IKEUCHI / OISHI LAB.

[Sensing, Modeling, and Representing the 4D World]

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- III
- IST-ICE
- IST-CS
- E-EEIS

Computer Vision / Spatiotemporal Media Eng.

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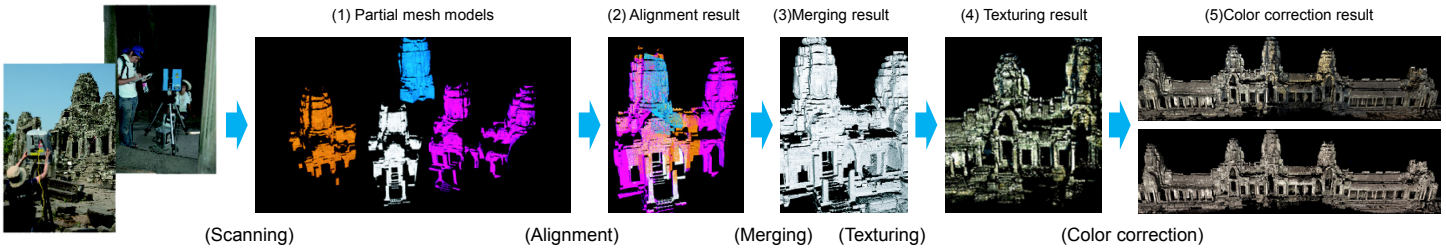
Capture the 4D world into your computer!

Tangible and intangible cultural assets are always in danger of being lost due to various causes such as disasters, wars, weathering, lack of successors, etc. One of our main goals is to create digital models of such objects and motions by using our digitization technologies.
Focusing on software for computer vision, we are dealing with research topics from various fields: sensing, photometry, geometry, robotics, ITS, and AR/MR. The issues to be addressed vary depending on the subjects with no prior technology to rely on. Therefore, we develop these novel methods by ourselves.



Five steps for digital modeling of Bayon Temple
In the case of modeling Bayon Temple in Cambodia, The World Heritage, five steps of technologies were needed to be developed – (1) Development of sensor systems for scanning, (2) Alignment of partial mesh models, (3) Merging for unite meshes into one, (4) Texturing for mapping photos onto geometric models, (5) Color correction for getting rid of influences of light sources and shadows.

Robot dancer

We have been researching technologies to transfer human skills to robots under “Learning from Observation“ framework, in which robots observe and learn human behavior. Extraction of the essence enables robots to imitate human dancing regardless of body structure. Our latest work is to develop a robot which dances to arbitrary musical tempos by applying the learned skills in different situations.

Color analysis/simulation of cultural heritage

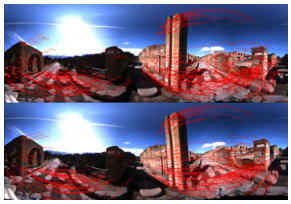
Analyzing color in spectrum allows us to obtain detailed color information. Since the observed color is the multiplication of illumination color and surface color, it is possible to realistically simulate scenes under various lighting condition, once the object‘s surface color is estimated. We also develop methods to obtain objects’ geometry from shading information in order to preserve and analyze cultural heritage objects.

Improving reality in MR using vision psychology

Mixed Reality (MR) refers to a technology that enables the real-time merging of real and virtual worlds. However, contradiction between a CG and a real scene often cause a feeling of terrible mismatch. In order to overcome such issues at low computational cost, we are trying to utilize characteristics of the human visual system.

Automatic shape restoration

Shape incompletion can be caused by various reasons, such as vandalism. We develop a novel shape restoration method making use of shape similarities. Given objects within a same category, we manage to reveal the hidden structural information and restore incomplete samples automatically based on low rank matrix recovery theory.



Omnidirectional video stabilization

Our method has three main steps; motion estimation, motion compensation, and video synthesizing. The motion is estimated by a SFM method developed for omnidirectional videos. The original camera pose is replaced by a smoother path. A new video is synthesized with respect to the new desired camera path. A structure is considered on the original image and its corresponding grid is obtained on the output image.