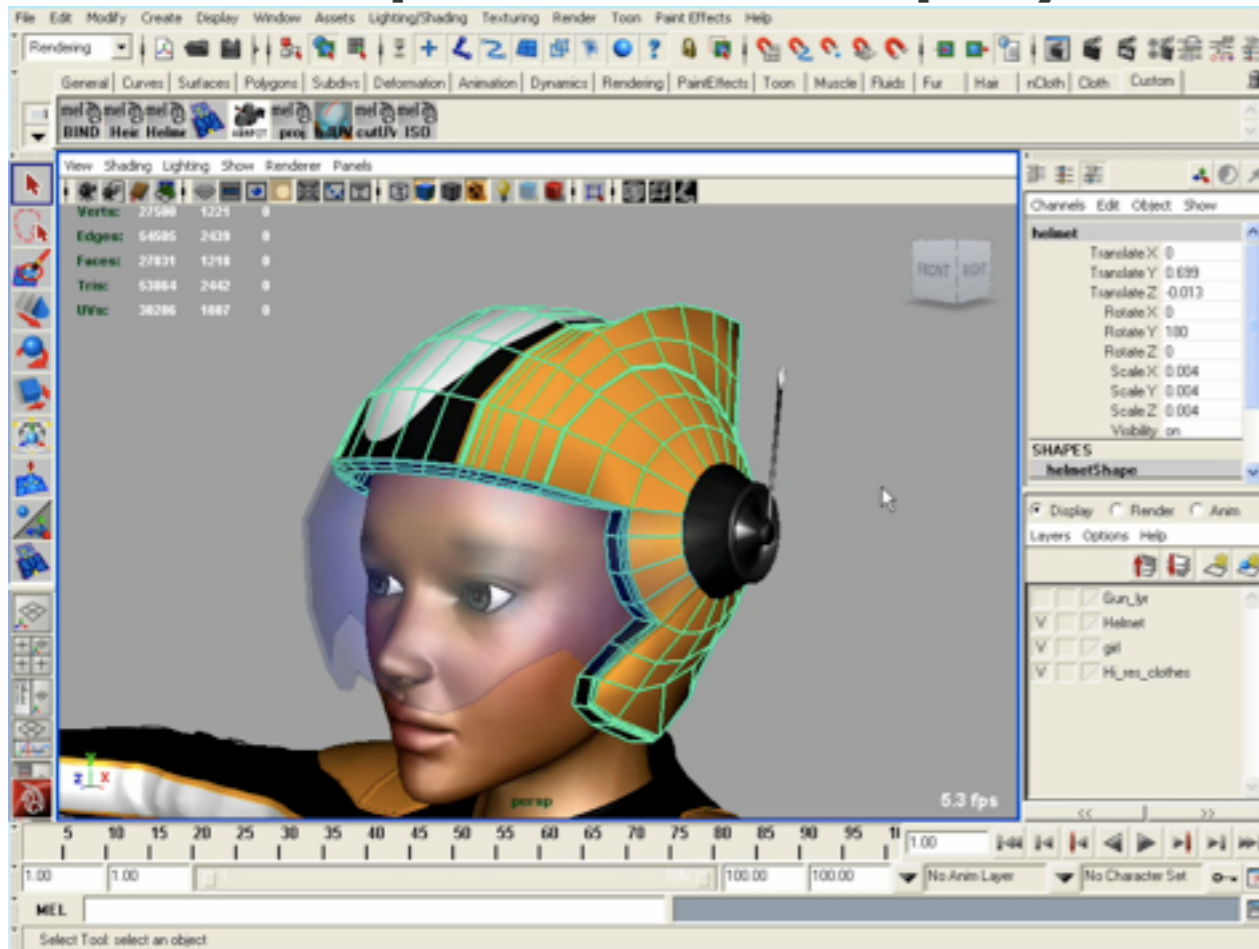
Denis Zorin (*New York University*)

Pencil and Paper Sketches



Traditional Expert Systems

Concept artwork plays no direct role



[Maya]



[Mudbox]

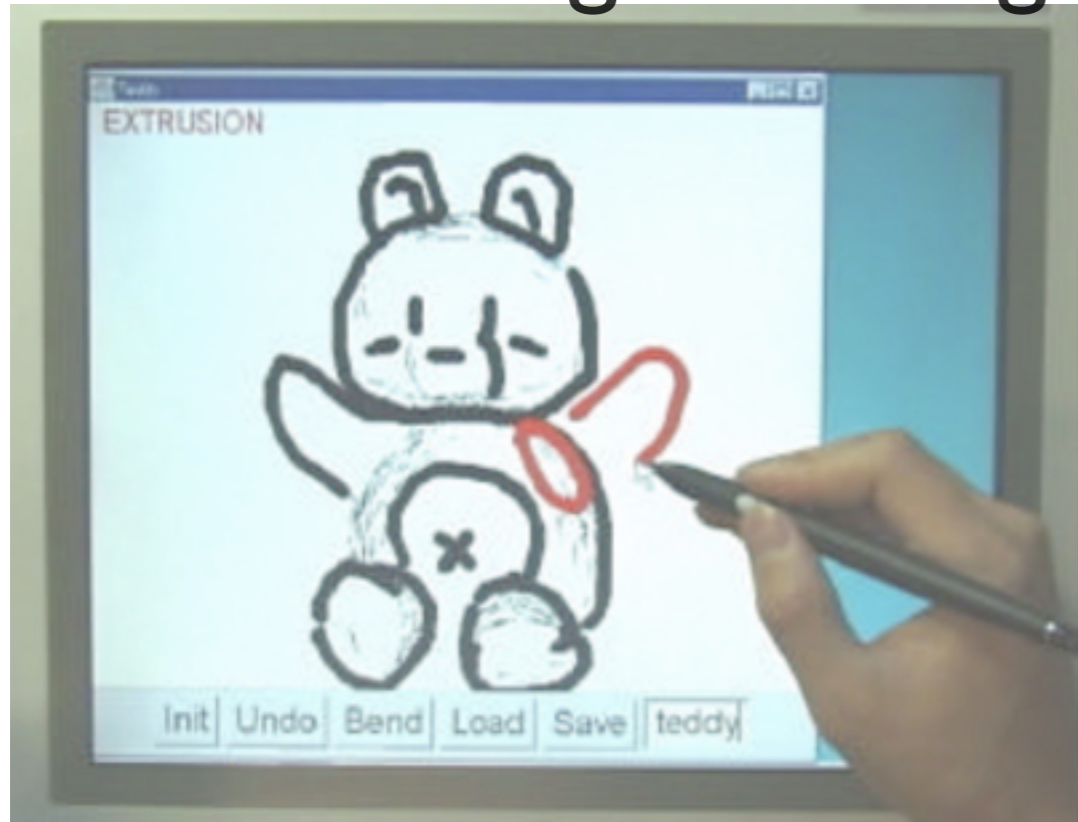


[Thormälen and Seidel 2008]

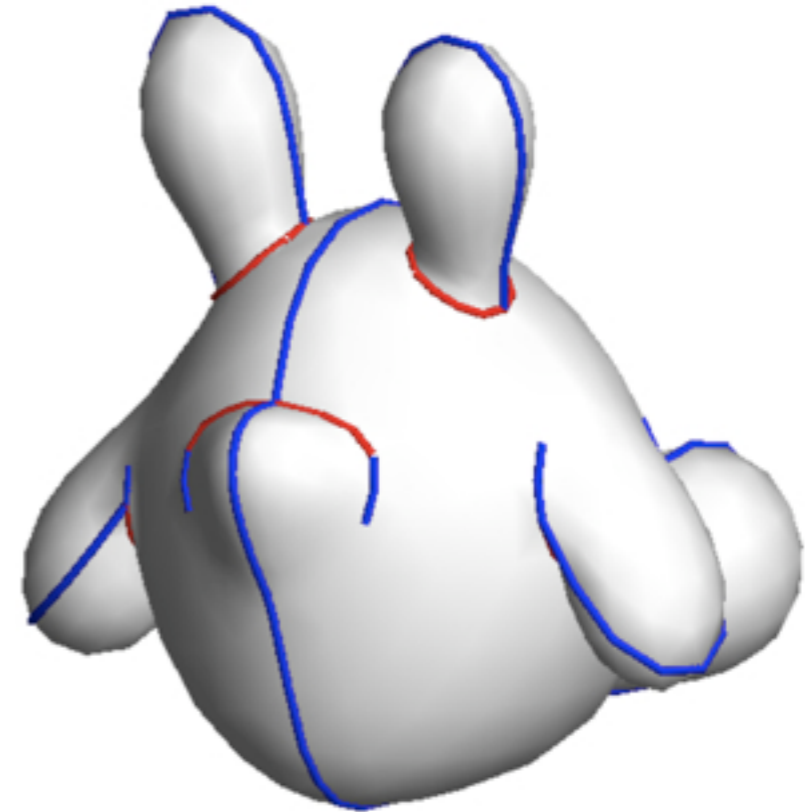
Novice Systems

Can't trace a guide image

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



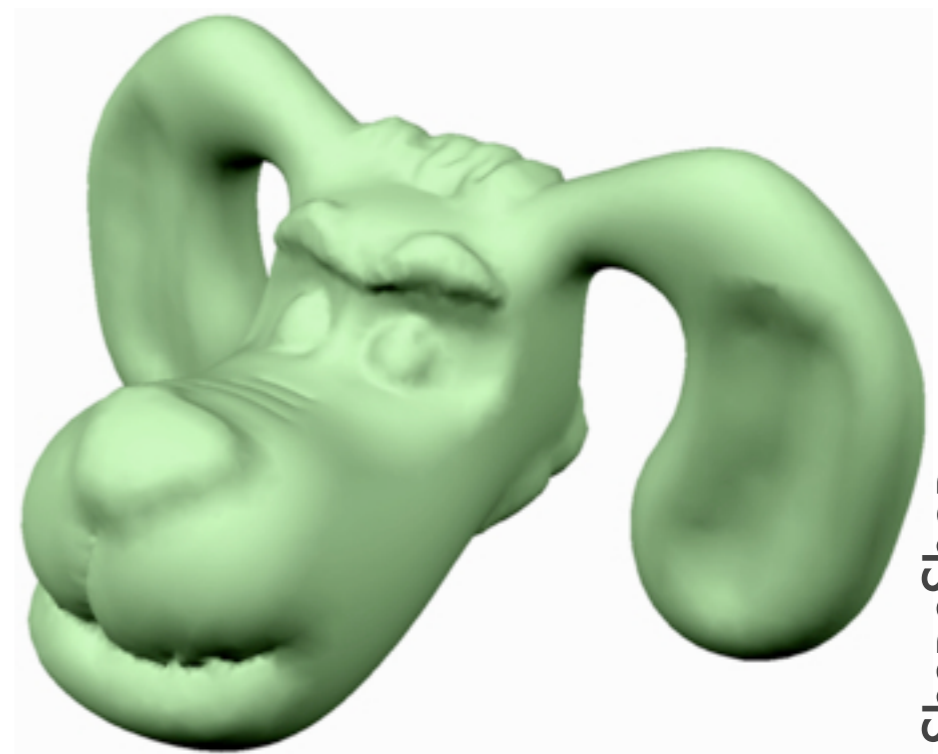
Teddy [Igarashi et al. 1999]



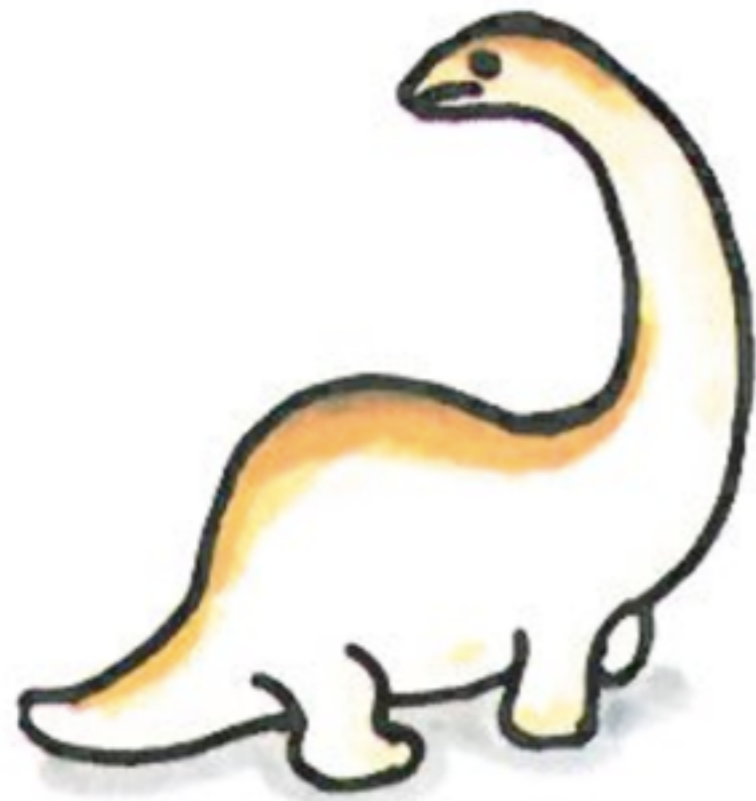
FiberMesh [Nealen et al. 2007]



Spore [Maxis 2008]



ShapeShop
[Schmidt et al. 2005-8]



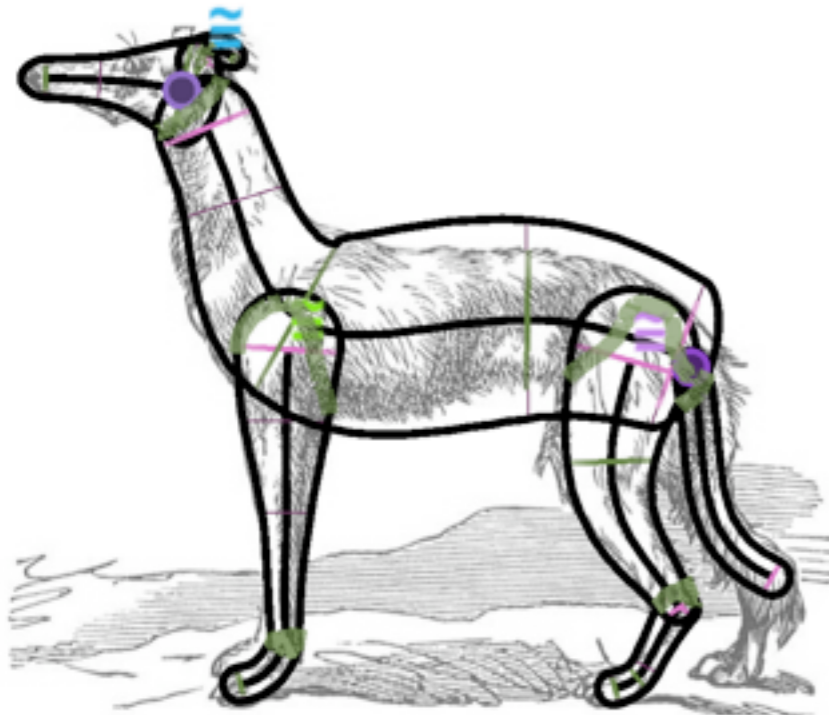
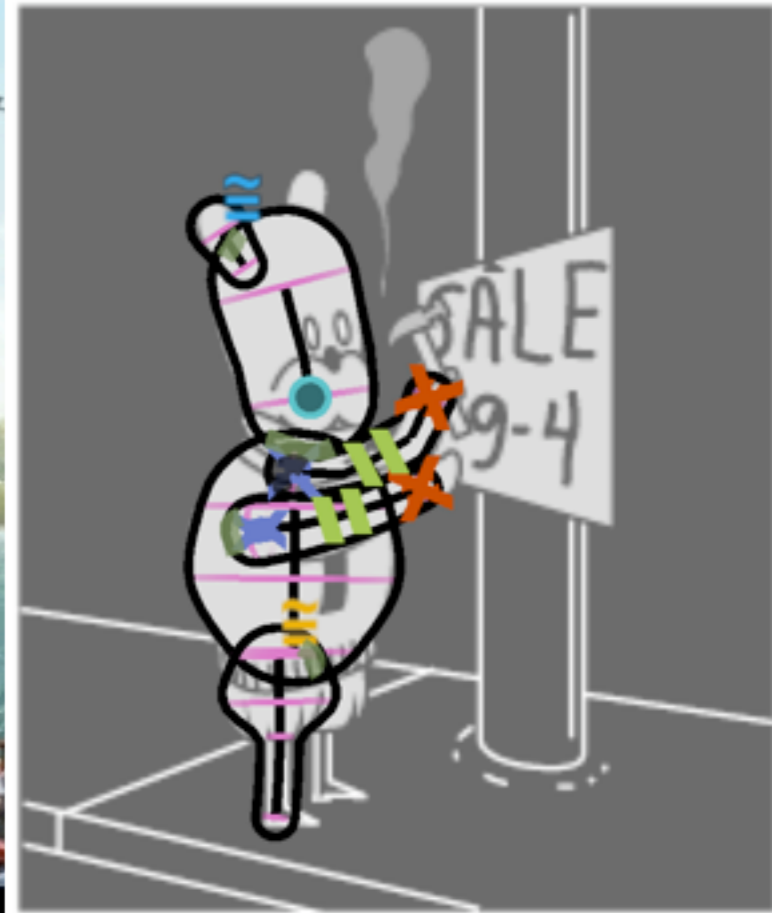
© 2009 Chris Onstad :: achemwood.com



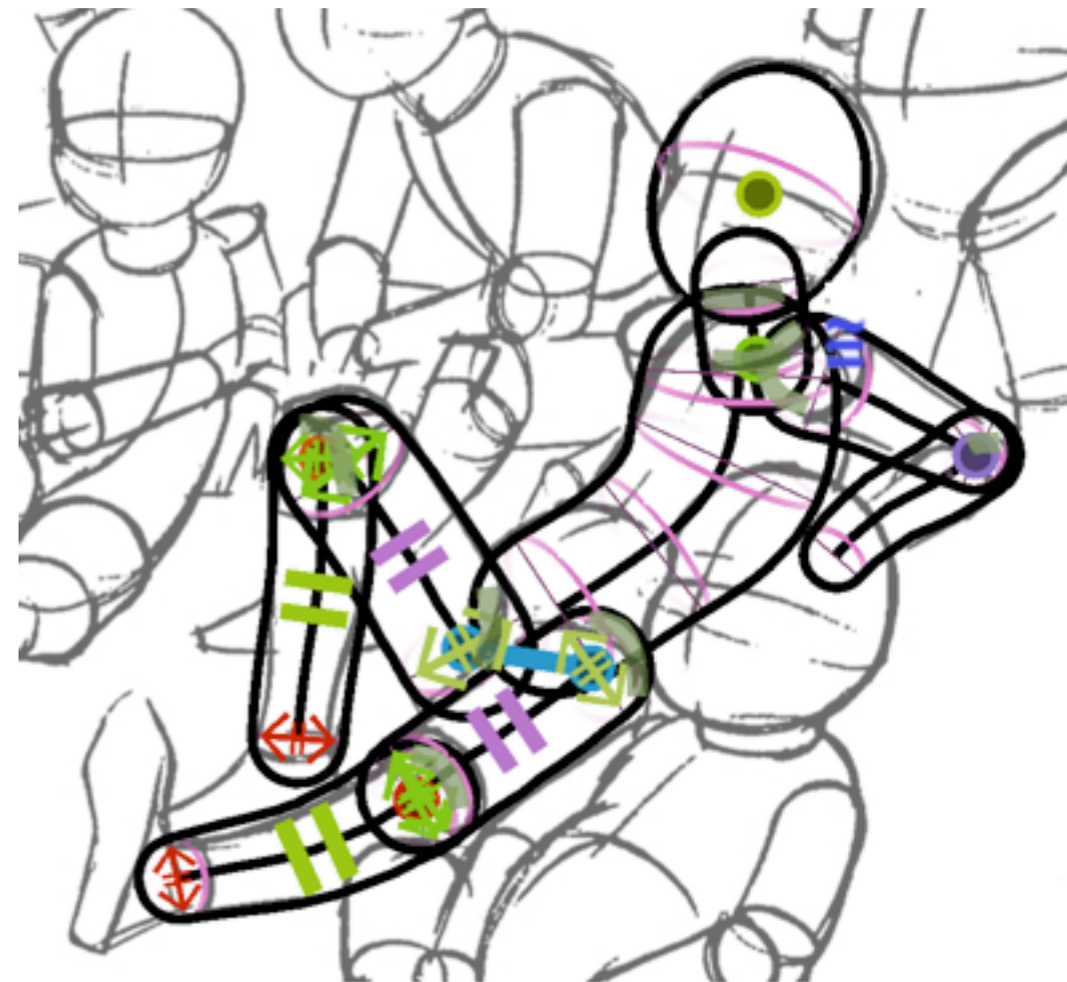
Lévrier persan.

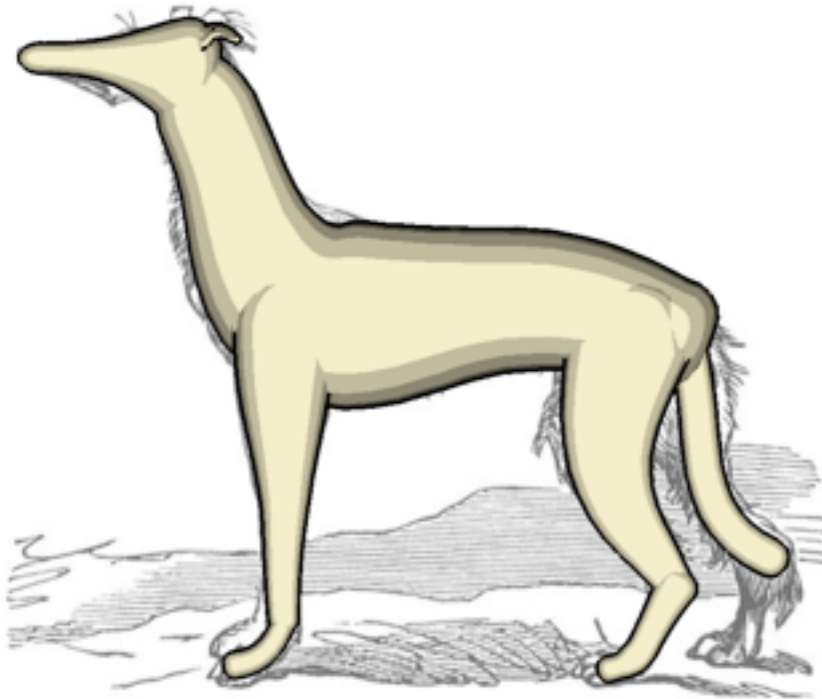
oldbookillustrations.com



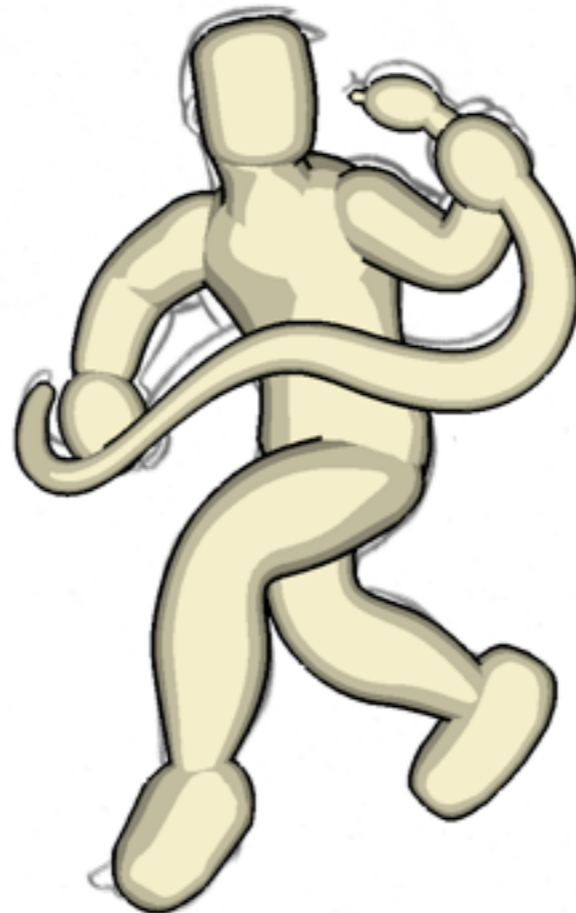


Lévrier persan.





Lévrier persan.



Overview

Interface

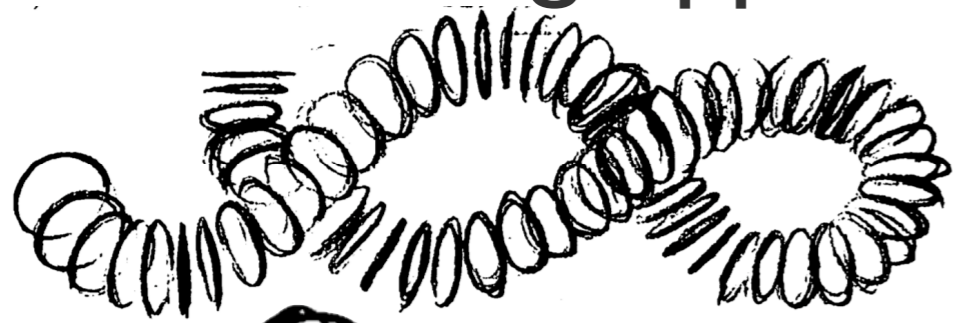
Results & 2 User Studies

Implementation Details

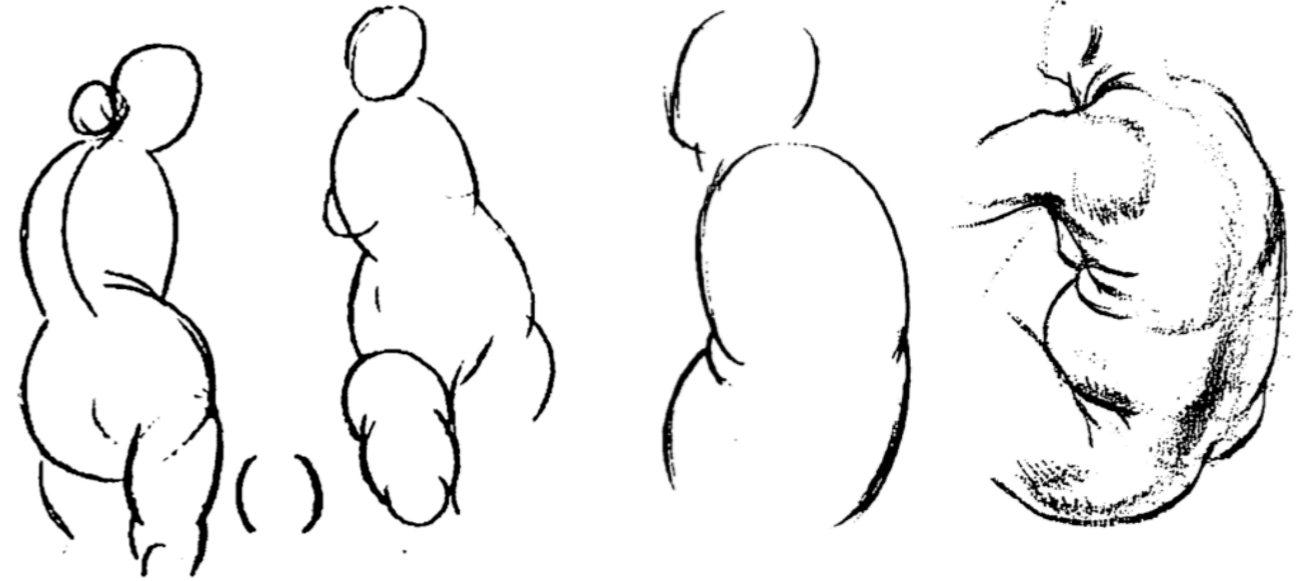
Conclusion

Inspiration

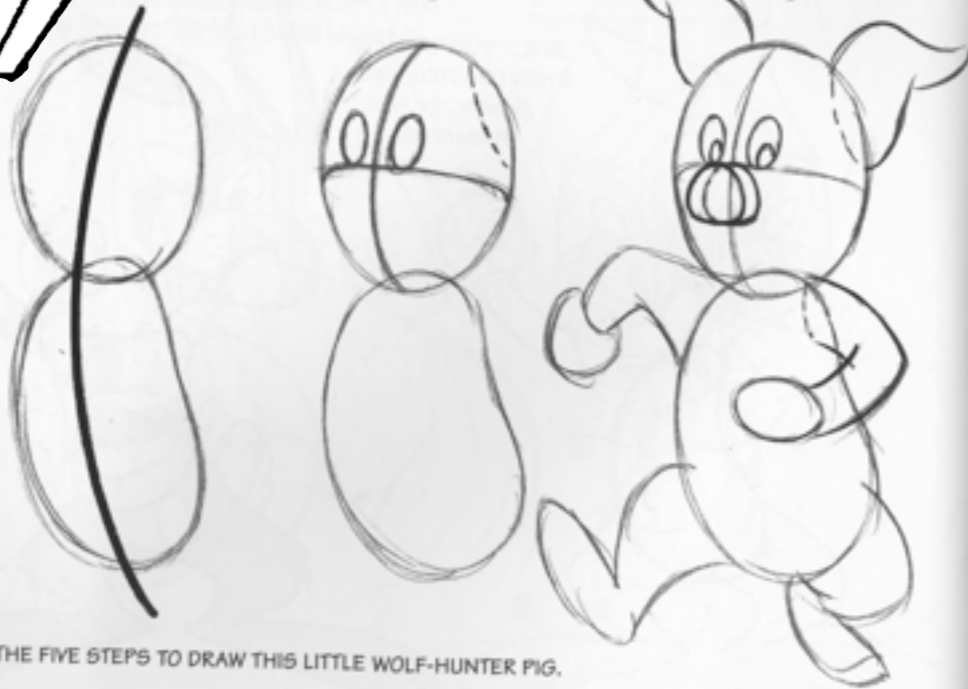
2D Drawing Approaches



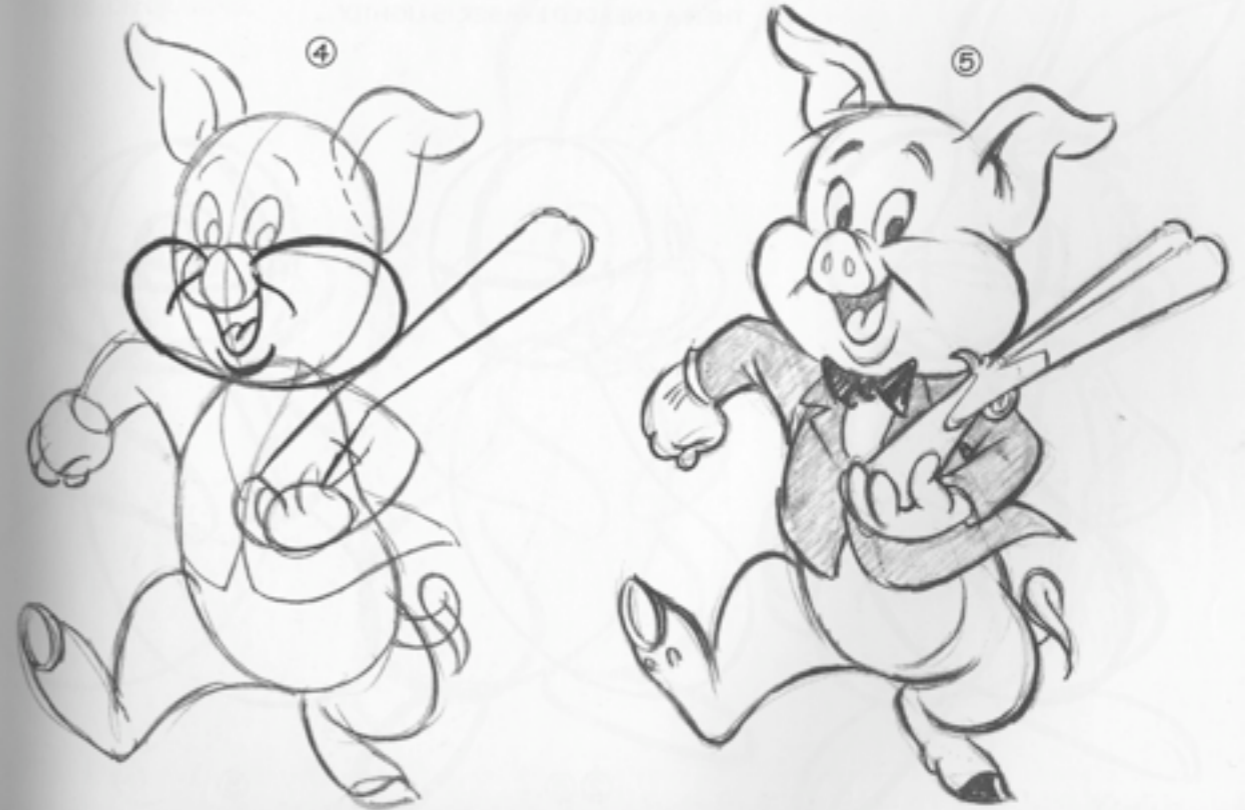
[Vilppu 1997]



WOLF-HUNTER PIG



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



[Blair 1994]

Primitives

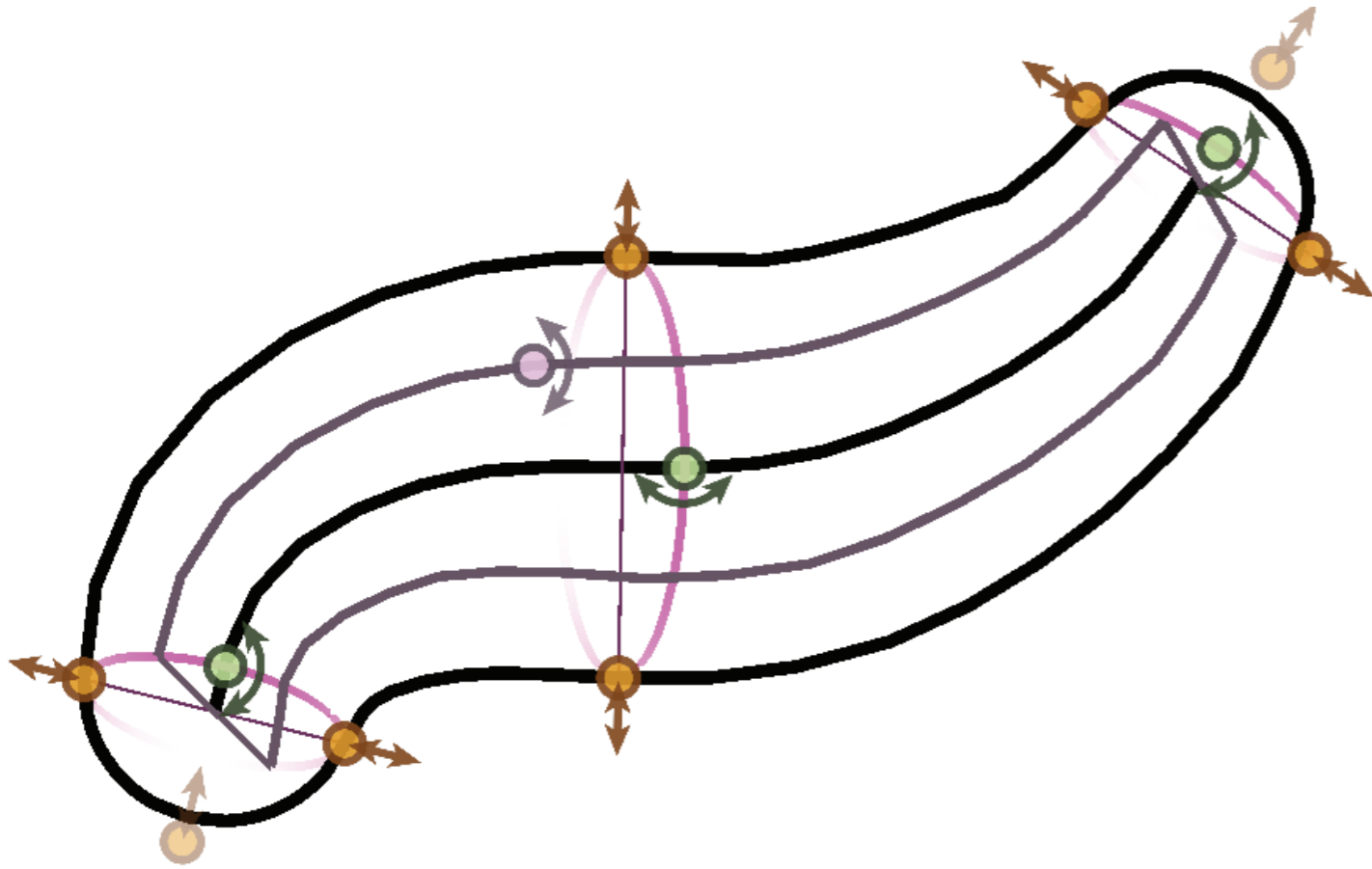
Generalized Cylinders & Ellipsoids

Primitives

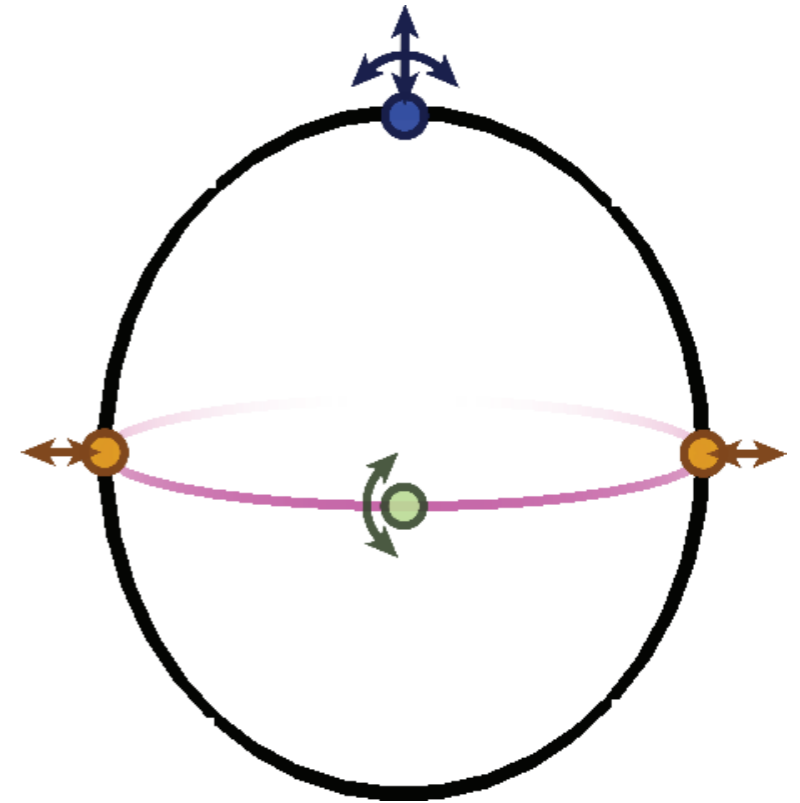
Generalized Cylinders & Ellipsoids



Primitives



Generalized Cylinder



Ellipsoid

Primitive: Generalized Cylinder

Primitive: Generalized Cylinder

Generalized Cylinder

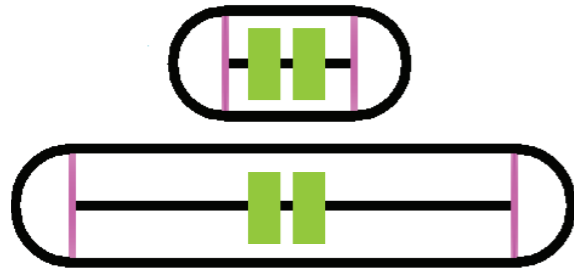
Primitive: Ellipsoid

Primitive: Ellipsoid

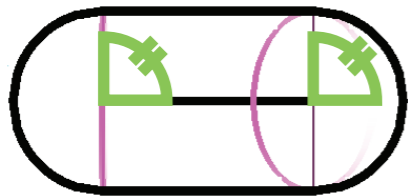
Ellipsoid

Annotations

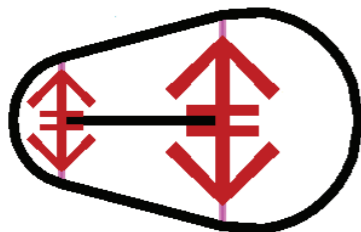
Same-length



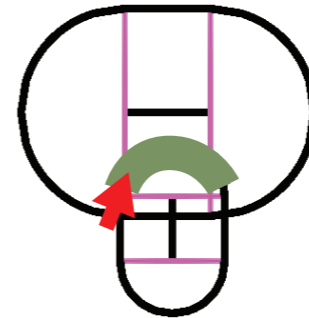
Same-tilt



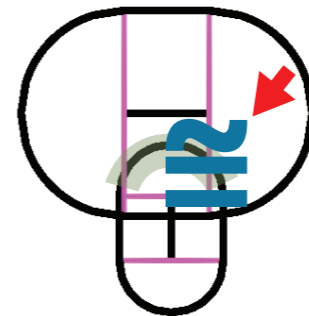
Same-scale



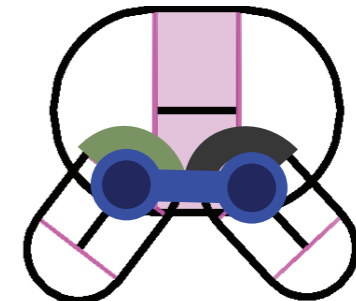
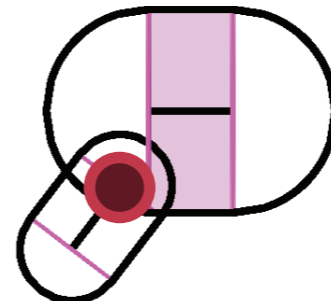
Connection curve



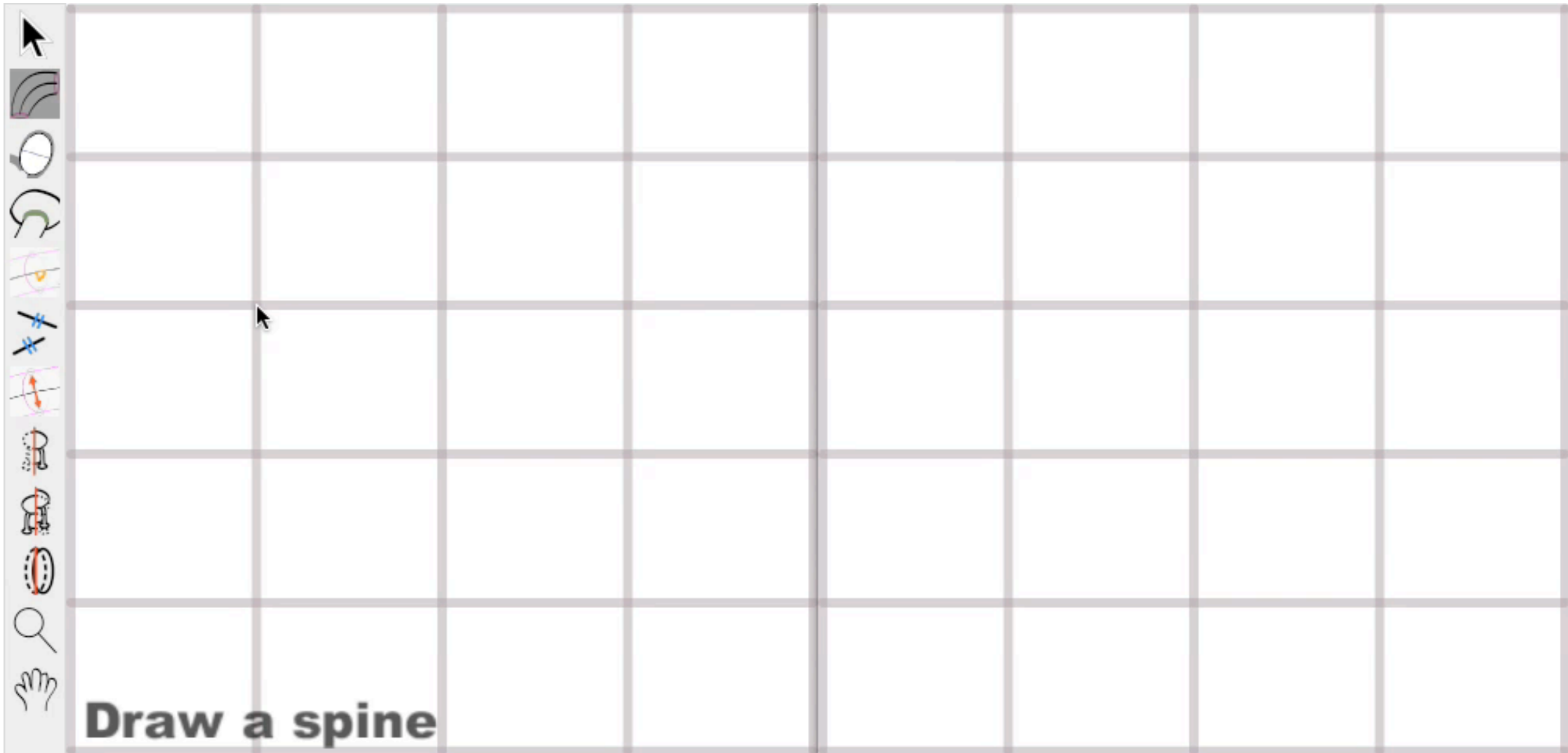
Mirror



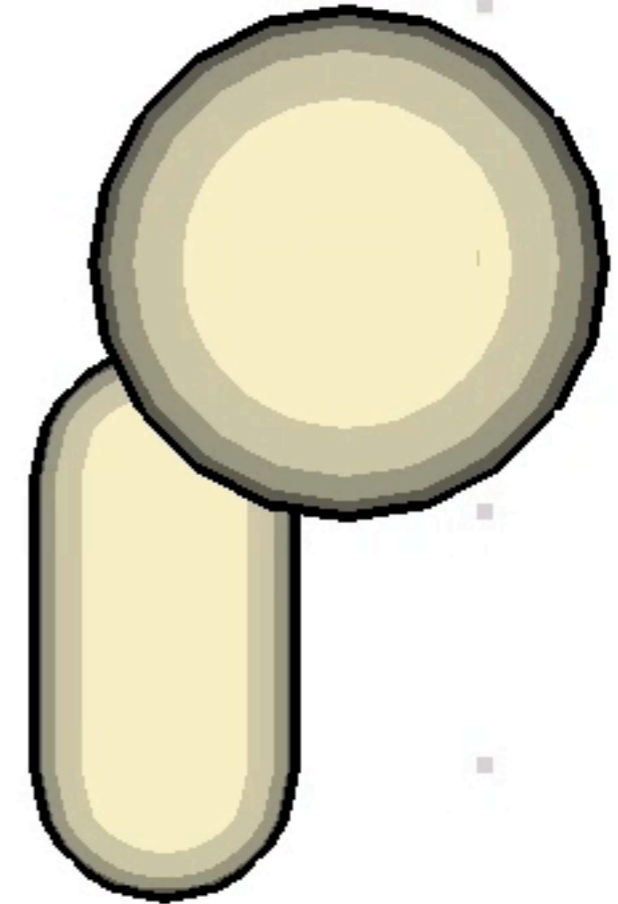
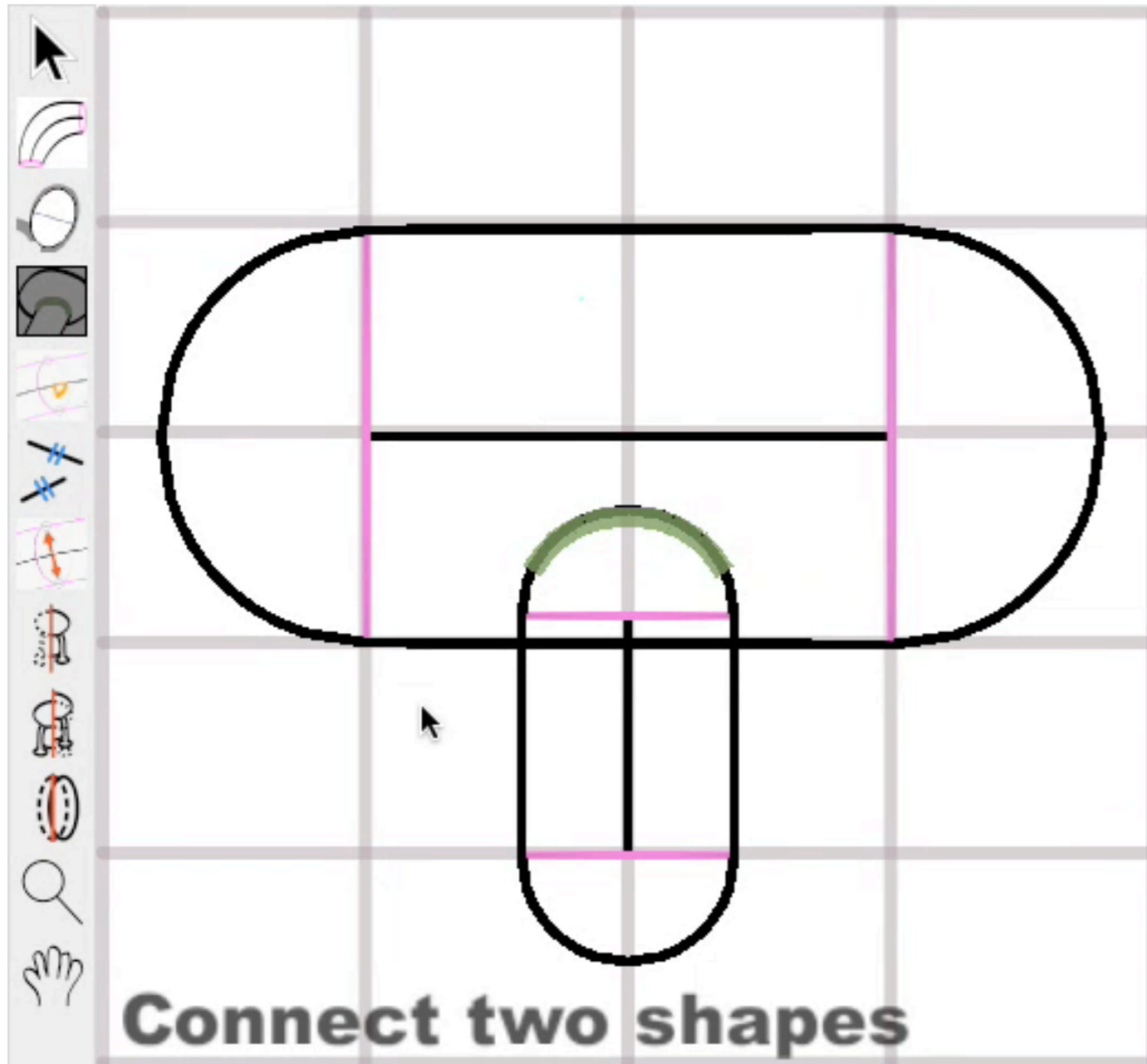
Alignment



Annotations: Connection Curves

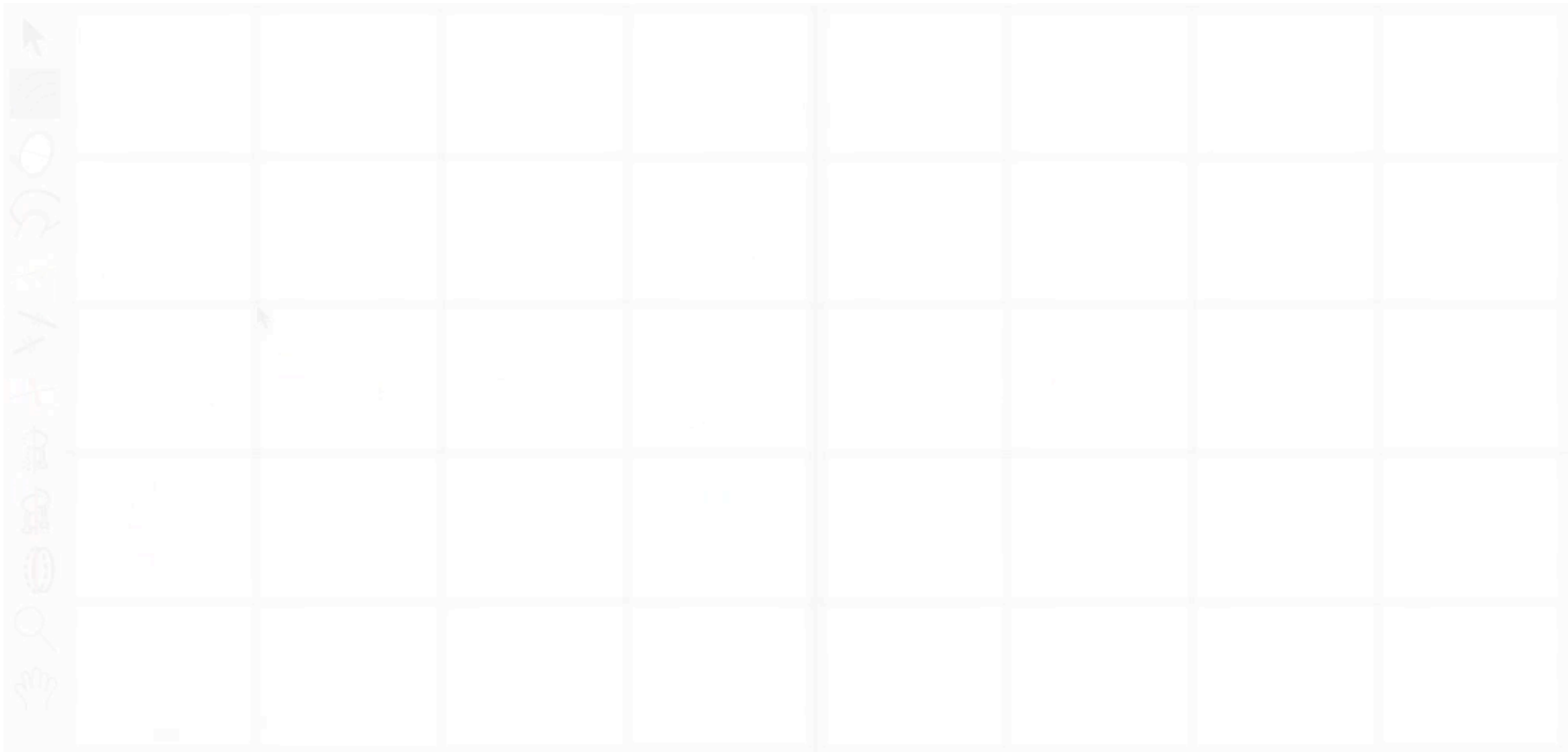


Annotations: Mirror

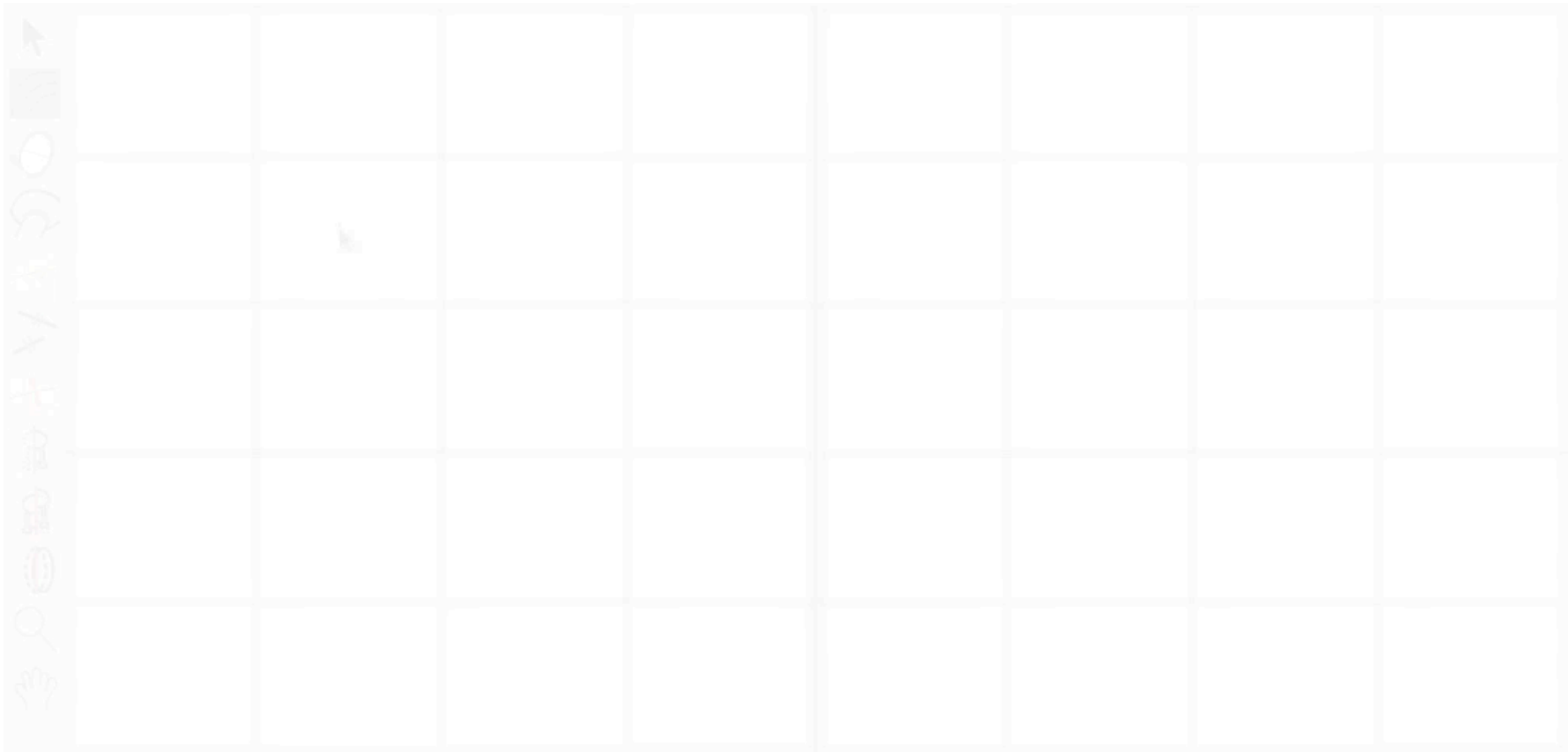


Annotations: Alignment

Annotations: Alignment



Annotations: Same-length



Annotations: Same-scale



Annotations: Same-tilt

Demo

Demo

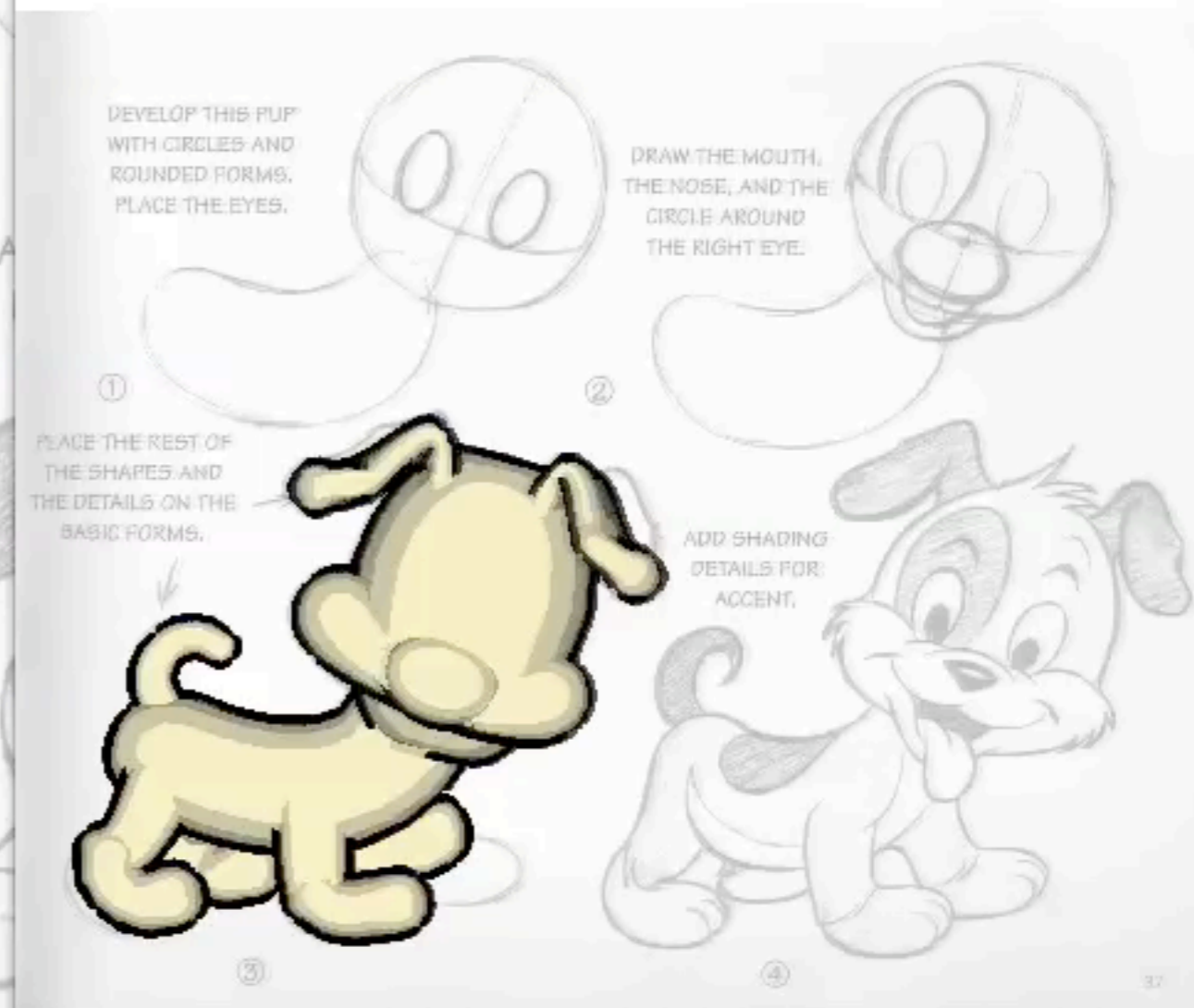
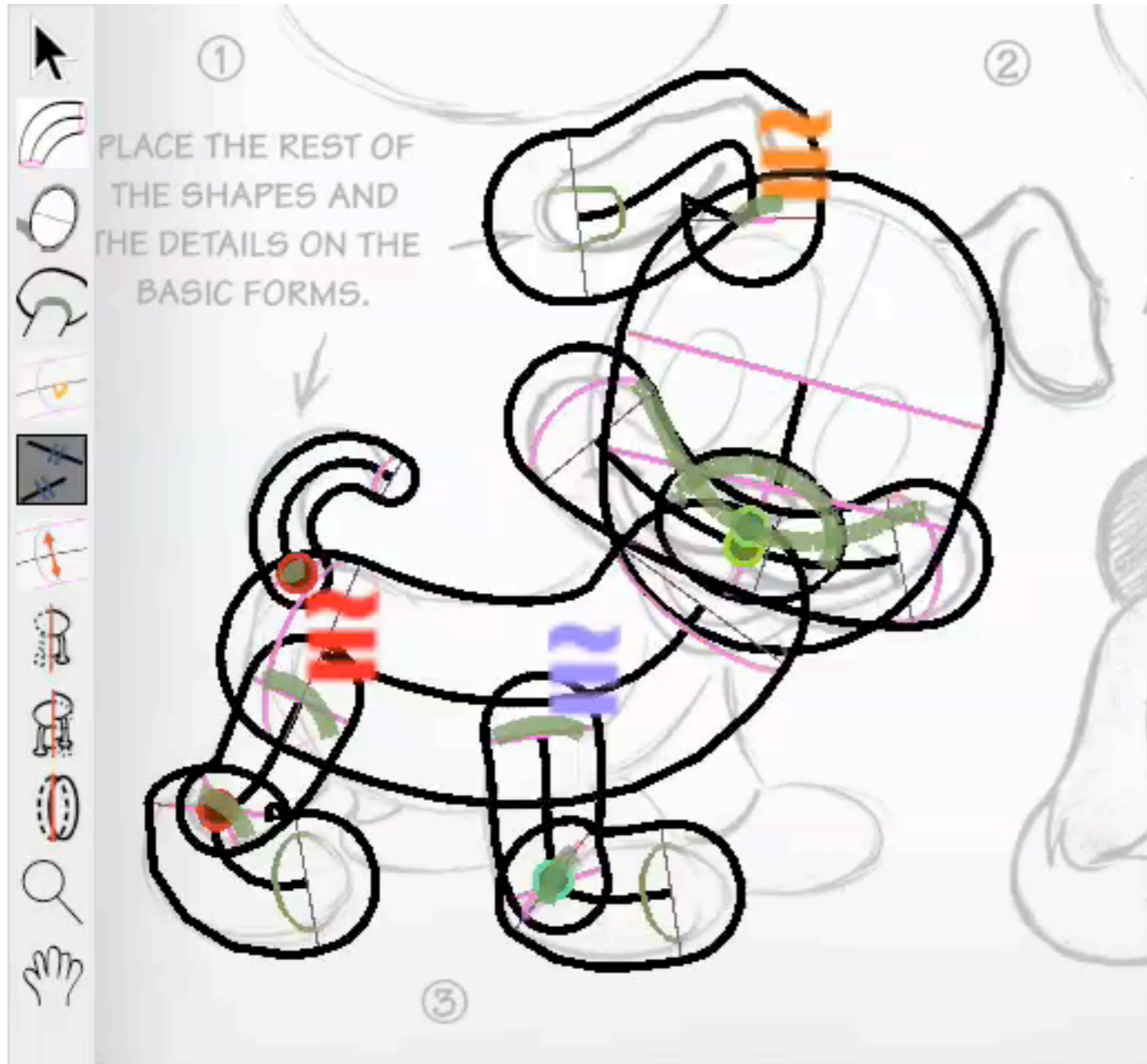
Modeling Session
5x Speed

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]

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

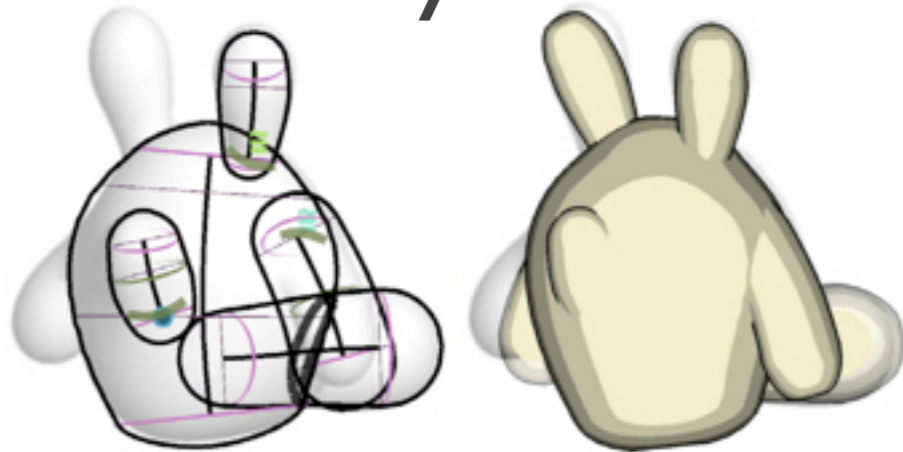
Informal Study

**Models Created by
First-Time Users**

Comparison Study

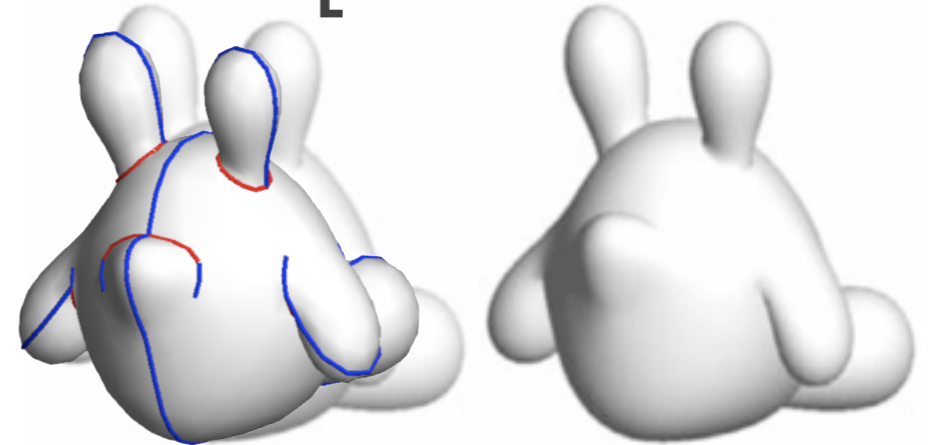


Our system



FiberMesh [Nealen et al. 2007]

vs.



Create 3D model from this dog illustration

15 minutes of training

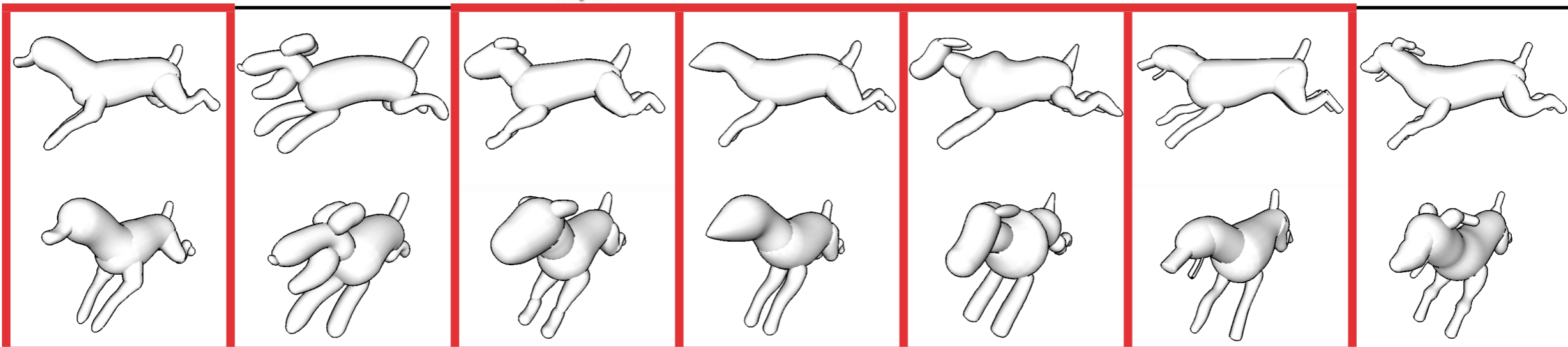
7 users, none had 3D modeling experience

Comparison Study



 preferred

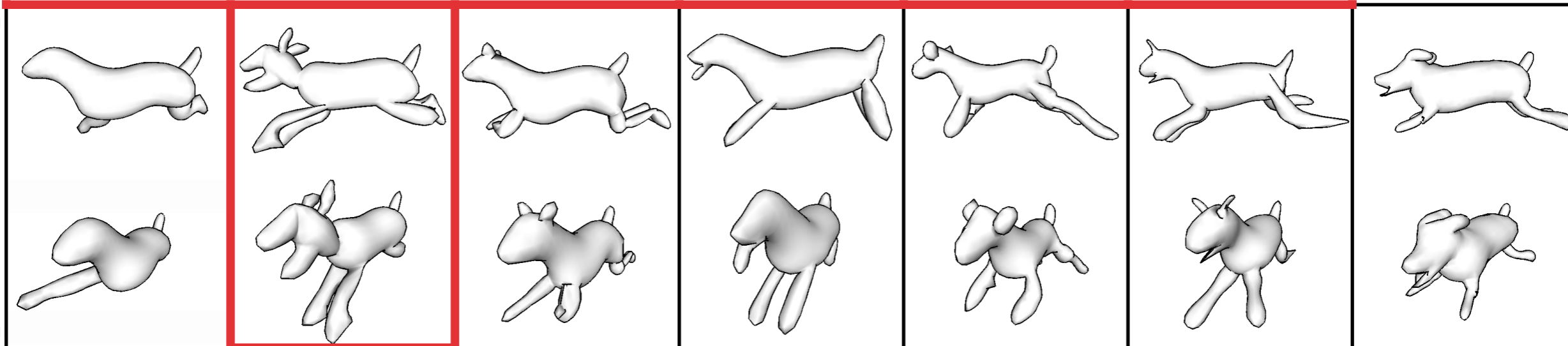
Our system



avg: 29 mins

FiberMesh

[Nealen et al. 2007]

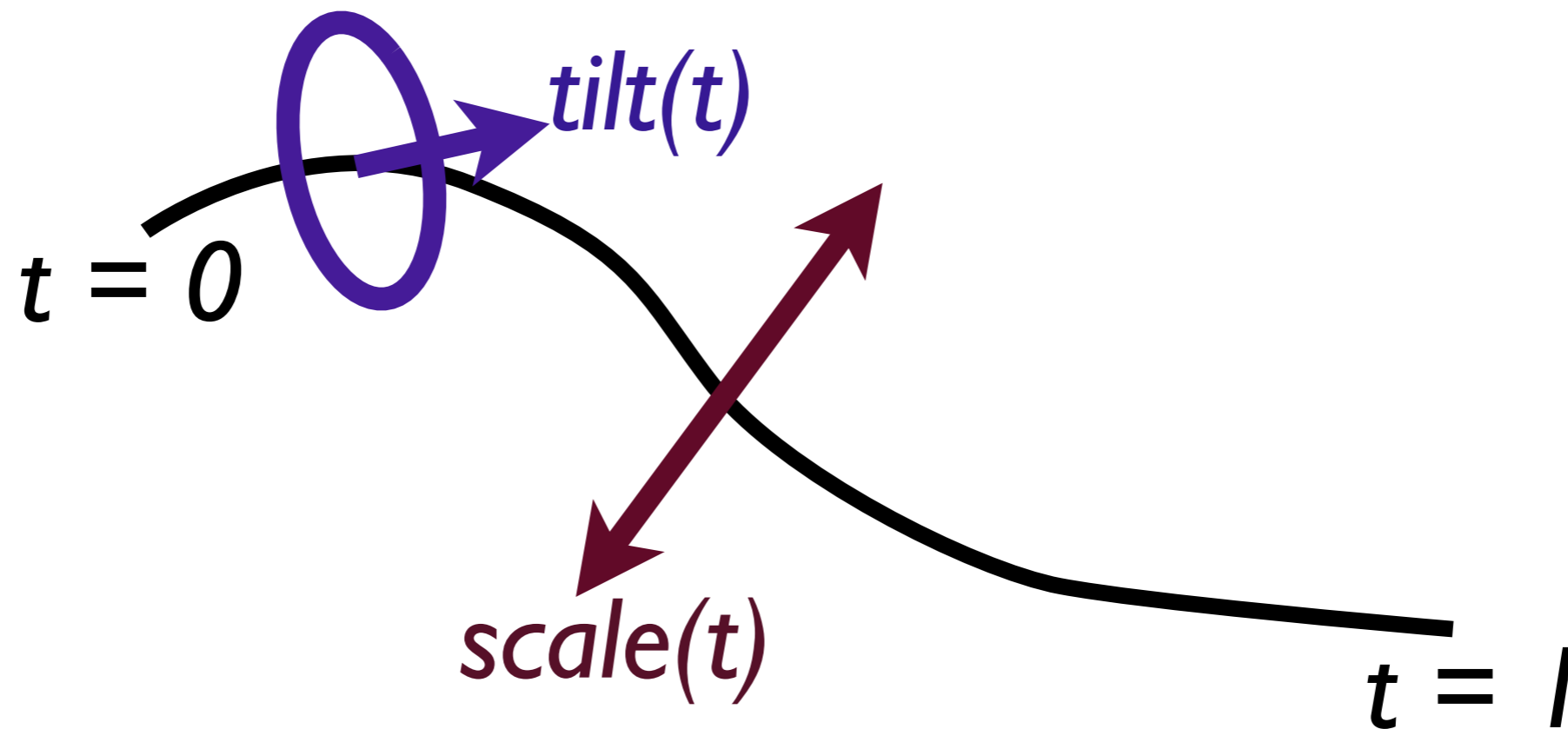


avg: 31 mins

Implementation

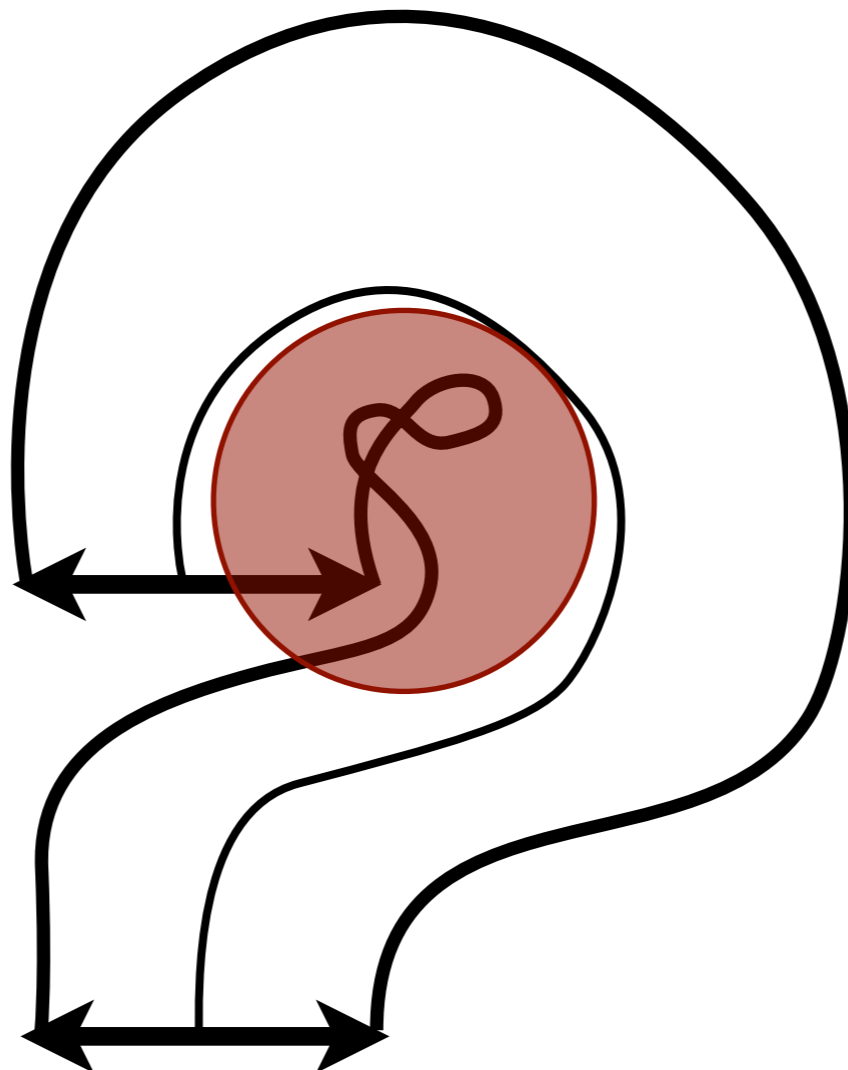
Implementation: Generalized Cylinder

- Parametric



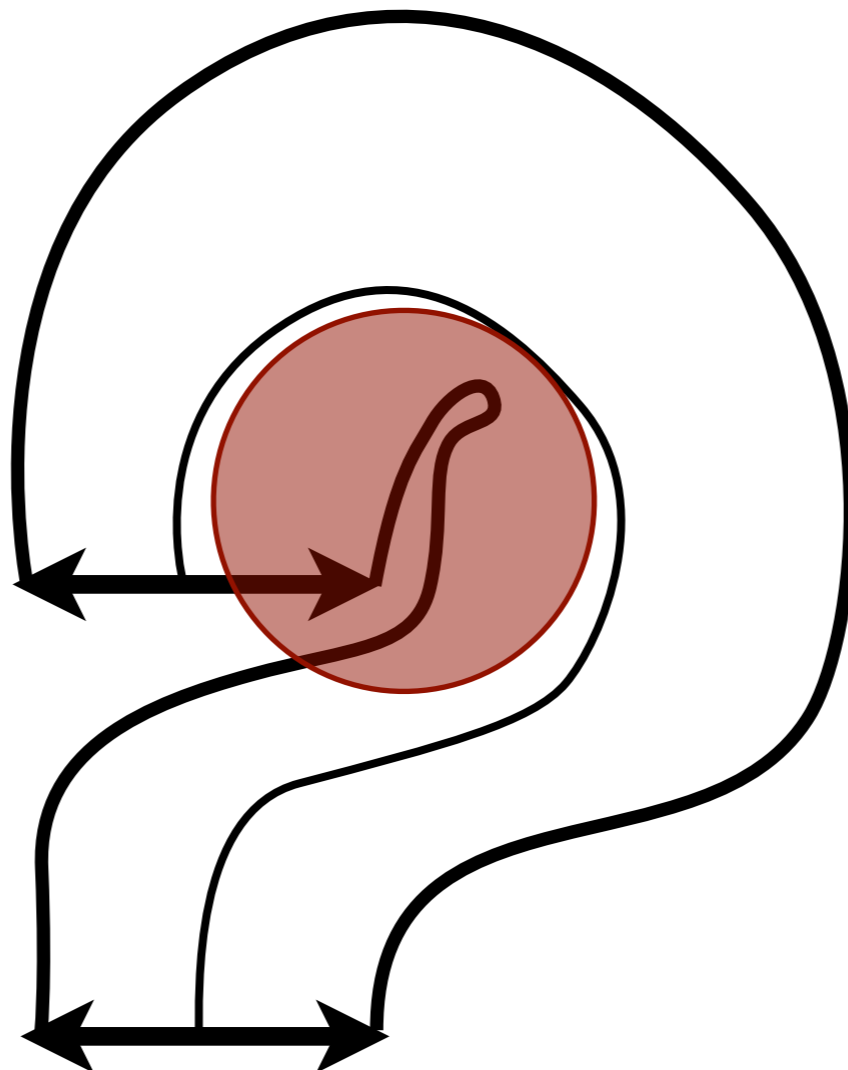
Implementation: Generalized Cylinder

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



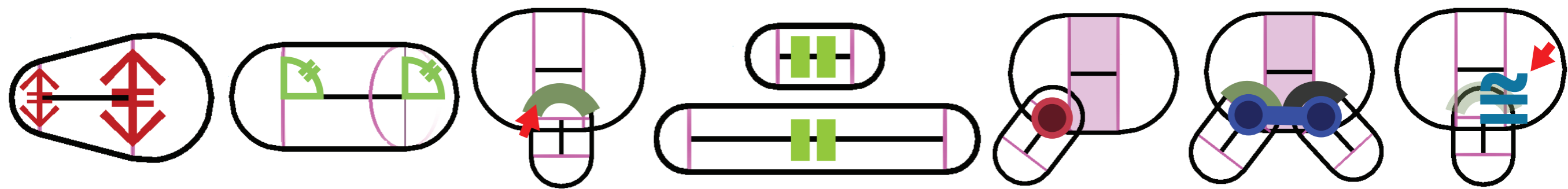
Implementation: Generalized Cylinder

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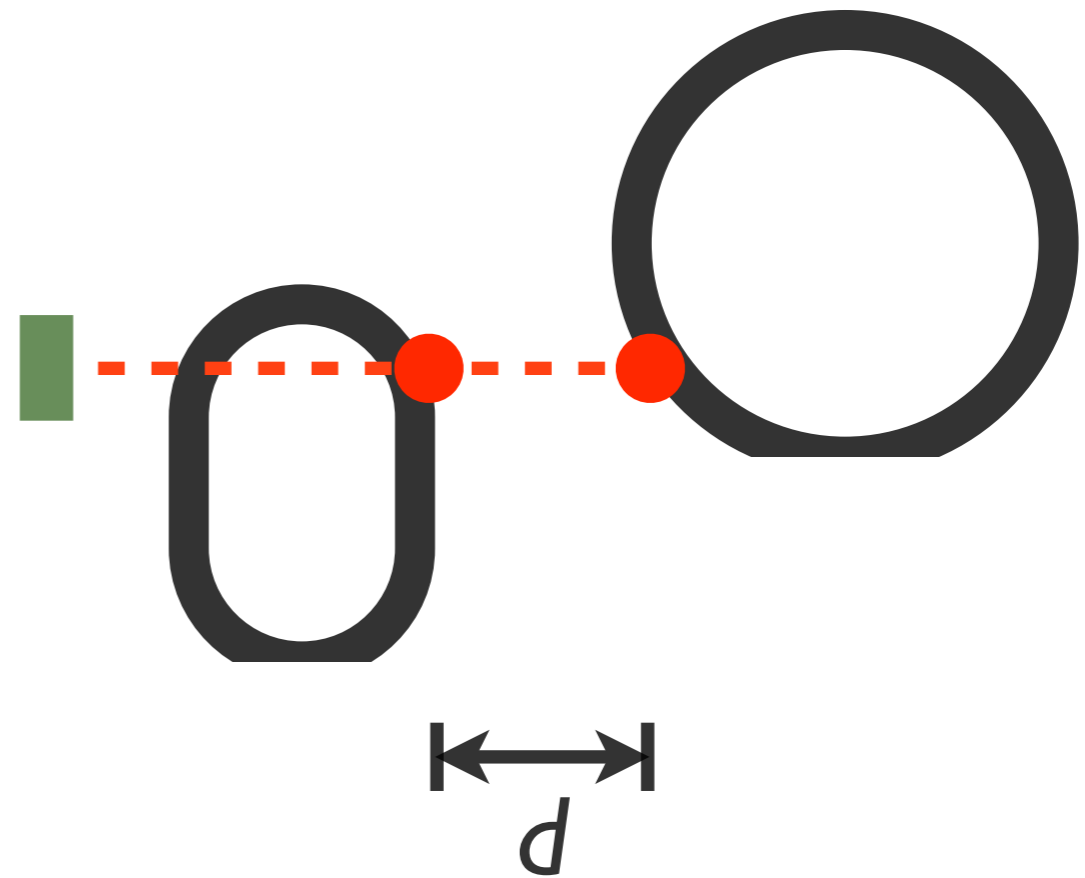
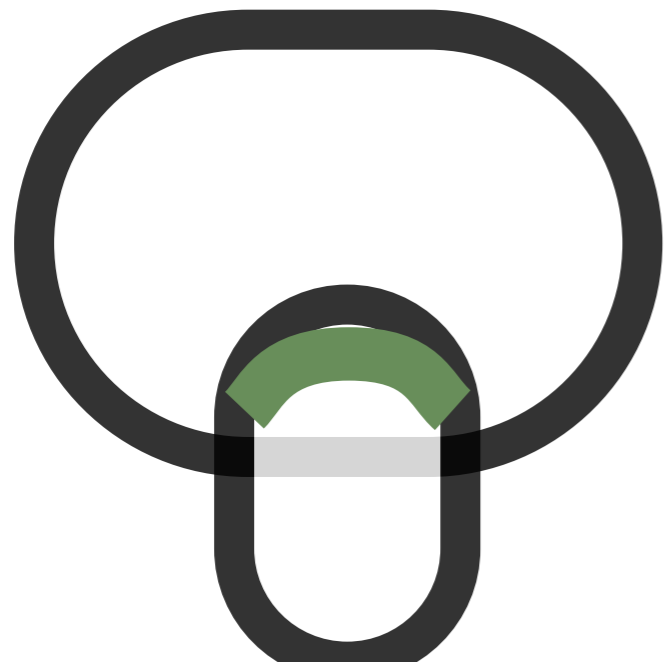
Implementation: Annotations

- 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

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- Interface for modeling by “describing” an existing 2D image with primitives and annotations.

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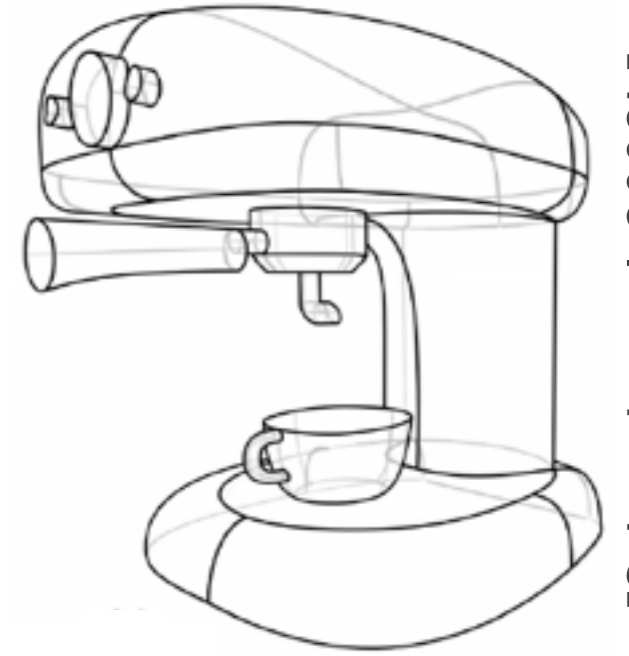
Contributions

- Interface for modeling by “describing” an existing 2D image with primitives and annotations.
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- Resulting model is structured and contains semantic information.

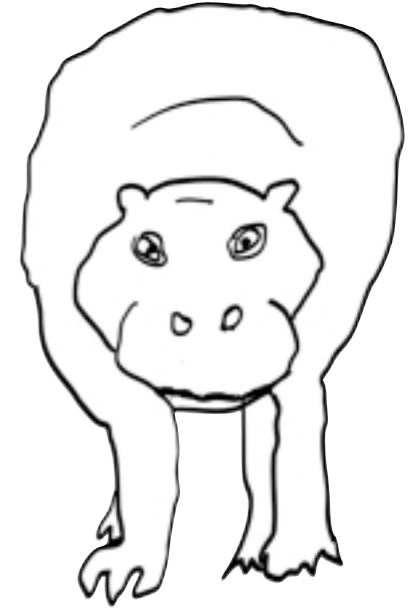
Contributions

- 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

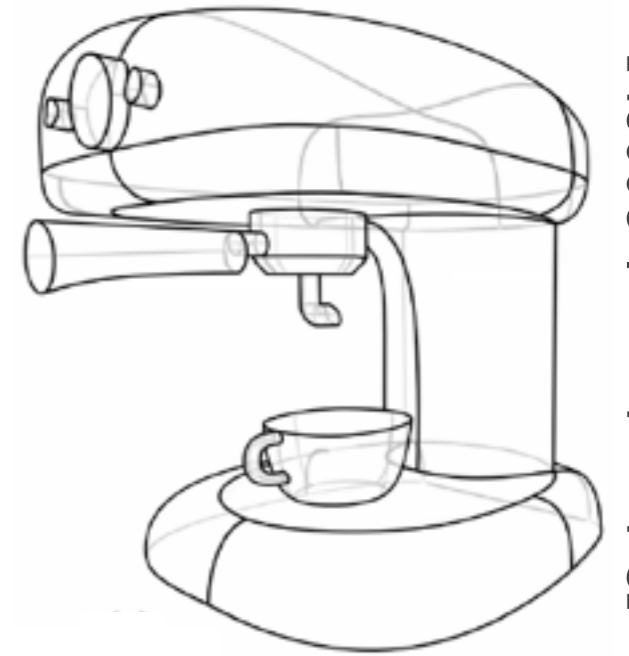


[Schmidt et al. 2009b]

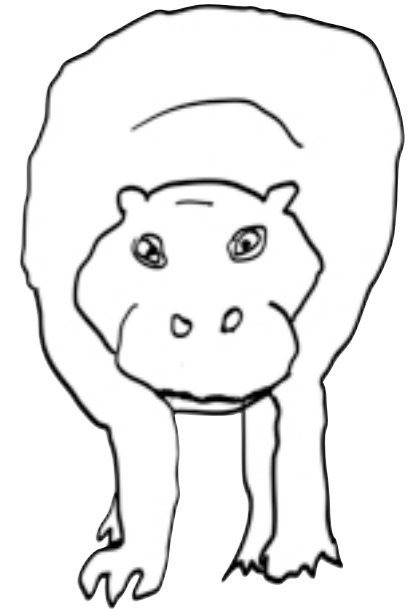


Limitations

- Limited range of models

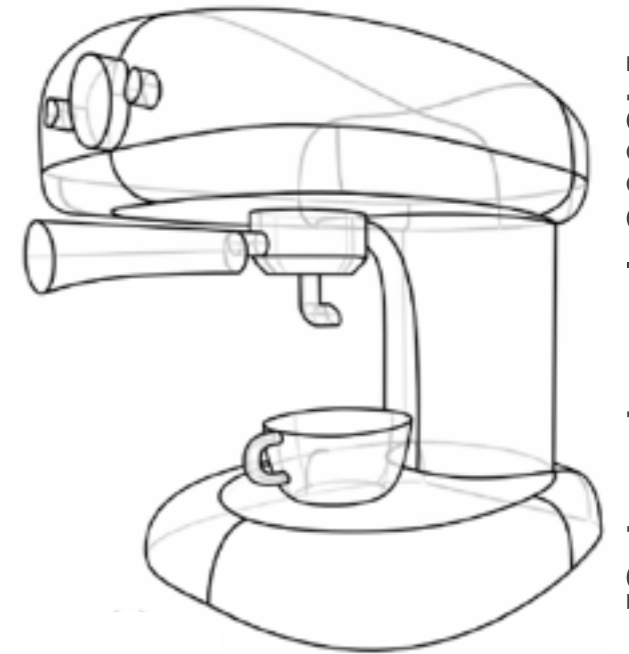


[Schmidt et al. 2009b]

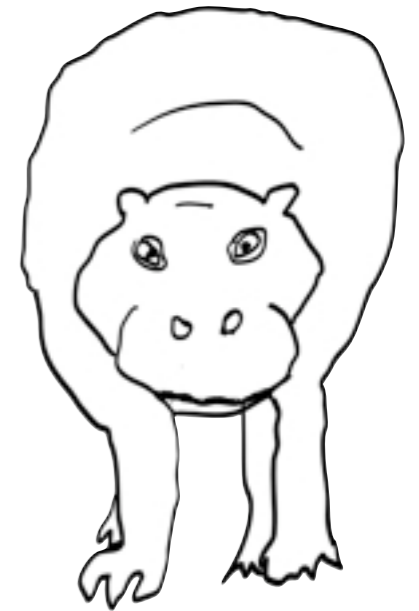


Limitations

- Limited range of models
- Can't be used for certain drawings

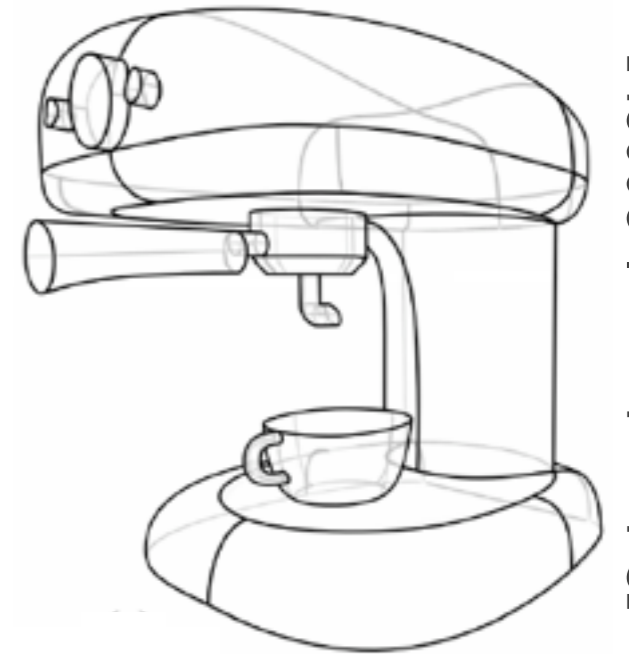


[Schmidt et al. 2009b]

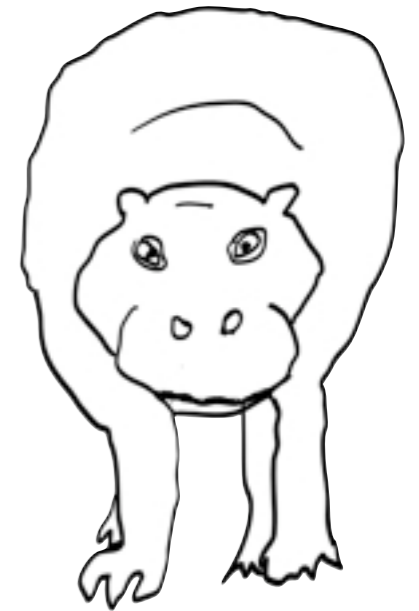


Limitations

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



[Schmidt et al. 2009b]



Future Work

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- More primitives and annotations

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- Use the underlying guide image [Tsang et al. 2004]

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- Different camera models

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