



Swarm Robots for Dynamic Reconfiguration in Underground Industrial Environments for VLC Communication

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Keywords:

Swarm Robots; Dynamic Reconfiguration; Underground Industrial Environments; Visible Light Communication (VLC); Rescue Missions

Abstract:

This paper investigates the application of swarm robots in underground industrial settings, specifically designed for inspection and rescue missions. The primary objective is to dynamically reconfigure the swarm in response to the site's topology, ensuring continuous wireless communication. The literature review addresses the prevalent use of swarm robots cooperating towards a common goal, with a particular emphasis on their training methodologies using diverse artificial intelligence models tailored to specific application fields. The literature review reveals a research gap concerning the integration of swarm robots and VLC in underground industries. To bridge this gap, the paper delves into training algorithms for swarm dynamic reconfiguration in the context of VLC communication. The system design phase involves selecting the optimal communication strategy based on the underground topography and swarm organization. The chosen design is a critical aspect ensuring robust and reliable communication lines for the swarm. In conclusion, this paper addresses the challenges posed by hazardous underground industrial environments, where human involvement is risky and failure is unacceptable. The integration of swarm robots with dynamic reconfiguration capabilities, trained using advanced algorithms, offers a viable solution to exempt humans from perilous tasks, thereby making industrial environments safer and more secure.