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Design and Development of a Teleoperated Mobile Robot with SLAM and Thermal Sensing

[Lecture Notes in Networks and Systems](#) • Conference Paper • 2026 •

DOI: 10.1007/978-3-032-16548-0_7

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Abstract

Mobile robots are now widely used in many areas such as industry, monitoring, and rescue operations. A common problem is that most robots either focus on mapping or sensing, but not together in one simple system. The aim of this research is to design and develop a customized mobile robot that can do Simultaneous Localization and Mapping (SLAM) while also using a thermal camera for non-contact temperature measurement and thermal imaging. The method involves two parts: simulation and hardware implementation. The simulation was done using robotic firmware, and the hardware was designed in SolidWorks and built with sensors including LiDAR, IMU, and a thermal camera. The robot is controlled by teleoperation, which allows manual navigation while collecting temperature data and creating maps in real time. The results show that the system can display mapping and temperature information on an onboard LCD and a remote workstation. The significance of this finding is that the proposed system provides a reliable way to combine teleoperation, temperature detection, and mapping in one robot, with possible use in hazardous

environments, industrial monitoring, and inspection tasks. © The Author(s), under exclusive license to Springer Nature Switzerland AG 2026.

Author keywords

Mobile Robot; SLAM; Teleoperation; Thermal Imaging

Indexed keywords

Engineering controlled terms

Firmware; Infrared imaging; Liquid crystal displays; Machine design; Mapping; Remote control; Temperature indicating cameras; Temperature measurement

Engineering uncontrolled terms

Design and Development; Industry operations; Non contact temperatures; Rescue operations; Simple system; Simultaneous localization and mapping; Teleoperated; Thermal camera; Thermal sensing; Thermal-imaging

Engineering main heading

Mobile robots

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Asian Office of Aerospace Research and Development See opportunities by AOARD 	SPI25-257-0257	AOARD

Funding text

This research was supported by the AOARD Grant SPI25-257-0257, awarded by the Asian Office of Aerospace Research and Development (AOARD).

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