View-Aware Image Object Compositing and Synthesis from Multiple Sources

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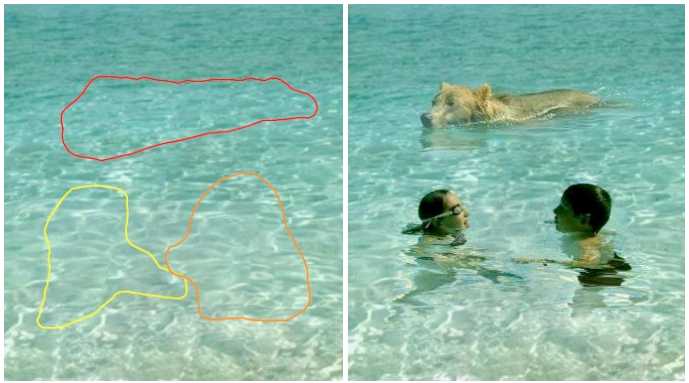
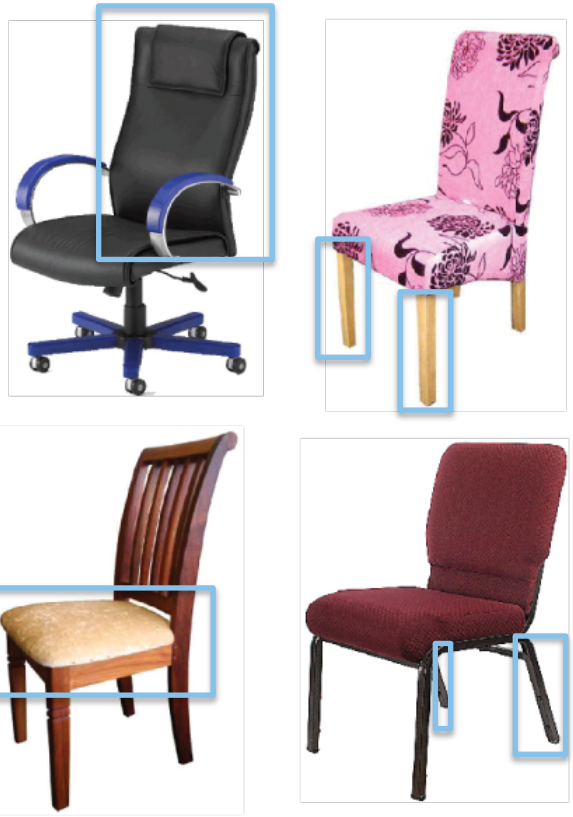
Image Compositing



Poisson Image Editing
[Pérez et al. 2003]

Sketch2Photo: Internet Image Montage
[Chen et al. 2009]

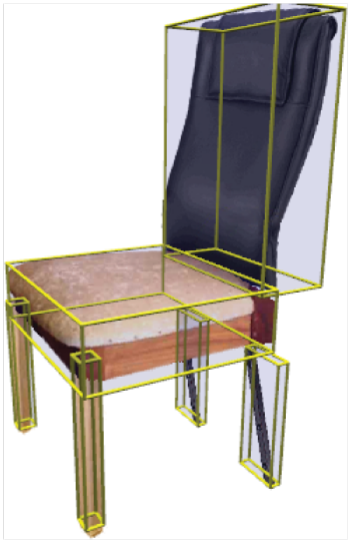
Image Object Compositing



direct compositing

View-Aware Image Object Compositing

spatialize



transform + warp

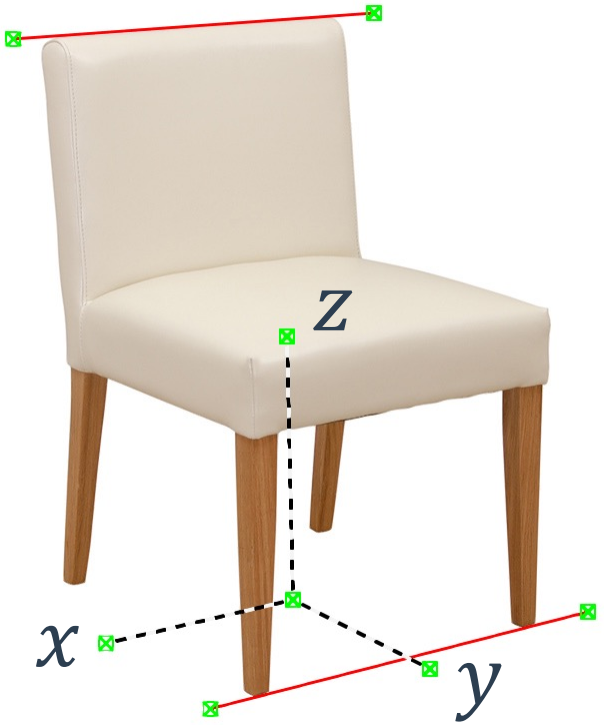
stitch

3D Cuboid Proxy Construction

- Camera calibration

$$M_{3\times4} = K[R|t]$$

7 unknowns



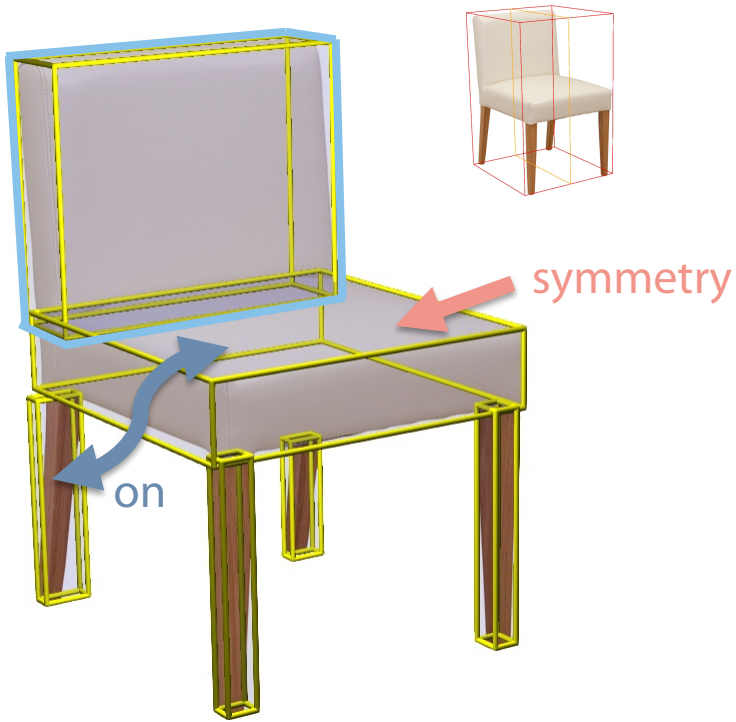
3D Cuboid Proxy Construction

- Initial fitting
  - All proxies on ground
  - [Zheng et al. 2012]

3D Cuboid Proxy Construction

- Structural optimization
  - Energy function

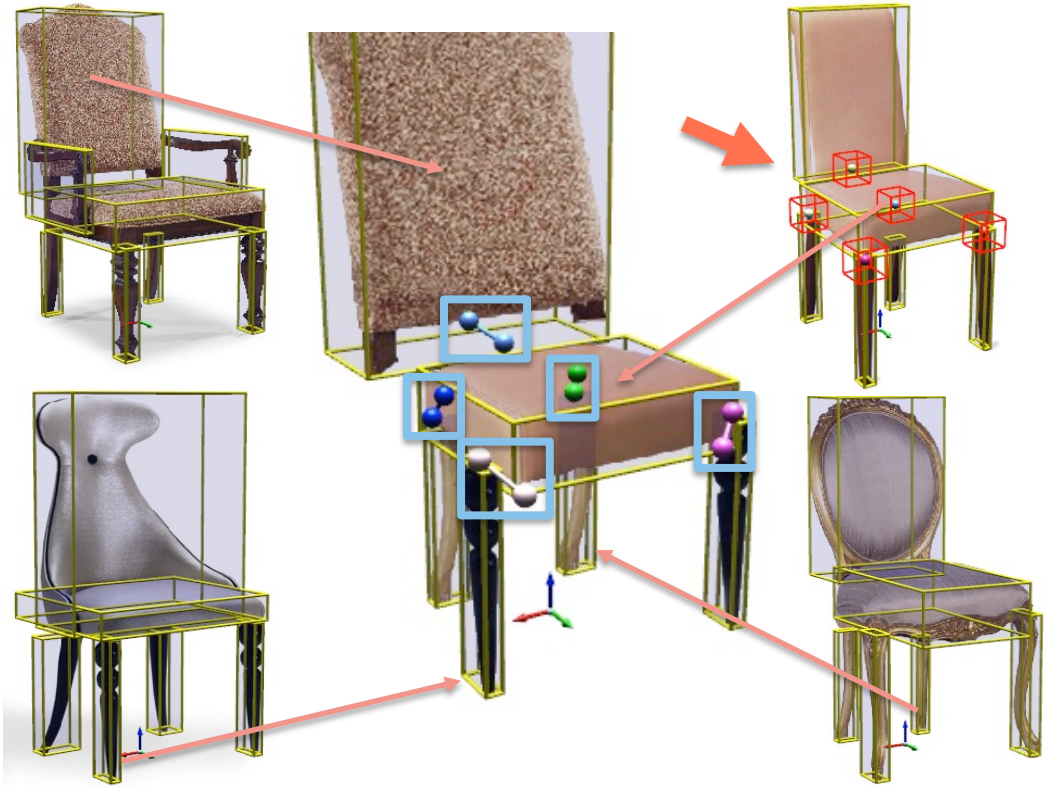
$$w_f E_{fitting} + w_u E_{unary} + w_f E_{pair}$$



Proxy-Guided Component Compositing

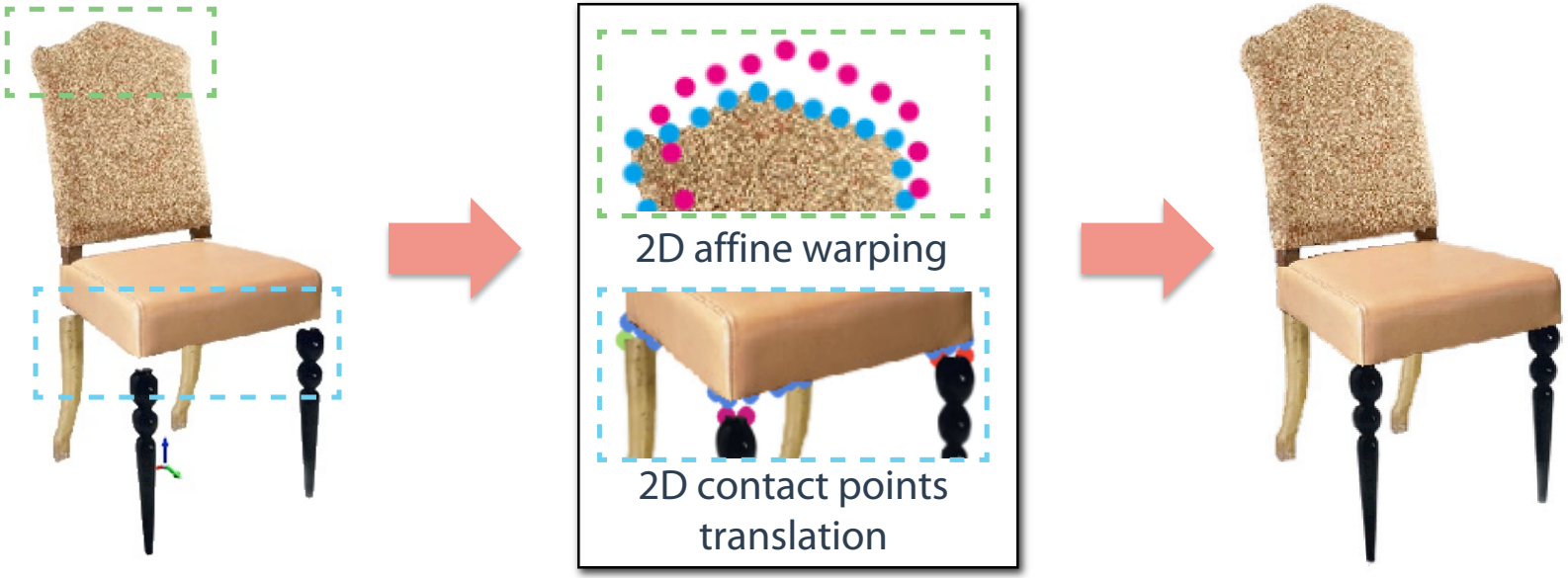
- 3D Conjoining
  - Slot
  - Translation

    Scaling



Proxy-Guided Component Compositing

- 2D Warping + Stitching



Compositing Session

Compositing Session

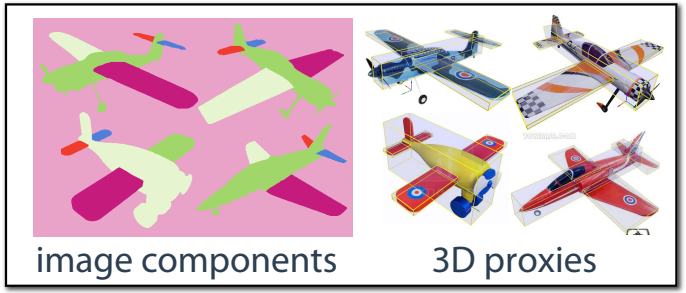
Image Object Synthesis

- 3D shape synthesis
- Research value
  - Huge image resources on the Internet
  - Color or appearance information
  - Inspire 3D shape design

Image Object Synthesis

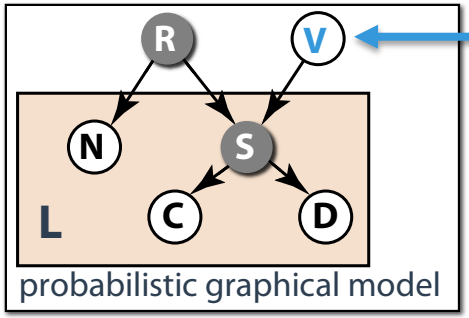
Dataset

3D Cuboid Proxy Construction



Bayesian graphical model training

Proxy Size, Camera Parameter, ...



Viewpoint

Suggested Components

Proxy-Guided Component Compositing

Synthesis Results

- Dataset

Dataset	*Chair*	*Cup*	*Lamp*	*Robot*	*Toy Plane*
#training data	42	22	30	23	15
#categories	6	3	4	5	4
#components	243	44	90	130	63

Synthesis Results

- 259 chairs

Synthesis Results

- 259 chairs

Synthesis Results

- 259 chairs

Synthesis Results

- 259 chairs

Synthesis Results

- 259 chairs

Synthesis Results

- 171 cups

Synthesis Results

- 171 cups



Synthesis Results

- 171 cups

Synthesis Results

- 171 cups

Synthesis Results

- 171 cups

Synthesis Results

- 147 lamps

Synthesis Results

- 147 lamps

Synthesis Results

- 147 lamps

Synthesis Results

- 147 lamps

Synthesis Results

- 147 lamps

Synthesis Results

- 190 toy planes

Synthesis Results

- 190 toy planes

Synthesis Results

- 190 toy planes

Synthesis Results

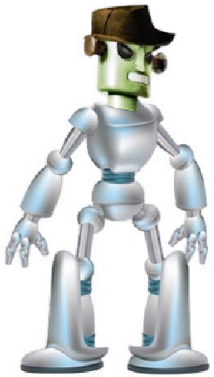
- 190 toy planes

Synthesis Results

- 190 toy planes

Synthesis Results

- 270 robots

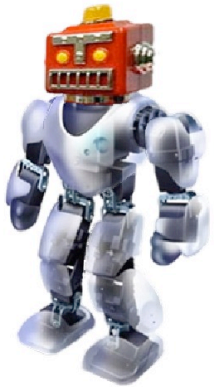


Synthesis Results

- 270 robots

Synthesis Results

- 270 robots



Synthesis Results

- 270 robots

Synthesis Results

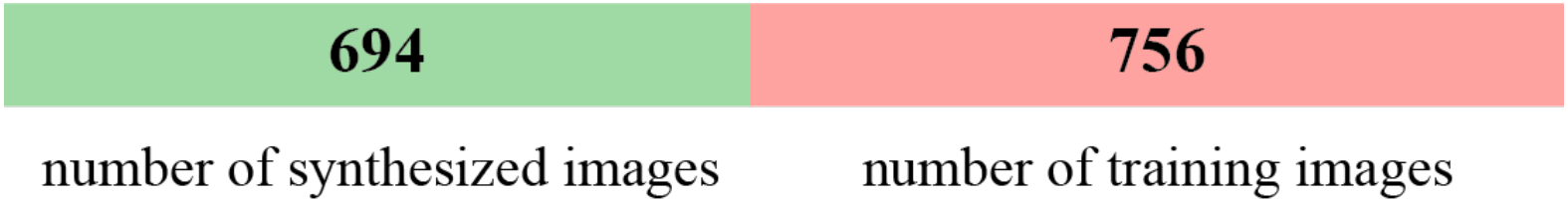
- 270 robots

Synthesis Results

- More results …

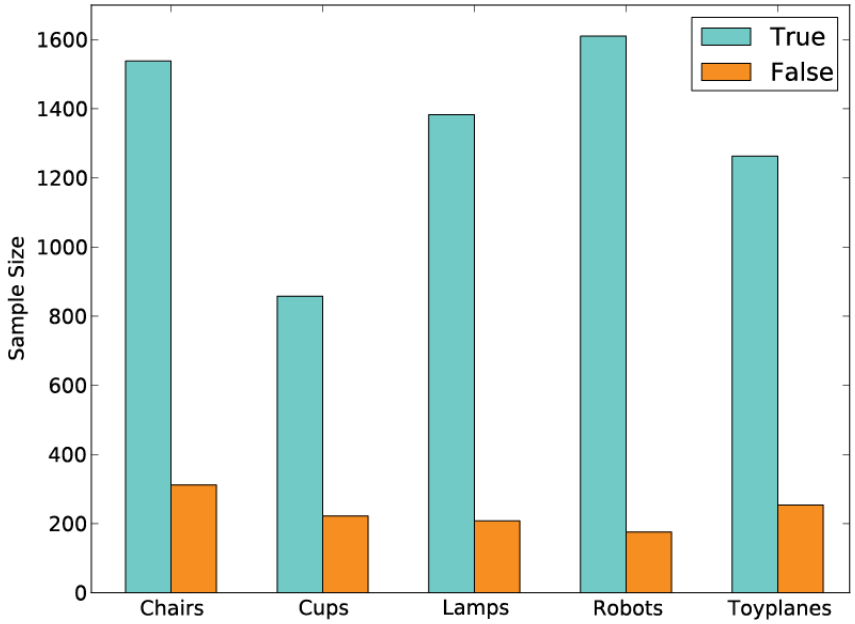
Synthesis Results

- User study: Design Preference Test



Synthesis Results

- User study: Creativity Test



Limitation

- Affine transformation
- Severe occlusions
- Strong illumination effects

Conclusion

- A view-aware approach
- An analysis-and-synthesis technique

- Future work
  - automatic segmentation
  - components compatibility

Thank you