Robots in Mine Search and Rescue Operations: A Review of Platforms and Design Requirements

V. Androulakis¹, R. Bakzadeh¹, H. Khaniani¹, S. Shao¹, M. Hassanalian¹, and P. Roghanchi²

¹New Mexico Institute of Mining and Technology
²University of Kentucky

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Abstract

The use of automation in mining can be found at all stages of the mining process, covering exploration, excavation, loading, transportation, mineral processing, and search and rescue missions in emergency situations. Due to the harsh conditions during an underground mine disaster, robots can be of great assistance to rescue teams by entering areas that are unsafe for human rescuers, locating trapped workers and collecting valuable data. The design and implementation of mine rescue robots is characterized by great complexity since it encompasses the consideration of a great range of components and requirements. However, comprehensive guidelines for design and deployment of robots in harsh underground environments have not been established. As a result, the developers of mine rescue robots (MRRs) are to exercise their own judgment on the development and evaluation of the platform functionalities. This review attempts an extensive discussion of design and functionality requirements based on the common practices and lessons learned from the existing MRRs. Common considerations, as well as current and future trends are identified with the aim of facilitating future research and development on mine search and rescue robots.

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