Relationship Template for Creating Scene Variations

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Relationships in a Scene
How to make variations of complex relationship?
Existing Methods


Limitation of Previous Representations

e.g. example scene

ew scene

e.g. example scene

ew scene

e.g. example scene

new scene

new scene
The Representation We Use: IBS


Our Method
Overview

Example scene
Overview

1. Template construction
2. Object fitting
Overview

Result

1. Template construction
2. Object fitting
3. Scene synthesis
Relationship Template: Abstraction of The Open Space

1. Template construction
2. Object fitting
3. Scene synthesis
Template Construction: IBS

1. Template construction
2. Object fitting
3. Scene synthesis

Interaction Bisector Surface (IBS)
Template Construction: Cells and Features

1. Template construction
2. Object fitting
3. Scene synthesis
Shape Coverage Feature (SCF)

1. Template construction
2. Object fitting
3. Scene synthesis
1. Template construction

2. Object fitting

3. Scene synthesis
Object Fitting: the idea

Example scene

1. Template construction
2. Object fitting
3. Scene synthesis
What is a good fitting?

Similarity measurement (fitting score)

\[ S_{final} := (1 - d_{dis})(1 - d_{dir})(1 - d_{scf}) \]
Reduce the Search Space

Find the region of interest (ROI)

1. Template construction
2. Object fitting
3. Scene synthesis
Geometric hashing

Initial Matching

1. Template construction
2. Object fitting
3. Scene synthesis
ICP style refinement

1. Template construction
2. **Object fitting**
3. Scene synthesis
Larger Scenes

Scene hierarchy

Combine with other scene synthesis system


1. Template construction
2. Object fitting
3. Scene synthesis
Results and Evaluations
Pairwise Experiment: Our Method vs. ShapeSPH*

Input

Pairwise Experiment: Results
Larger Scene Experiment

Input scene

Results - Ours

Results - [Fisher et al. 2012]
Larger Scene Experiment

Input scene

Results - Ours

Results - [Fisher et al. 2012]
Larger Scene Experiment

Input scene

Results - Ours

Results – [Fisher et al. 2012]
Larger Scene Experiment: Evaluation

User study interface

Please select the object arrangement below that you judge to be more realistic.

- **Do** consider the relative arrangement of objects. (For example, *do* judge if the relative arrangement of persons, desks and chairs seems realistic to you.)
- Do **not** consider colors and materials. (For example, ignore that some objects may have a more realistic color than others.)
- Do **not** consider the quality of individual models. (For example, ignore how realistic the person models look.)

Choose the left or right object arrangement before submitting.
Larger Scene Experiment: Evaluation

- Bradley-Terry Model

Graphs showing pairwise scene comparisons and probabilities of being judged more realistic for 'vase-flower' and 'cart' scenes.
Spatially Repeated Objects
Conclusion

• We propose a method for synthesis of scenes with complex relationships.

• We propose a novel feature “SCF” to encode open space.

• Our method can be used to augment existing methods.
Limitations and Future Work

- Only consider rigid IBS

Future work:
- Add flexibility to the relationship template
- Learn a parametric model of the relationship template
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