

Automatic Texturing without Illumination Artifacts from In-Hand Scanning Data Flow



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Background

The proposed paper is related to the acquisition and visualization of color information on 3D Models.

The basic problem is due to:

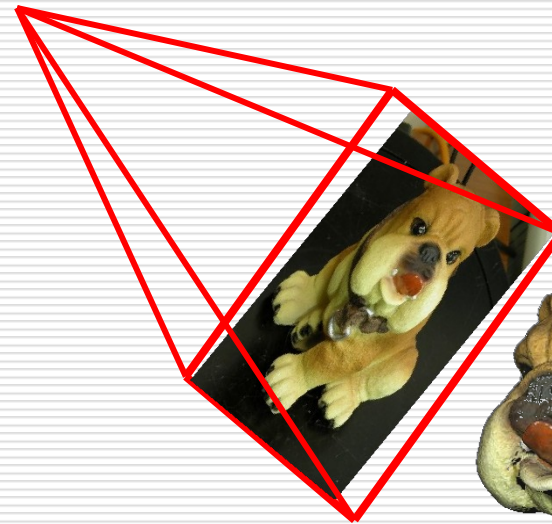
- ❑ The low quality of color provided by 3D scanners
 - ❑ The complexity of the acquisition of the reflection properties of an object
-

Background

A robust and widely applicable solution is to start from a set of photos covering the surface of the object. In a photo, color information is stored according to optical laws of perspective ...

If camera parameters can be recovered, it is possible to project back the information onto the geometry

Simple and effective...



Background

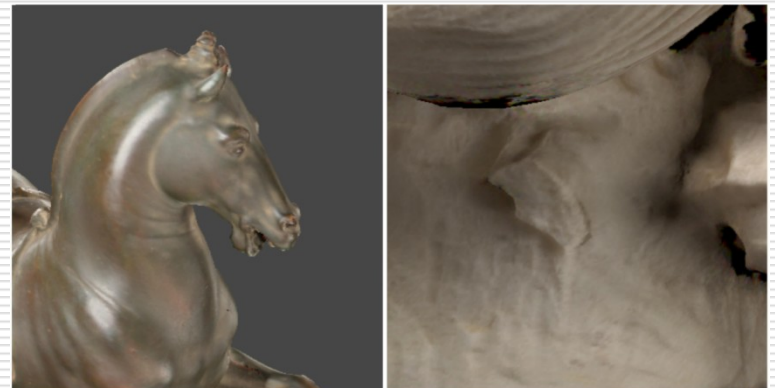
Color projection from images

Issues:

- ❑ Image alignment
- ❑ Color projection (combination of images contributions)

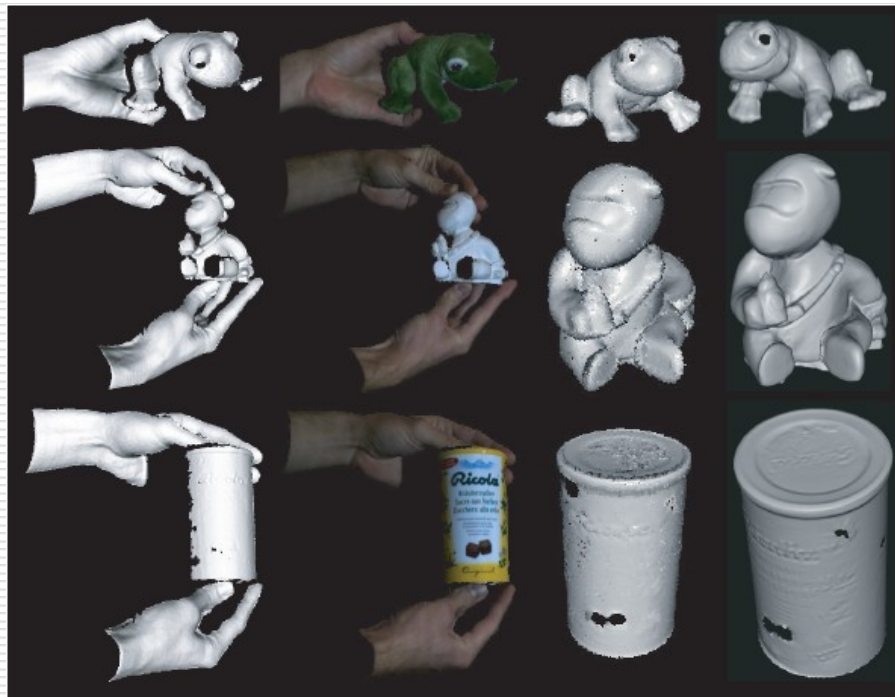
Limitations:

- ❑ Small misalignments -> aliasing, blurring
- ❑ No information about
Illumination -> lighting artifacts



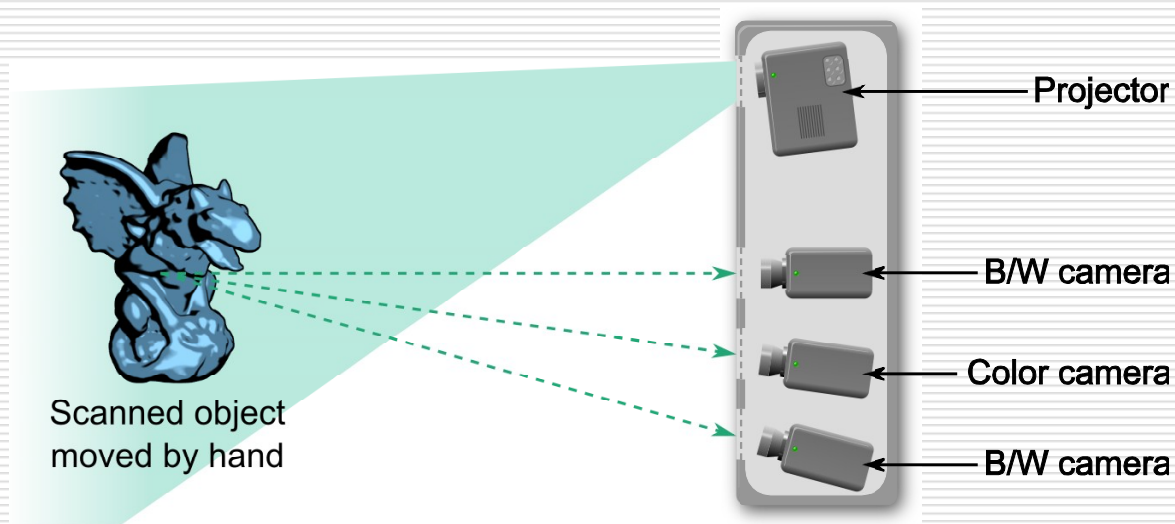
In-hand 3D scanners

Recently, cameras and projectors with high frame rate have been used to provide “quasi real-time” 3D scanning devices



In-hand 3D scanners

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Proposed approach

An texturing system, which takes into account the advantages of the input data provided by in-hand scanners

The system can be implemented to be:

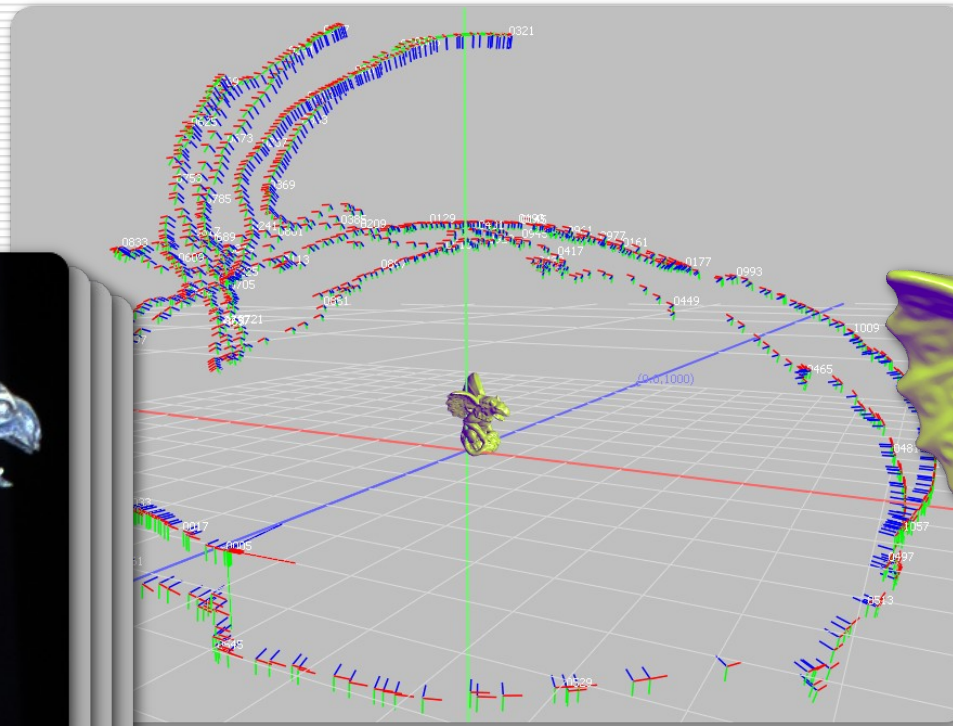
- ❑ Fast
 - ❑ Automatic
 - ❑ Dealing with most of the limitations of color projections approaches
-

Input data

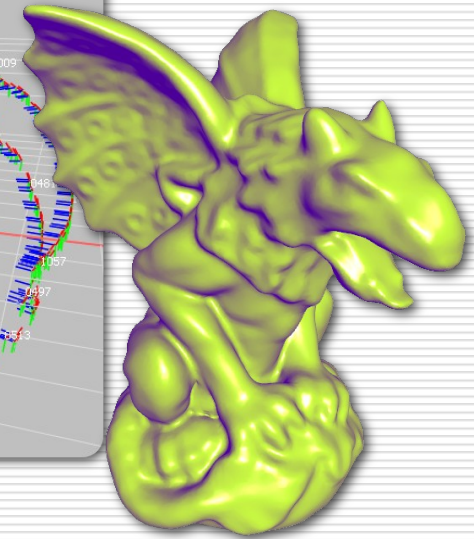
provided by the ETH's in-hand scanner



Color images



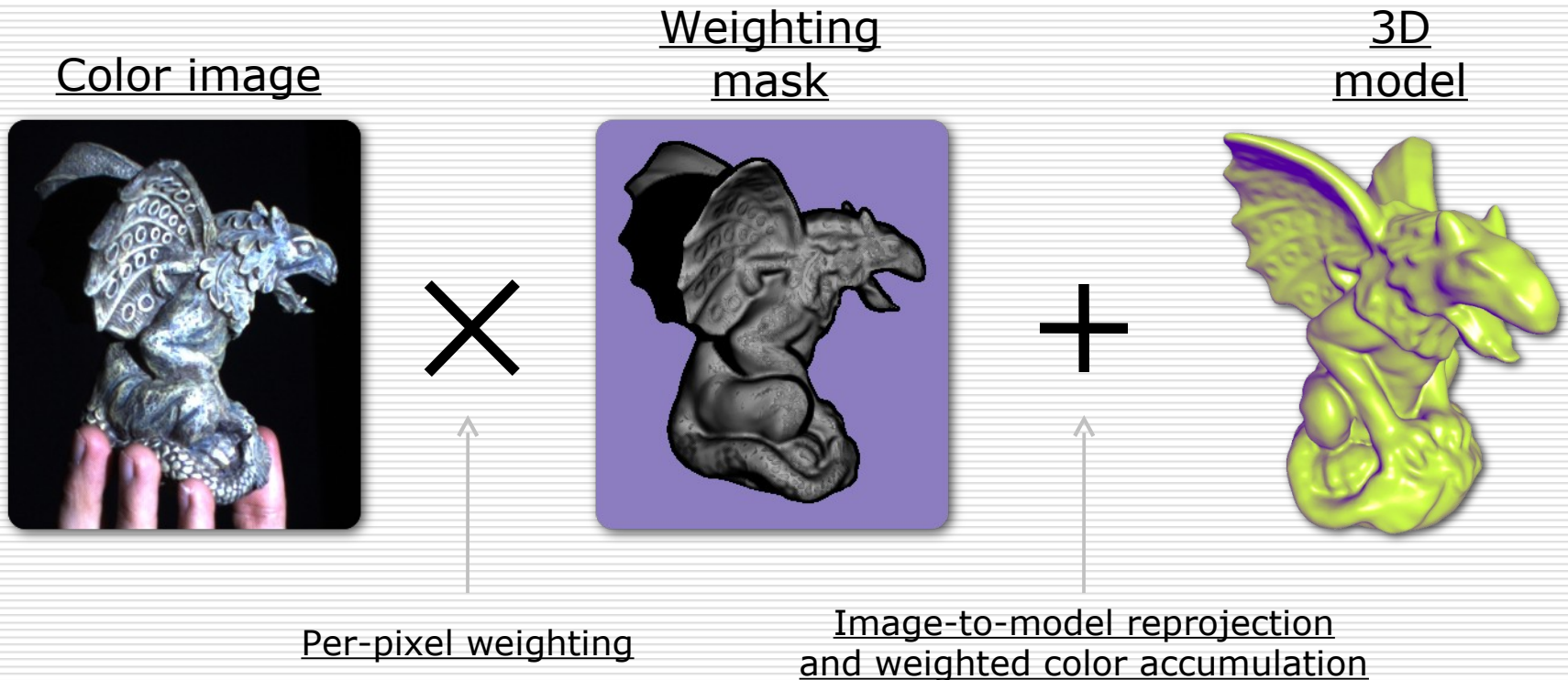
Rigid motions



3D model

Basic projection approach

Texture synthesis:
weighted averaging of input images onto the 3D model



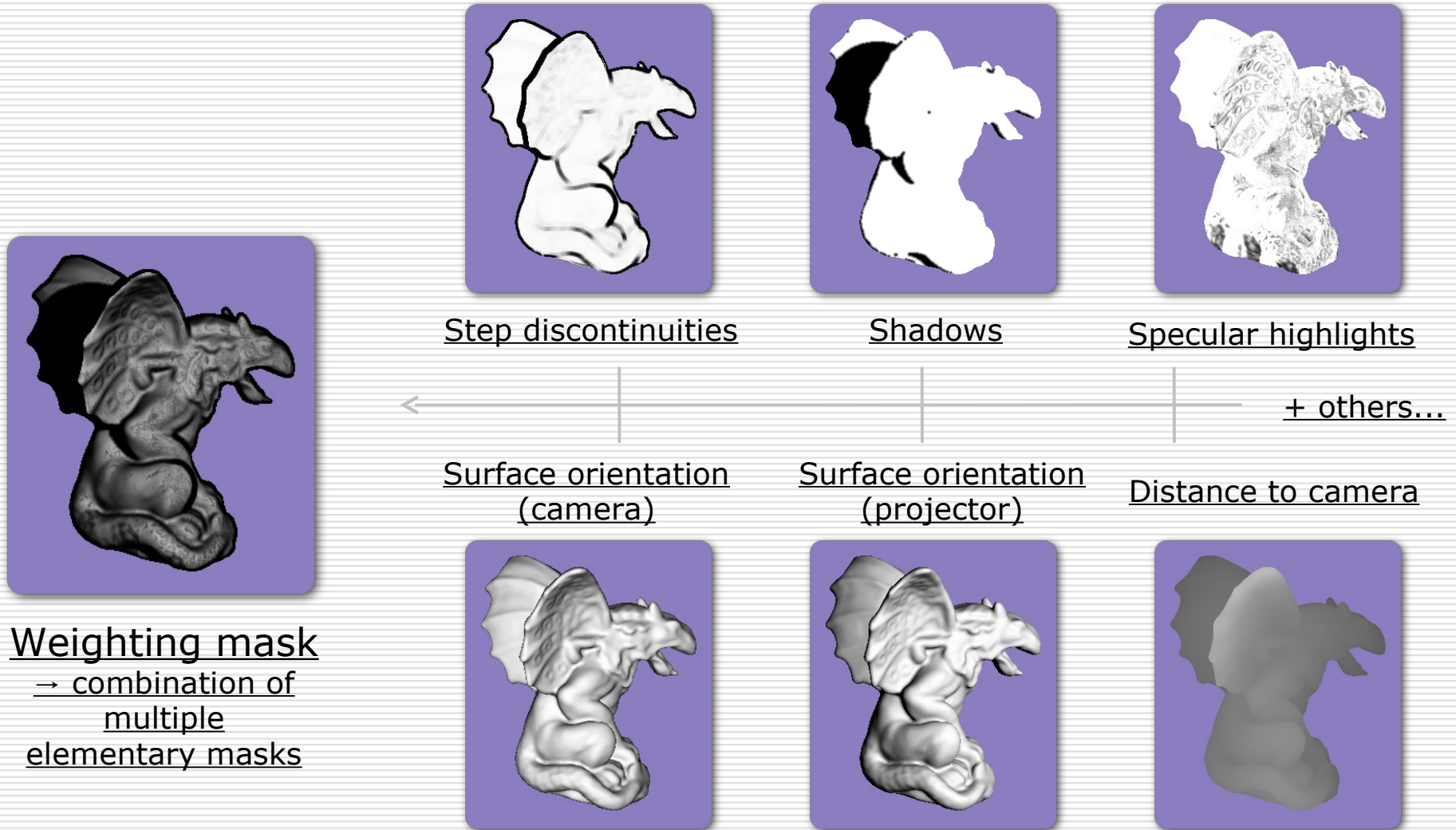
Advantages of in-hand systems

But in-hand systems provide richer data respect to a typical color projection case

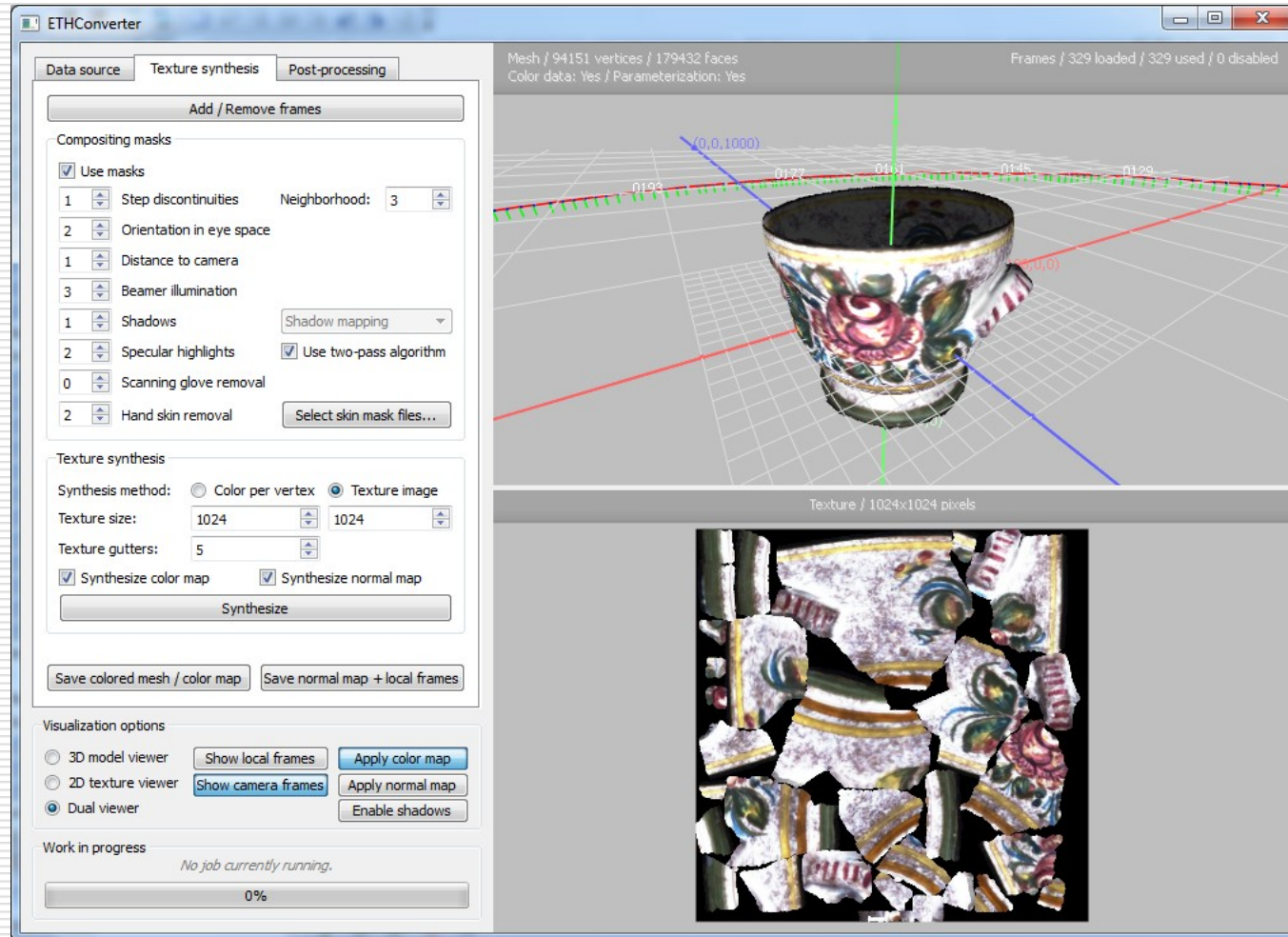
In particular:

- Precise image alignment
 - Light position
 - Info from previous and next frames are known in advance for each frame!
-

Quality masks for color projection



Projection software



Results

Naive approach:
(simple averaging)



Fine details recovered
more accurately



No visible seams,
no loss of brightness



Impact of specular
highlights reduced

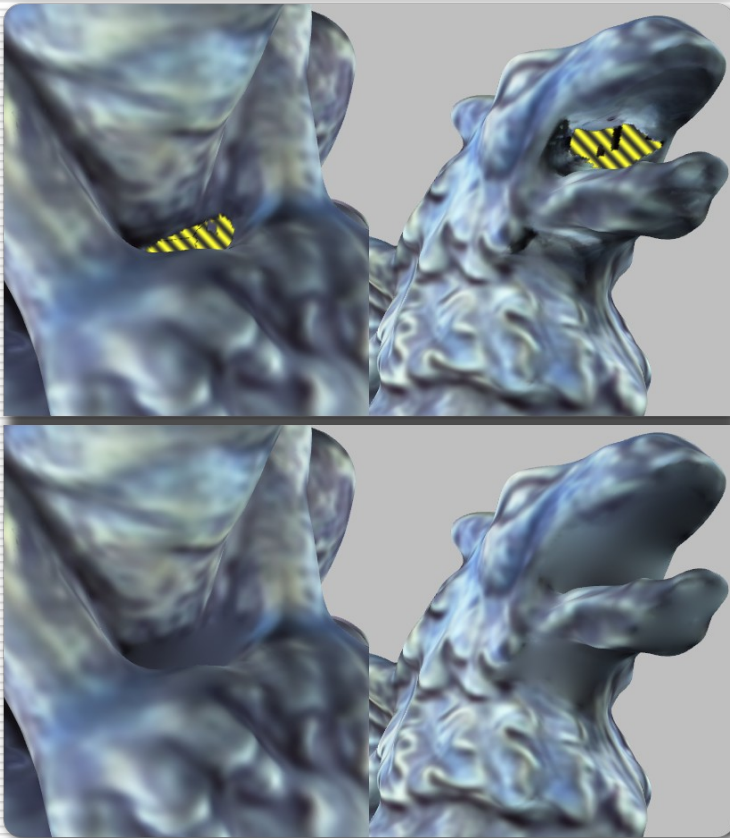
Proposed
approach:



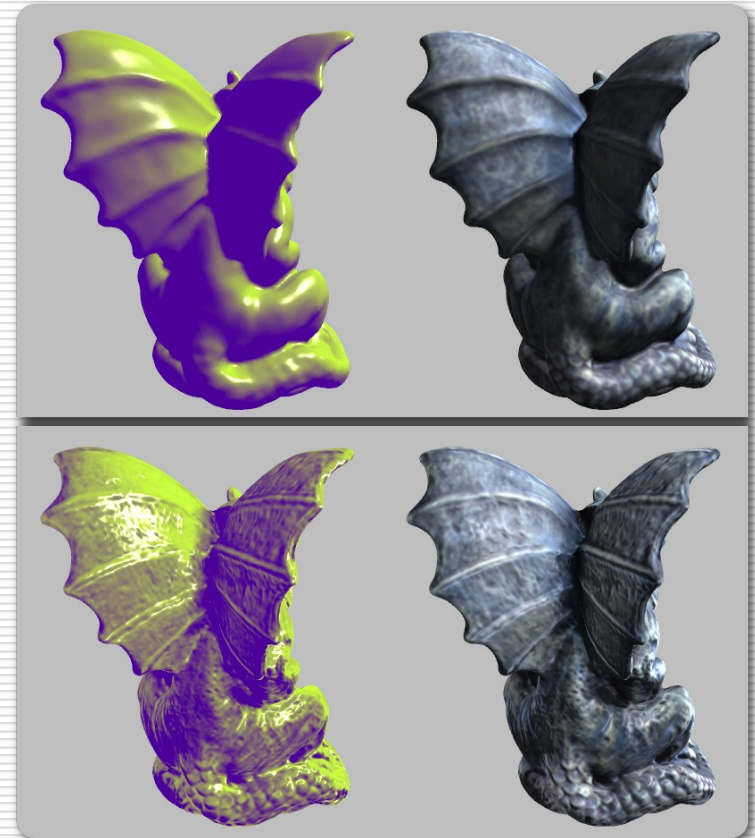
Improvements over final mesh

Additional features:

Texture hole filling by an iterative diffusion process



Extraction of a normal map by a shape-from-shading approach



Without

With

Conclusions

Limitations:

- Image resolution
- Smoothness of 3D Models

Possible future work:

- Use of projector to get some information about surface material
 - Creation of an automatic pipeline “from your hands to the web”
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Thanks, questions?



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