# OISHI LAB.

## Spatiotemporal Modeling and Visualization

Department of Informatics and Electronics, Technology for IoT sensing and analysis
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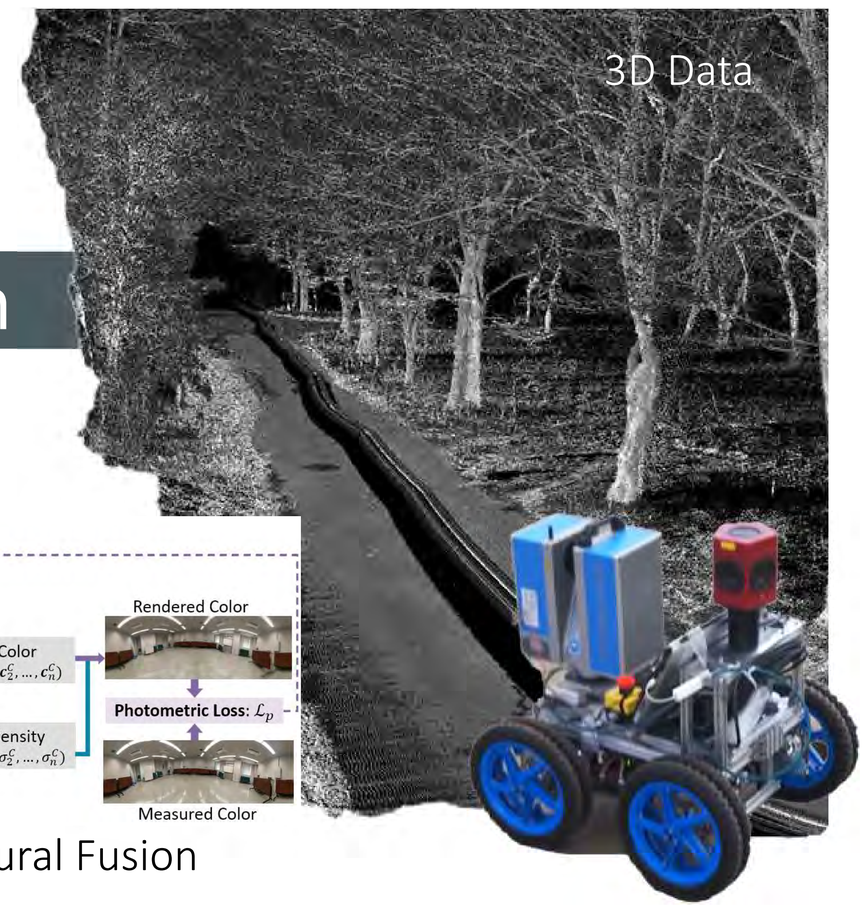
Spatiotemporal Media Engineering

https://www.cvl.iis.u-tokyo.ac.jp/en/

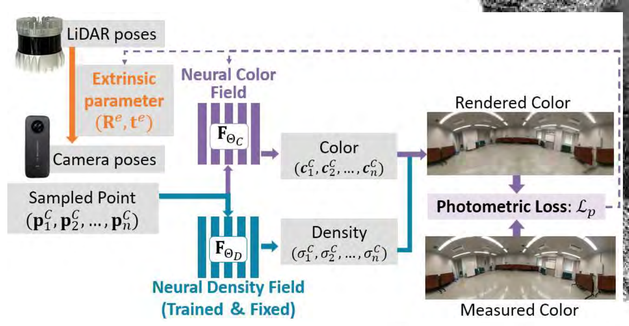
## 3D Vision and Robotics

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.

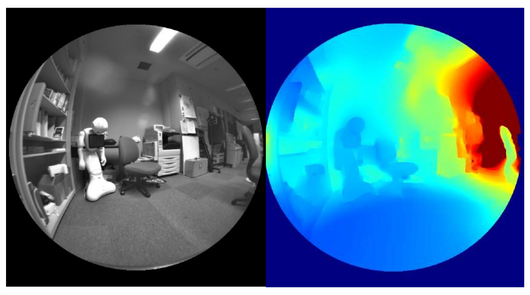



## 3D measurement: optical sensor fusion

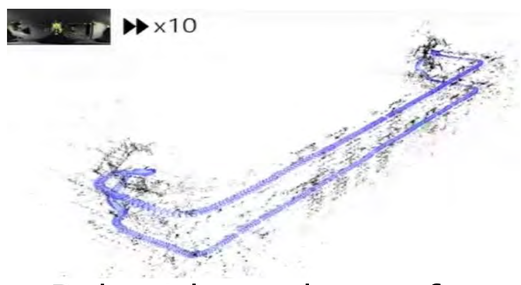
Autonomous mobility systems require various sensors with different measurement ranges and accuracy according to the scenes. We have been developing systems that use multiple optical sensors, such as LiDAR and cameras, to generate dense and accurate 3D maps of the surroundings. We have also developed precise calibration methods between multiple sensors and pose estimation methods by fusing the camera and the laser profiler.




Implicit Neural Fusion



Fisheye Stereo

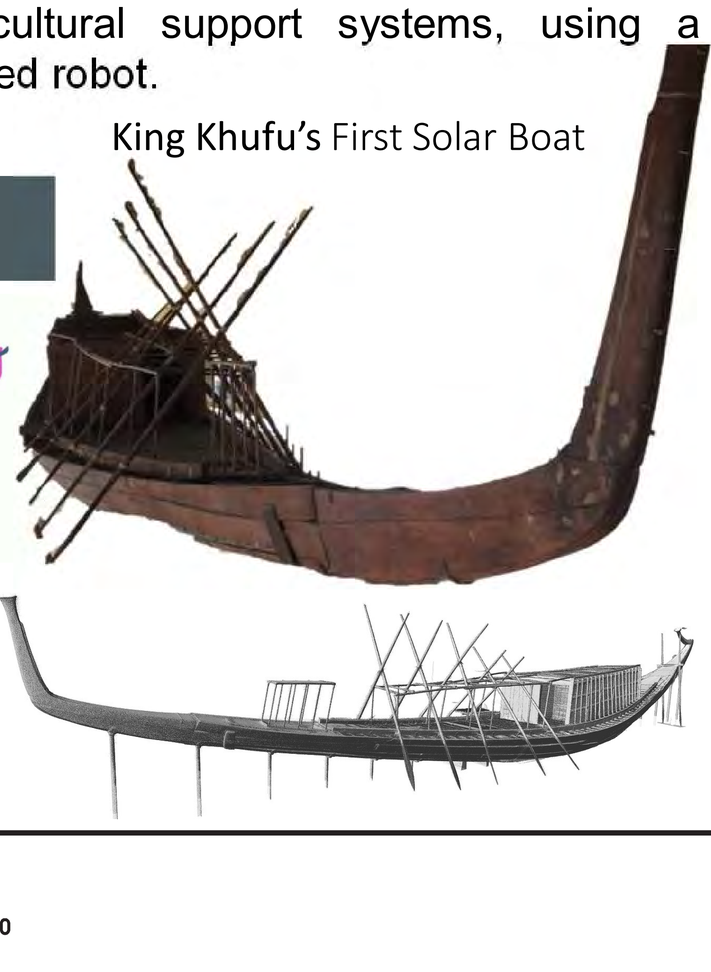



Robust loop-closure for Visual SLAM

## 3D image processing: depth map estimation

Agricultural support robot
(pest detection, pesticide spraying)

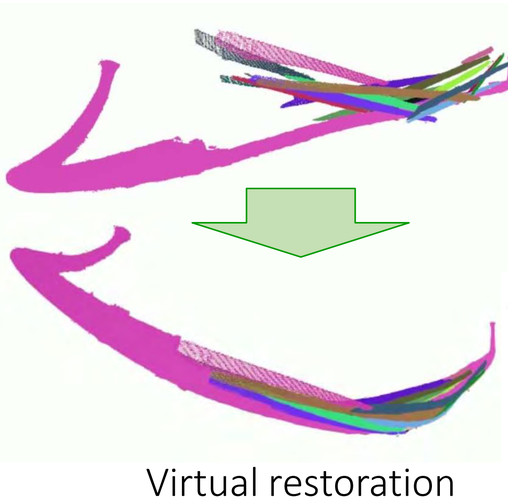
SLAM technology is essential for autonomous robots. We are developing basic techniques for SLAM, such as depth estimation from the camera, depth map completion through LiDAR-camera fusion, and 3D map enhancement for SLAM by loop closure. In addition, we are developing application systems for autonomous mobile robots, such as agricultural support systems, using a quadruped robot.



King Khufu's First Solar Boat

## 3D shape analysis: virtual reconstruction

3D shape analysis provides new knowledge in various research fields, such as archaeology and art history. The figure on the right shows a virtual restoration of King Khufu's first solar boat, estimated to have been built 4,500 years ago and found near the Great Pyramid of Giza. We proposed a physical deformation model and an optimization algorithm to reconstruct the entire shape of the boat by assembling the three-dimensional data of the excavated wooden parts.



Virtual restoration