

Novel Robotic Solution for Efficient Material Handling in Confined Spaces and Real-Time Environmental Condition Monitoring in an Industrial Setting

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In industrial settings, material transportation faces significant challenges, especially in confined spaces where conventional methods, such as forklifts, prove inadequate. Forklifts have limitations in tight areas and require skilled operators, contributing to potential challenges. Moreover, it has been observed that the absence of a continuous monitoring system for non-ideal environmental conditions within a manufacturing facility, such as diminished lux levels, elevated temperature levels, presence of combustible gases, and increased decibel values, adversely affects employee well-being, resulting in hazardous situations and diminished workplace efficiency. This research project introduces a robotic solution featuring an integrated system designed to address these identified problems. The proposed robotic system not only enhances material handling efficiency but also identifies non-ideal environmental conditions, prioritizing employee well-being and minimizing hazards in manufacturing facilities. The concept note emphasizes the utilization of image processing techniques and innovative design principles to redefine material handling in limited spaces. The proposed prototype of the robotic solution employs image processing techniques to autonomously follow the operator and enables him to pick up a metal pallet for transportation using a handheld remote controller. Subsequently, the robot follows the operator, allowing him to choose the desired location for pallet placement. The robotic solution aims to refine the defined functions of the robot through the utilization of advanced image processing techniques and Laser Ranging Sensors in future development phases. This proactive and novel approach is crucial for mitigating hazards and ensuring employee well-being and elevating workplace efficiency in industrial manufacturing facilities while providing novel concept in material handling where conventional methods pose challenges.

Keywords: *Material handling; Hazard mitigation; non-ideal condition detection; Manufacturing facility; Image processing;*