Title:	Mutual Information Based Registration of Textured 3D Point Clouds
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Keyword(s):	Scan Registration Point Cloud Alignment, Multimodal Data
Subject(s):	Computer Vision Robotics
Abstract:	This thesis work reports a novel two-step algorithm for the estimation of full 6-DOF rigid body transformation between any two overlapping point-clouds. We rst estimate the ground plane (X-Y plane) from the two 3D point-clouds and align them to obtain a good estimate of the distance between the ground planes (i.e. tz) and rotations x and y about the X and Y axis respectively using the Rodrigues rotation formula. The remaining parameters are then estimated by maximizing the total MI between the 2D feature maps generated from the multi-modal sensor data. Experi- mental results using scans obtained by a vehicle equipped with a 3D laser scanner and an omnidirectional camera are used to validate the robustness of the proposed algorithm over a wide range of initial conditions. The proposed method provides an e cient framework for multi-modal sensor data fusion and provides a robust solution to the scan alignment problem.

FIGURE 1.1: Test Vehicle (Left). 3D lidar and omni-directional camera system mounted on the test vehicle (Right) [24].

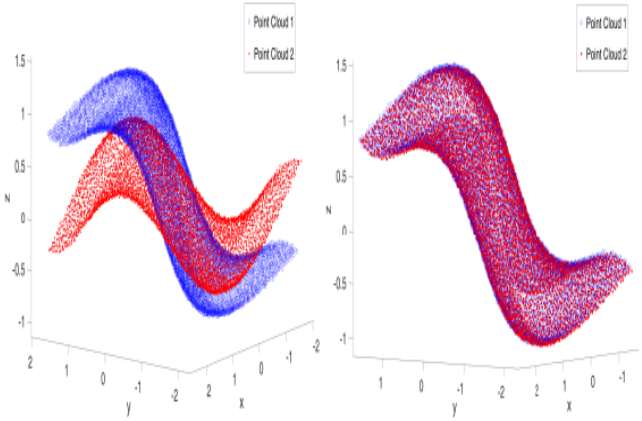
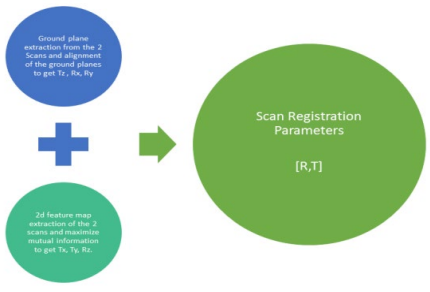
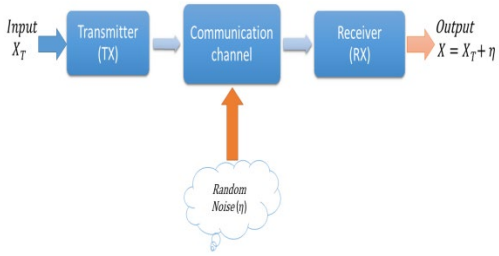
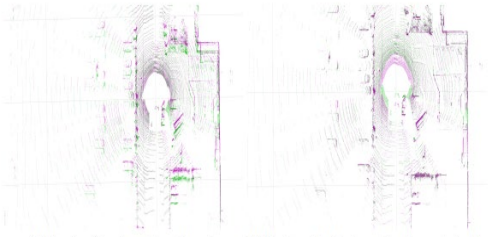


FIGURE 3.2: Left: Two point clouds before alignment, Right: Point Clouds after alignment using the ICP algorithm







(a) Top view of two Scans before alignment (b) Top view of the Two Scans after alignment using the GICP