simple, efficient visualization of heritage objects

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(presented by Mashhuda Glencross)

Simple, Efficient Visualization of Heritage Objects

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Goals

- Produce registered height field with texture

- "Good-enough" model for visual reconstruction

Example from Chichén Itzá

Depth Hallucination Method

- Capture photo pair with and without flash under diffuse ambient lighting (overcast or sky light)

  - Flash calibration required once per lens/flash combination

- Process RAW image files to yield depth & albedo maps

  - Surface normal map may be computed with 3 flashes

- Convert to renderable model

Image Capture

Flash

No Flash

Initial Image Processing

Images are first cropped and aligned, as necessary

Albedo

Shading

(Flash - Diffuse)/Flash_calibration

Diffuse / Albedo

Example Flash Calibration Set

Final Image Processing

Depth derived from shading image

Rendered height field with albedo map

Data is perfectly aligned at full-resolution with no gaps

Deluxe Three-flash Capture System

Diffuse Lighting

Flash 1 (top)

Flash 2 (lower left)

Flash 3 (lower right)

Previous Single Flash Result

Three Flash Result Rendered w/o Normals

# Three Flash Result with Surface Normals

What If Even One Flash Is Too Many?

- Sometimes, we cannot use a flash reliably

    - Distant surfaces (esp. large areas)

    - Bright conditions

- In these cases, we resort to Histogram Matching

    - Take sample capture of similar surface using flash(es)

Simplified Capture w/o Flash

- Histogram Matching
    - Needs exemplar model
    - Single diffuse-lit photo
    - Match histograms
    - Create rendering
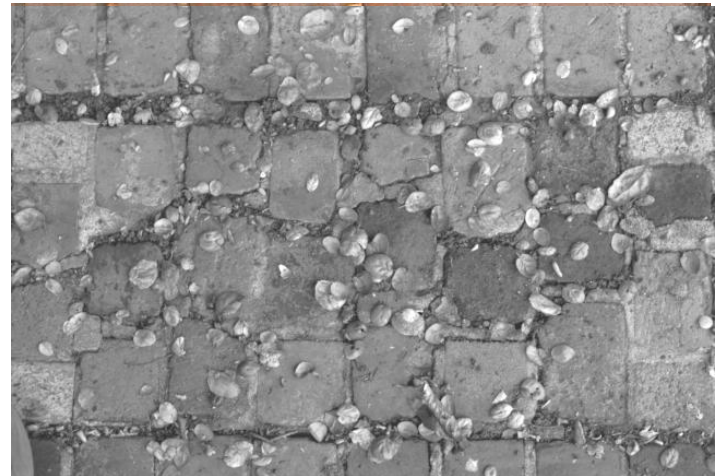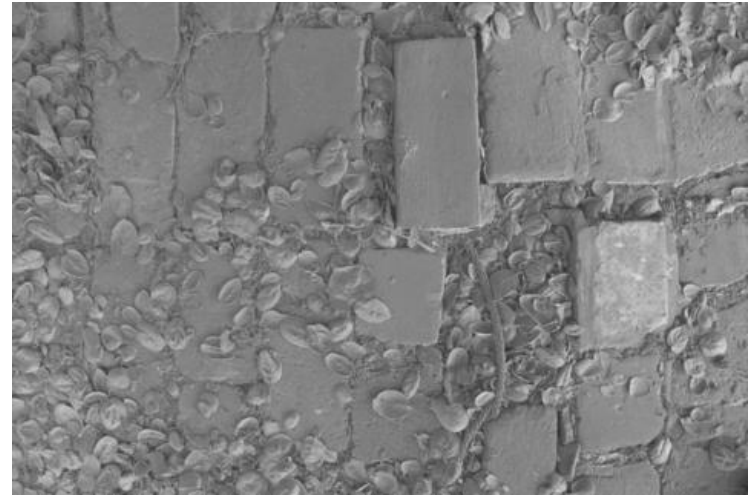
Conclusions

- Simple capture method provides renderable model

- Works on most surfaces that can be represented with a height field (i.e., no detached geometry)

- Three-flash method produces improved results, perceptually indistinguishable from photographs

- Histogram matching allows us to hallucinate depth and albedo on surfaces too large for effective flash

- Need means to hallucinate surface normals as well

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Software Availability

Command-line and (soon) interactive GUI tool:

aig.cs.man.ac.uk/research/daedalus/hallucination.php

THANKS!