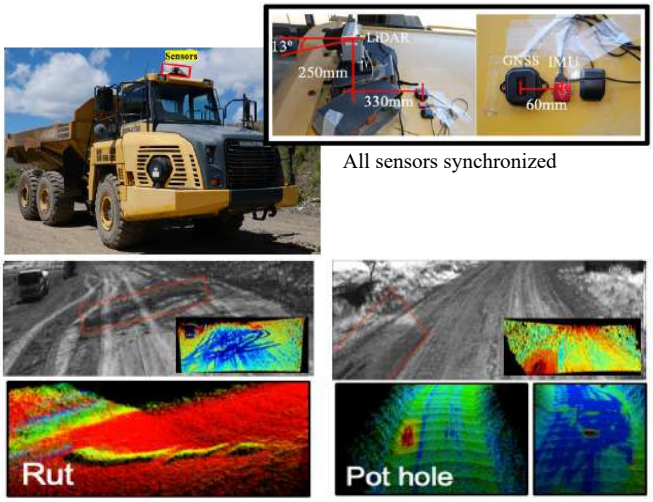
RESEARCH SUMMARY



3D Mapping of Unpaved Road Surfaces

1) **3D mapping system for unpaved road surfaces** built upon a novel interpolation method that estimates the point depth by utilizing corresponding LiDAR depth.

2) **LiDAR intensity-weighted point cloud registration**, which robust to noise and dust particle.

Keyword: Sensor fusion, Point cloud registration, LiDAR degeneration, 3D mapping

[Journal of Field Robotics 2024], [Video]

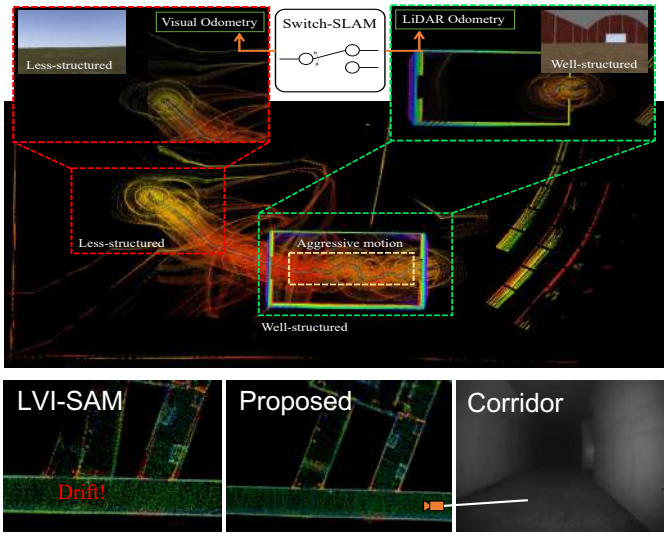
Robust LiDAR-visual-inertial SLAM

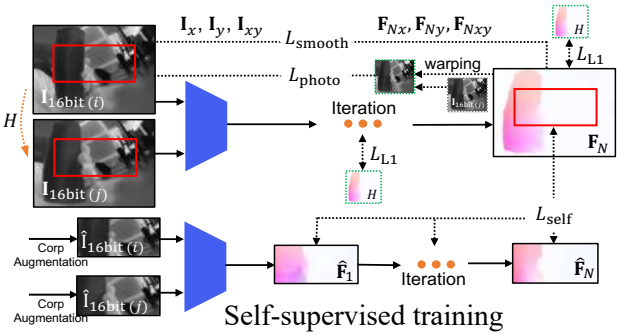
1) **Switching-based sensor fusion approach** that utilizes a switching structure to effectively prevent failure information from propagating throughout the entire SLAM system.

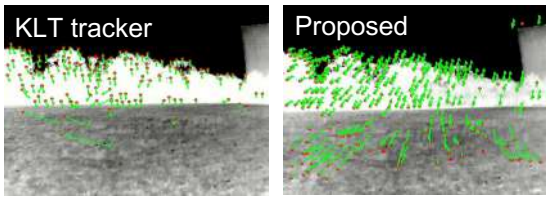
2) **Non-heuristic degeneracy detection**, which eliminates the need for heuristic tuning for LiDAR degeneracy detection.

Keyword: Sensor fusion, LiDAR degeneration, Statistical detection, Extreme environments

[IEEE RA-L 2024], [Video]







Self-supervised Thermal-inertial SLAM

1) **Learning-based feature point tracker** that is robust and accurate for 16-bit thermal images, with lightweight real-time inference.

2) **Fully self-supervised training strategies** to address the issue of insufficient ground truth data and improve generability.

Keyword: Optical flow, Feature point tracking, Self-supervised Learning, Thermal-inertial odometry

[IEEE RA-L 2025], [ICCAS 2024], [Video]