



# Extending Machine Vision with mmWave Perception

TECHNOLOGY NUMBER: 2024-334

## OVERVIEW

Enhancing robotic perception with mm-wave radar and RFID integration

- Combines mm-wave radar with RFID for precise long-range localization
- Warehouse automation, search-and-rescue, autonomous navigation

## BACKGROUND

Robotic perception and navigation have traditionally relied on technologies like cameras, LiDAR, or UHF RFID, each facing significant limitations. Cameras and LiDAR are adversely affected by occlusions and have limited range in complex environments, while UHF RFID systems suffer from limited powering range and require bulky readers. These constraints hinder accurate detection and localization of targets, especially in non-line-of-sight (NLoS) conditions, thus complicating tasks such as item retrieval, collision avoidance, and mapping within dynamic environments. While mm-wave radar offers high-resolution mapping and penetration capabilities, it falls short on precise identification and localization. The current technological gaps necessitate an integrated solution to foster more robust and efficient robotic systems capable of operating effectively in challenging environments.

## INNOVATION

Researchers at the University of Michigan have developed, mmID, integration of mm-wave radar and RFID technology, into the robotics domain. By merging mm-wave radar's high-resolution mapping with RFID's precise identification and localization abilities, mmID achieves unparalleled long-range and NLoS perception. A key component is the fusion of these technologies, enabling robots to detect, identify, and localize objects with sub-centimeter accuracy, even behind obstacles, and without heavy computational loads. Real-world applications include enhancing warehouse robots for efficient item retrieval, enabling search-and-rescue robots to locate trapped individuals in rubble, and providing autonomous navigation systems for drones and vehicles in various environments. This low-cost, compact, and computationally efficient technology vastly improves the flexibility and capabilities of robotic platforms.

## ADDITIONAL INFORMATION

### INTELLECTUAL PROPERTY

Pending

### Technology ID

2024-334

### Category

Hardware  
Engineering & Physical Sciences  
Semiconductor, MEMS, and  
Electronics

### Inventor

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