The Surfacing of 3D Drawings Through Lofting and Occlusion Reasoning

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The Problem

From a **large** sequence of 2D images, produce 3D models
This paper: dense surface reconstruction via 3D curves

How far can we get without shading?

MOTIVATION

Isolated point features + dense multiview stereo

Pro: uncontrolled acquisition; dense texturized models
Con: point cloud; need texture; use a large amount of resources; unscalable; oversmoothing; lack semantic info

We favor a middle ground approach based on curves

More distinctive features than points, allowing for applications such as 3D modeling and object matching

More efficient in space and time compared to volumetric or mesh-oriented approaches; prioritizes informative areas

More flexible when there aren't enough feature points or texture, on its own or by **constraining surfaces**

Sketches as Anchors to Appearance

(Pipeline diagram)

3D Curve Drawing – ECCV'16 & CVPR'10

AUTOMATED LOFTING

Interactive technique until the present work

S.Schaefer, J.Warren, and D.Zorin. SIGGRAPH SGP 2004

HYPOTHESIS GENERATION

3D CURVE DRAWING REORGANIZATION

HYPOTHESIS TESTING

$$E_{n,k}^l = \int_{a_{k,n}^l}^{b_{k,n}^l} \phi(\gamma_k^l(s))ds$$

EVALUATION

RECONSTRUCTOIN RESULTS

DATASETS

50 views with full camera models
Smooth surfaces & Cast Shadows

Professionally composed in Blender
Realistic videos / 3 extreme illuminations
Mesh ground truth / Man-made objects

RECONSTRUCTION RESULTS (Continued)

ONGOING WORK

CONCLUSION

- Global multiview **surface** reconstruction based on image curve content with **no shading or appearance**
- Resolution anchored at singularities for progressive & crisp reconstructions
- First ever automated surface lofting
- Occlusion reasoning as a first step to augment 3D drawings with rough and robust surface information

Multiview-3d-Drawing.sf.net