IKEUCHI / OISHI LAB.

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

Institute of Industrial Science

Dept. of Informatics and Electronics / Advanced Mobility Research Center (ITS Center)

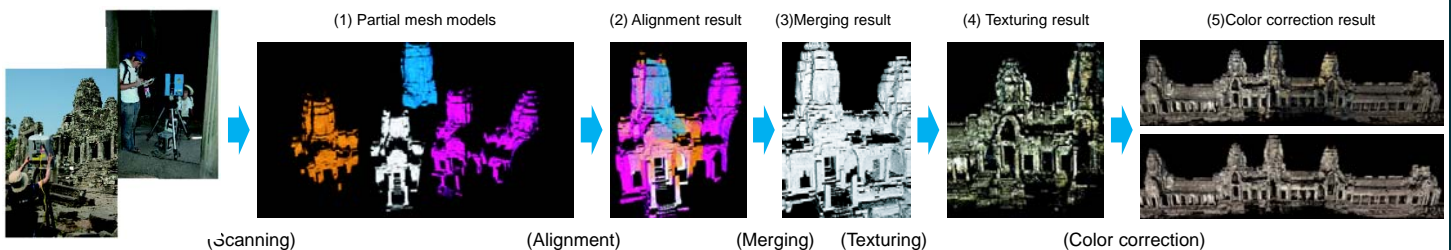http://www.cvl.iis.u-tokyo.ac.jp

Computer Vision / Spatiotemporal Media Eng.

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

*Interfaculty Initiative in Information Studies / Grad. School of Information Science and Technology (Information & Communication Eng., Computer Science) / Grad. School of Eng. (Electrical Eng. & Information Systems)


Capture the 4D world into your computer!

Tangible and intangible cultural heritages, the humans precious assets, are always in danger to be lost because of disasters, wars, weathering, luck of successors, etc. One of our main theme is to create the digital model of such objects and motions by using our digitizing technologies.
Based on the softwears for computer vision, the research topics lay in varions fields including sensing, photometry, geometry, robotics, ITS, AR/MR. Since the problems to be soved differs depending on the subject and there is no best prior technology, we develop them by ourselves.

(1) Partial mesh models   (2) Alignment result   (3)Merging result   (4) Texturing result   (5)Color correction result

(Scanning)   (Alignment)   (Merging)   (Texturing)   (Color correction)

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.
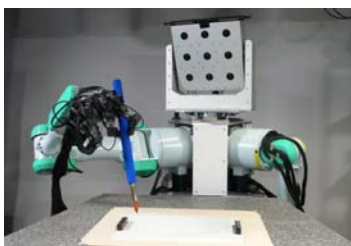
Robot painter
"Learning from Observation" means that a robot determines how to act by observing and learning human behavior. Under this framework, dancing robot, knot-tying robot, painting robot, etc. are studied. How to implement human motion to a robot whose joints are different from that of human? How to learn skill from human painters? We can consider such issues by assuming some kinds of models.

Spectral analysis in *Villa dei Misteri in Pompei*
Analyzing colors in RGB? – it's now obsolete. Colors can be represented by light spectrums of 400–700 nm wavelength. Since the color observed by eyes is calculated by multiplying the color of light source and the surface color of the reflecting objects, it is possible to know the objects' specific color by some methods. Removing shadows and measuring objects' geometry by shading are also studied.

Modeling Ohashi JCT
Large space like urban structures are also subjects for modeling. Modeling road structure by a sensing vehicle, estimating self position by on-vehicle camera, matching videos and digital maps, autonomous driving, driving simulator based on real video, etc. are studied – the fusion of vision and mobility. Collaborating with researchers in mechanical and traffic eng., novel research fields are also developed.

Virtual *Asukakyo* and *Heijokyo*
Using our MR (Mixed Reality) technology, lost scenery can be virtually restored at the actual site. Our advantage lies in how to blend CG naturally into the real scene. In the *Heijo-Sento* 1300th anniversary, we developed mobile MR system where the contemporary view and the ancient view and events are experienced from a tram-car. We found a venture company.

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