Structured Annotations for 2D-to-3D Modeling

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Pencil and Paper Sketches
Traditional Expert Systems

Concept artwork plays no direct role
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]
Overview

Interface

Results & 2 User Studies

Implementation Details

Conclusion
Inspiration

2D Drawing Approaches

[Vilppu 1997]

[Blair 1994]
Primitives
Generalized Cylinders & Ellipsoids
Primitives
Generalized Cylinders & Ellipsoids

Draw a spine
Primitives

Generalized Cylinder

Ellipsoid
Primitive: Generalized Cylinder
Primitive: Generalized Cylinder
Primitive: Ellipsoid
Annotations

Same-length

Same-tilt

Same-scale

Connection curve

Mirror

Alignment
Annotations: Connection Curves

Draw a spine
Annotations: Mirror

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
Results

Guide images: [Blair 1994]; © Alex Rosmarin; © Kei Acedera, Imaginism Studios 2008; © Björn Hurri, www.bjornhursti.com; © Alex Rosmarin; © Alex Rosmarin; [Kako 1973]; [Kako 1973]
2 User Studies
Informal Study
Informal Study

Models Created by First-Time Users
Comparison Study

Create 3D model from this dog illustration
15 minutes of training
7 users, none had 3D modeling experience

Our system vs. FiberMesh [Nealen et al. 2007]
Comparison Study

Our system preferred with an average time of 29 minutes compared to FiberMesh [Nealen et al. 2007] with an average time of 31 minutes.
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
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• Interface for modeling by “describing” an existing 2D image with primitives and annotations.
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- Usable by novices, including those with poor drawing skills.
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• Resulting model is structured and contains semantic information.
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• 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
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• 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
Future Work

• More primitives and annotations
• Use the underlying guide image [Tsang et al. 2004]
Future Work

- More primitives and annotations
- Use the underlying guide image [Tsang et al. 2004]
- 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,
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  Chris Onstad,
  Kei Acedera (Imaginism Studios),
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User testers

Questions?

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http://cs.nyu.edu/~gingold/annotations/
End