Proactive Preservation Activities of Cultural Heritage by Crowdsourcing

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Proactive Preservation of World Heritage by Crowdsourcing and 3D Reconstruction Technology

⇒ Judgment of damaged part
⇒ Visualization of damaged state

Cambodia, Bayon
Different chemicals were applied to stones made of same material as ruins to observe progress.

**Left:** Various stone materials used for ruins  
**Right:** Stone pillar of ruins of observation target
Time-lapse Image with different shooting timing

Previous method

Input image 1
December 2016

Misaligned

Input image 2
August 2017
Our goal
Planning a proactive preservation project of Angkor ruins using crowdsourcing and time lapse images.

1. Capturing image of the target object
2. 3D reconstruction of the target object
3. Time-Lapse image generation
4. Crowdsourcing
5. Re-capturing image of damaged parts
6. Upload image and selection
Preprocessing of the proposed method
Flow of the proposed method

- The camera position and orientation of two images with different image capture timing are obtained.
- The 3D model of the subject is rendered to the virtual camera.
- Estimate correct feature matches between each image using two captured images and two 3D model rendering images, and perform homography transformation.

\[
(L_1) \xrightarrow{\sim} L_1' \xrightarrow{H_1} L_1 \\
(M_1) \xrightarrow{\sim} M_1' \xrightarrow{H_3} M_1 \\
(L_2) \xrightarrow{\sim} L_2' \xrightarrow{H_2} L_2 \\
(L_1') \xrightarrow{H_1 H_3} L_1''
\]

- \((L_1)\) Captured image 1
- \((M_1)\) 3D model rendering image 1
- \((L_2)\) Captured image 2
- \((M_2)\) 3D model rendering image 2
Time-lapse Image with different shooting timing

Proposed method

Input image 1
December 2016

Our results

Input image 2
August 2017
Results
Results

Dataset1

Ours

2017. August  2016. December
Our goal
Planning a proactive preservation project of cultural heritage using crowdsourcing and time lapse images.

1. Public crowdsourcing
2. Image shooting
   Capture the same image as the old photo
3. Time-lapse image generation
4. Expert crowdsourcing

Old
Current
Archeologist
Feature matching of past image and current image (previous method)

Previous method:
→ Many image features are miscorrespondence
Feature matching of past image and current image (previous method)

Goals of the proposed method:
→ Remove image feature miscorrespondence
Autoencoder → Used for image feature matching
Image matching method using Autoencoder

Past image

Current image
Image matching method using Autoencoder

Past image

Current image
50 to 100 years ago image and current image data set for cultural heritage buildings

Image matching method using Autoencoder (experimental result)
Image matching method using Autoencoder (experimental result)
Research on 3D reconstruction of cultural heritage buildings

Matching images between 50 to 100 years ago and current heritage buildings

Proposal of image matching method using Autoencoder