

The Parameter Space of Cups: Cluster-based Exploration of a Geometry Generator's Parameter Space

Master- /Diplomstudium:
Visual Computing

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Motivation

Evaluation of computer vision systems

- Real-world test-cases
- **expensive!**

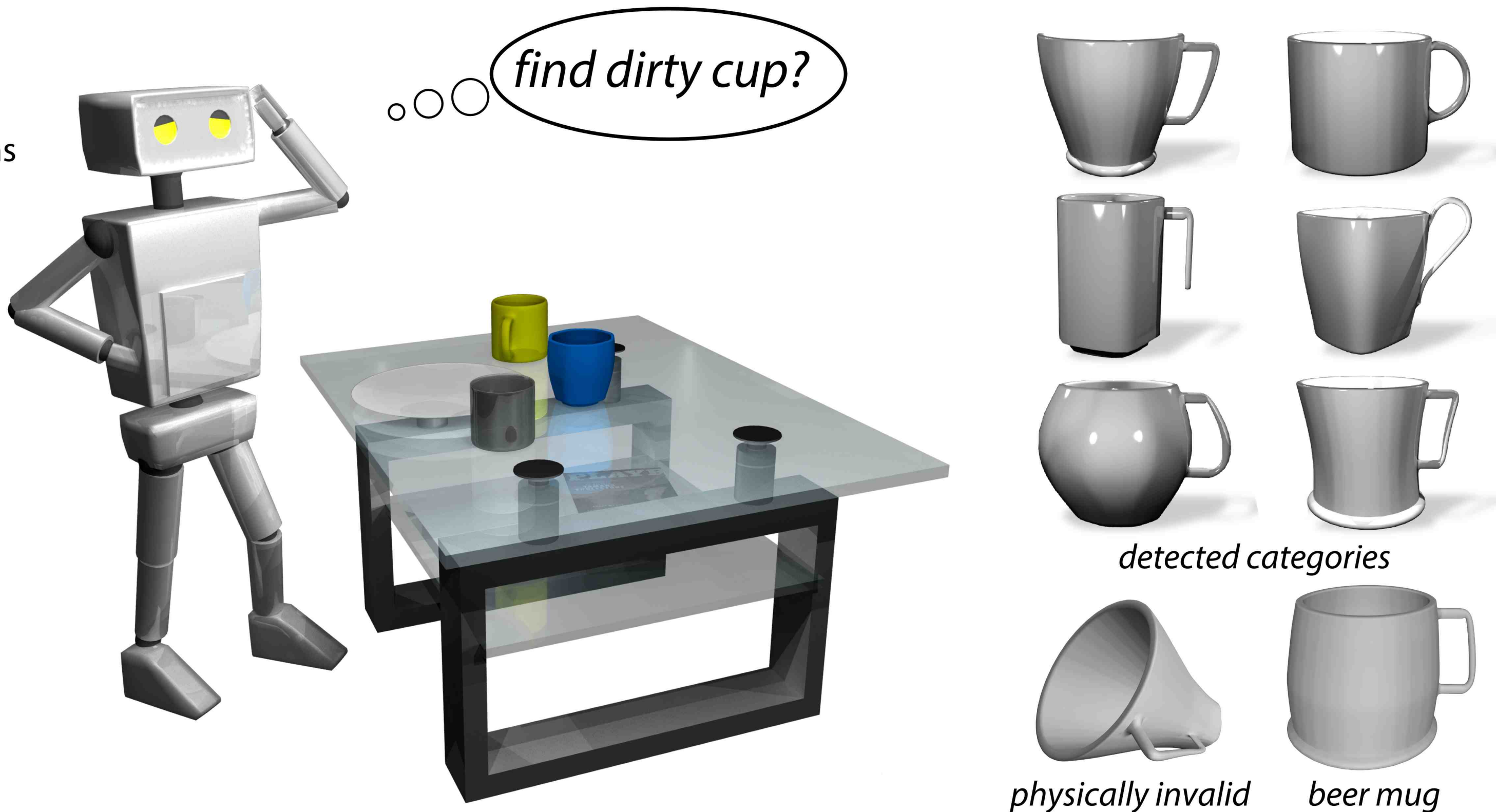
Idea: Simulate test-case

- Automatic test-case generation
- Using computer graphics

Application Area: household robot

Geometry Generators

- Generate 3D shapes
- Large variations
- Sample parameter space



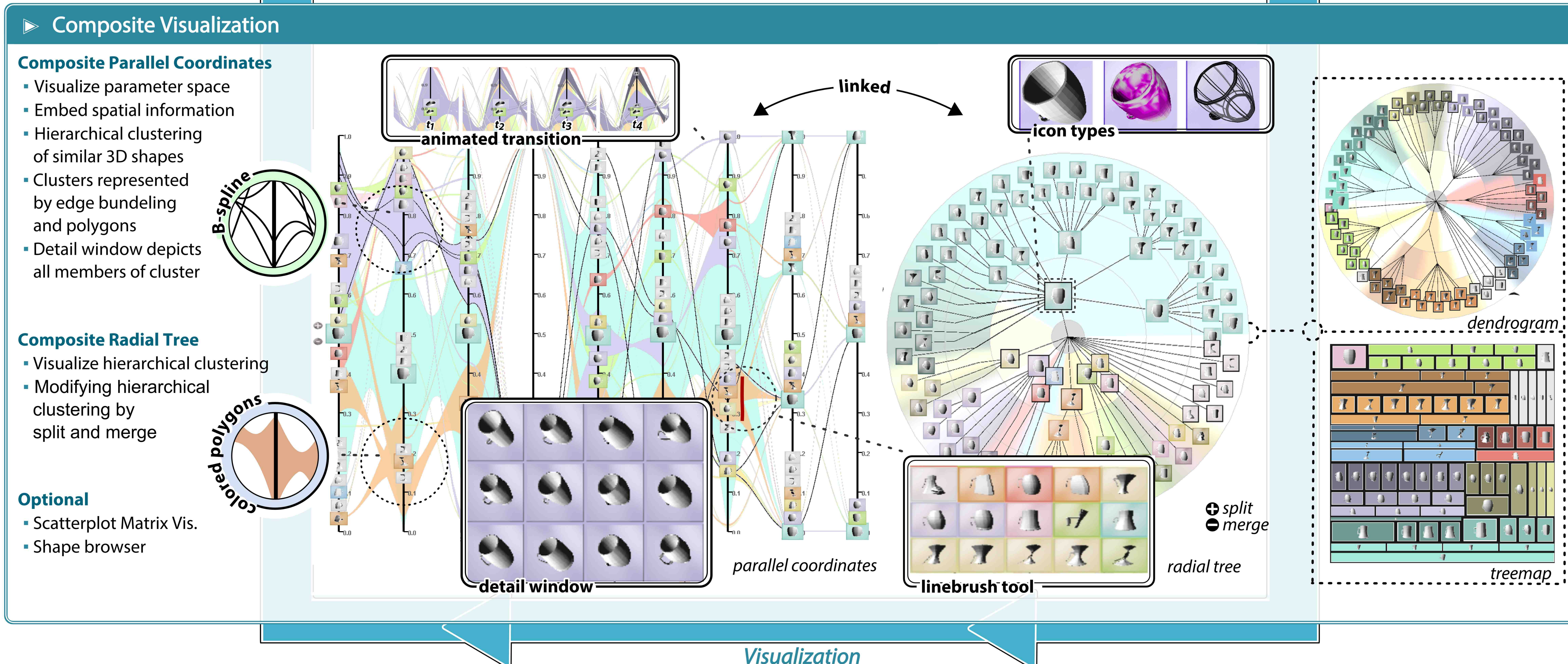
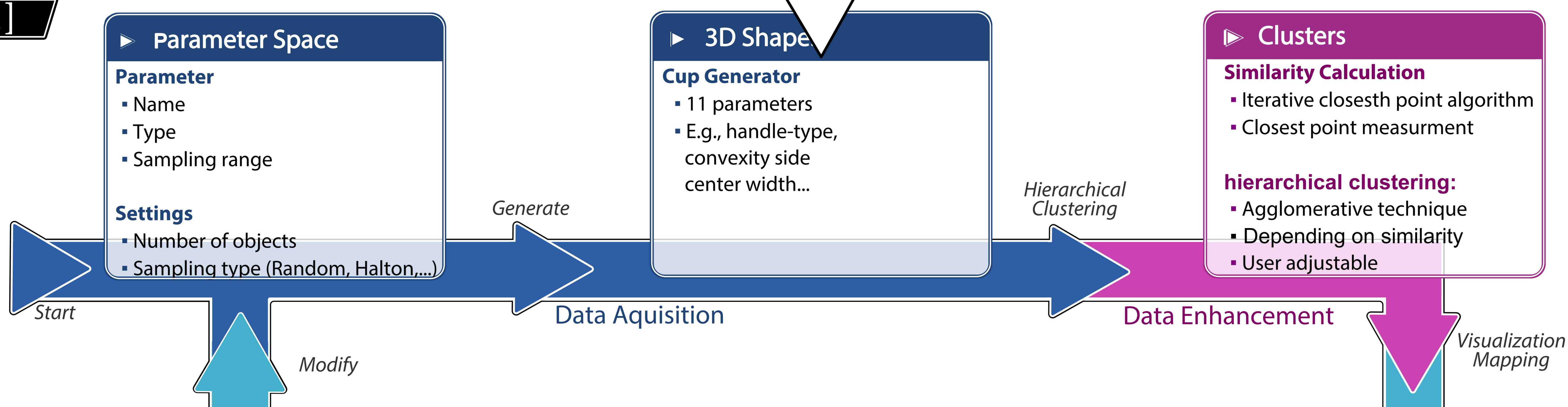
Tasks

»Find **similar 3D shapes** and corresponding **parameter settings**.«
T1: Categorization

»Find **errors and unwanted 3D shapes**.«
T2: Errors

»Determine **sensitivity and influence of parameters** on the resulting **3D shapes**.«
T3: Influence & Sensitivity

Cupid[1]



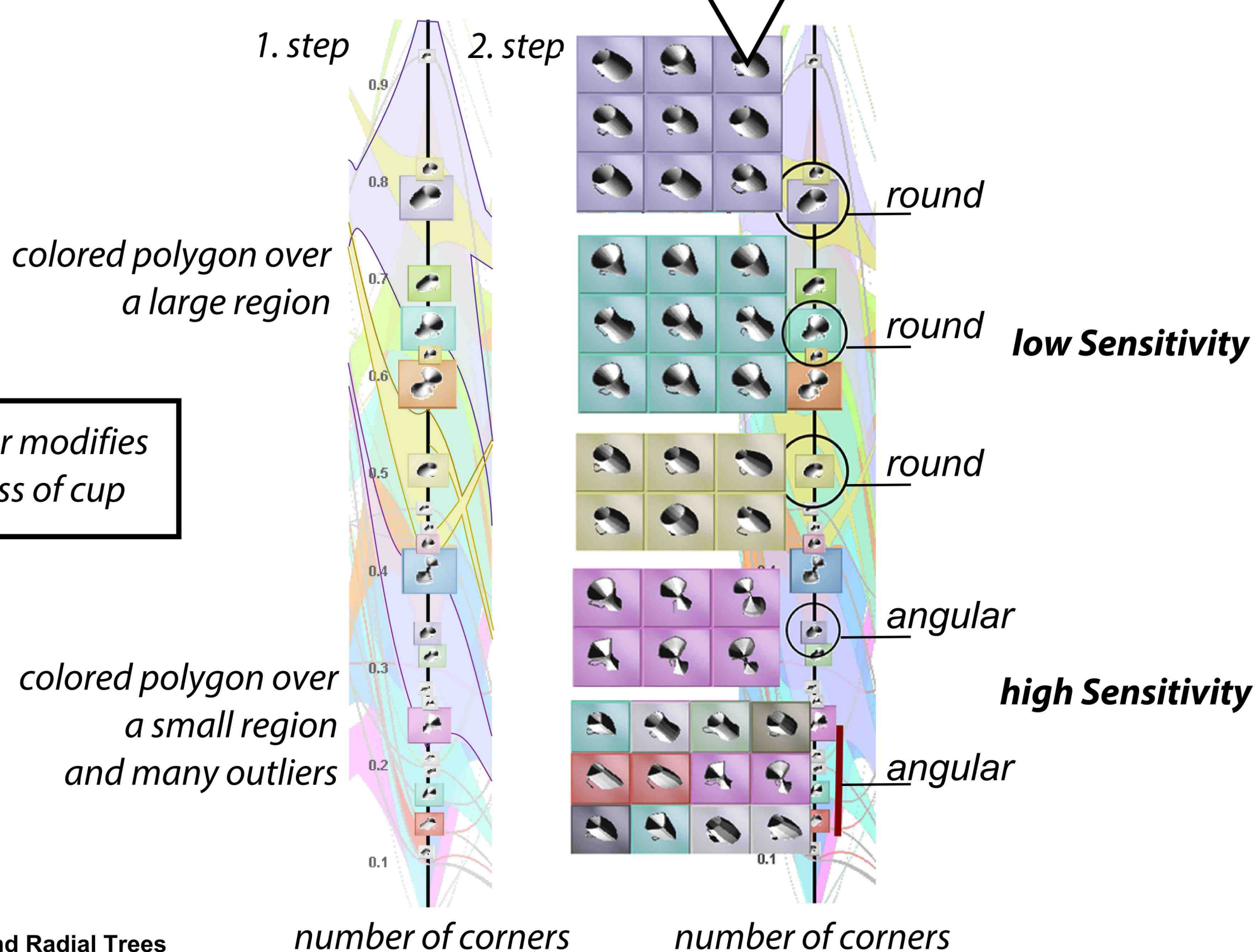
Result

Work-flows:

- Analyze effect of parameters
- Query-based exploration
- Categorization (**T1: Categorization**)
- Errors (**T2: Errors**)
- Influence of parameters (**T3: Influence**)
- Sensitivity of parameters (**T3: Sensitivity**)

Sensitivity Work-flow (T3: Sensitivity)

- Size of colored polygon
 - Large polygon → low sensitivity
 - Small polygon → high sensitivity
- Analyze regions with linebrush tool and clusters with icons



Feedback

from domain experts of testing computer vision systems

- + Illustrative Techniques
- + Integration of shapes & clusters
- + Highlighting & brushing
- + **T1: Categorization** and **T2: Errors**
- ~ **T3: Influence**
- **T3: Sensitivity**

Conclusion

novel combination using well-known techniques

- Composite visualization that combines the abstract parameter space with the resulting 3D shapes
- Illustrative techniques
- Hierarchical clustering
- Positive domain feedback

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