OISHI LAB.

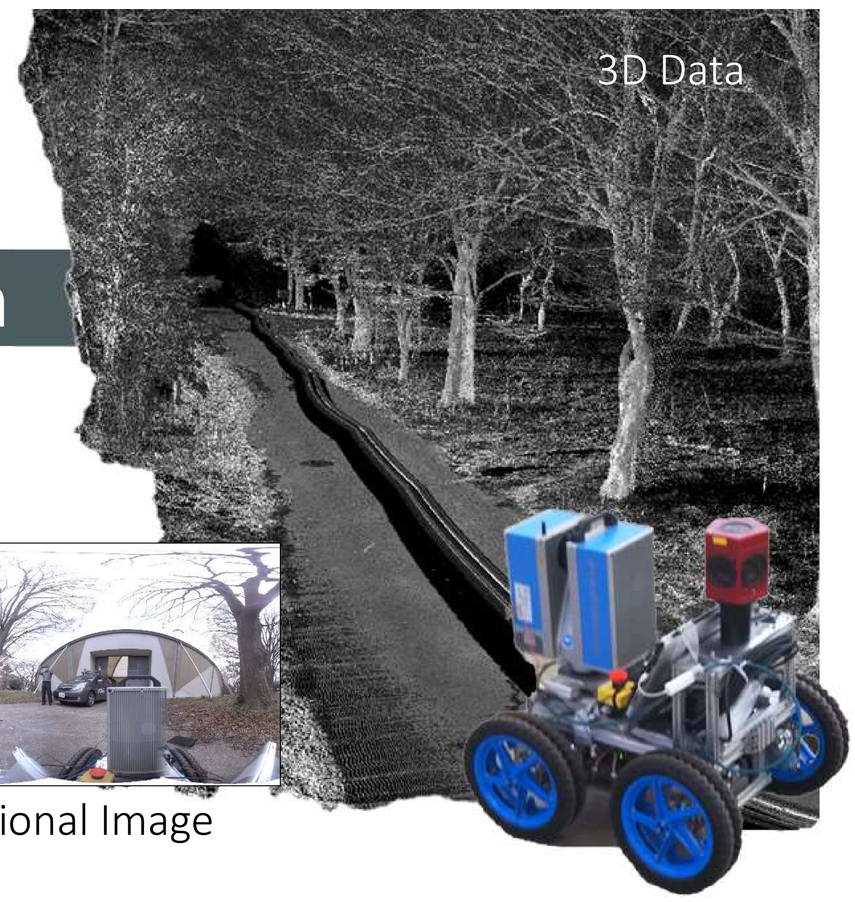
3D Vision

Department ofInformatics and Electronics , Technology for Iot sensing and analysis
Center for Integrated Underwater Observation Technology , Interspace Research Center

Spatiotemporal Media Engineering
Department of Electrical Engineering and Information Systems, Graduate School of Engineering/
Interfaculty Initiative in Information Studies
http://www.cvl.iis.u-tokyo.ac.jp/

3D Vision and Robotics

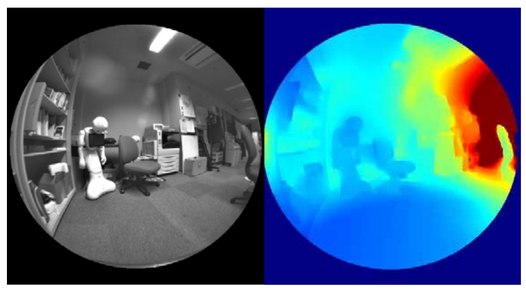
We have been developing the technologies of modeling, recognition, and analysis of 3D data by using optical sensors such as LiDAR and camera to realize the autonomous robot and mobility systems.



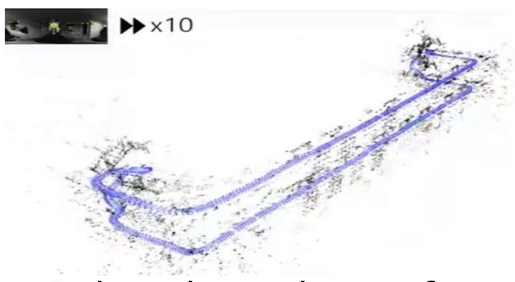
3D measurement: optical sensor fusion

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

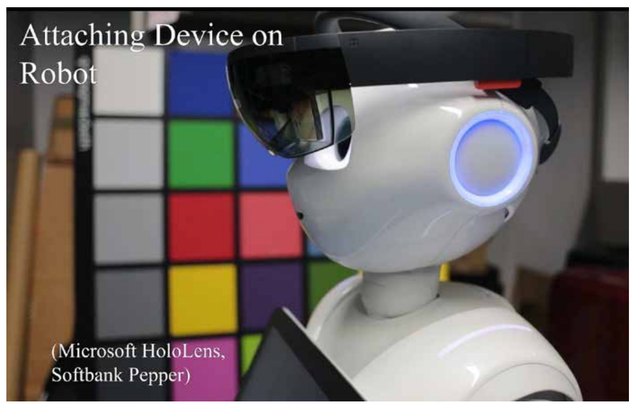


Fisheye Stereo



Robust loop-closure for Visual SLAM

3D image processing: depth map estimation



Robot Navigation with MR device

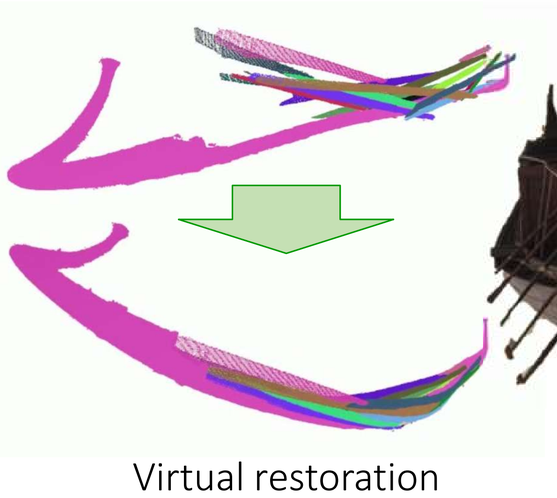
We are studying essential SLAM techniques crucial for autonomous robot navigation. Our focus includes the following:

- Development of dense and accurate depth estimation from cameras.
- High-density depth imaging through LiDAR-camera fusion.
- External calibration techniques for sensor fusion.

Additionally, we are developing a robust loop closure method and a robot navigation system that utilizes the MR device's head-tracking function.

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 Khufu