Look the world through the virtual space E-Piloti

OISHI LAB.

[Spatiotemporal Modeling and Visualization]

Department of Informatics and Electronics / Base Technologies for Future Robots

Spatiotemporal Media Engineering

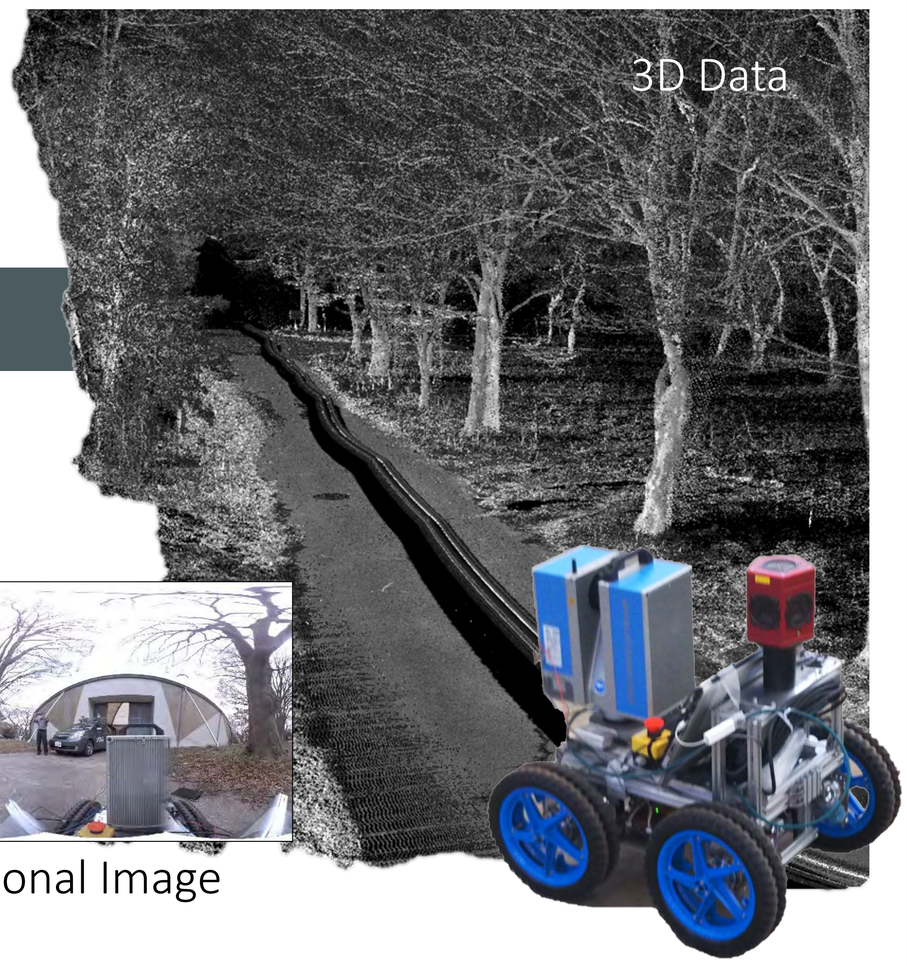
III

EE Dept. CCS

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

3D Vision and Robotics

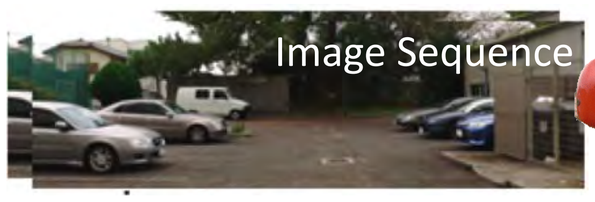
We have been developing the technologies of modeling, recognition, and analysis of 3D data by using optical sensors such as LiDAR and camera to realize the autonomous robot and mobility systems.

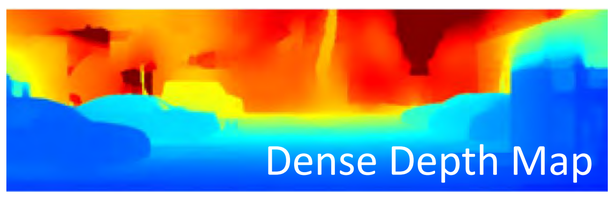


3D measurement: optical sensor fusion

The autonomous mobility systems require to use various sensors with different measurement range and accuracy according to the environment. We have been developing a system that uses multiple optical sensors such as LiDAR and camera to generate dense and accurate 3D maps of the environment. We have developed an accurate calibration method between multiple sensors and pose estimation methods by a fusion of the camera and the laser profiler.

Omni-Directional Image





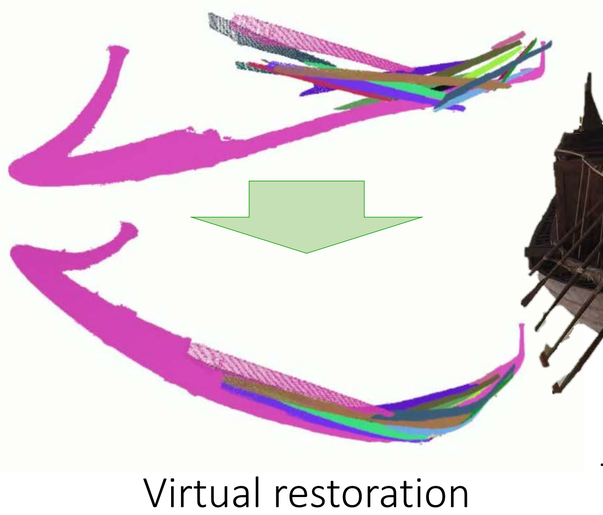
3D image processing: depth map estimation

MR Mobility System

Mobility systems are required to recognize surrounding objects dynamically by using several sensors such as LiDAR and camera. However, the sensors have a tradeoff between accuracy and resolution. Therefore, we have developed a method to acquire dense and accurate depth maps by a fusion of LiDAR data and camera images in real time. The depth maps are utilized in a Mixed Reality (MR) mobility system shown in the figure for pose estimation and occlusion handling.

3D shape analysis: virtual reconstruction

3D shape analysis provides new knowledge in various research fields such as archaeology and art history. The figure in the right shows a virtual restoration of the first solar boat of King Khufu, which is estimated to be built 4500 years ago and found near the Great Pyramid of Giza. To reconstruct the entire shape of the boat by assembling the three-dimensional data of the excavated wooden parts, we proposed a physical deformation model and optimization algorithms.



Virtual restoration

The First Solar Boat of **King Kufu**