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Abstract:

This paper introduces an ant's behavior based exploration algorithm for multiple agents to explore non-convex environments without requiring connectivity maintenance for each instant of time. The employed algorithm emulates the pheromone trails that the real ants employ in order to avoid exploration already done by a group of robots using periodically deployed markers. Also, it includes the possibility that when two or more agents enter within their communication range, they exchange information related to the known map and the markers found. Those behaviors are integrated with a frontier based exploration algorithm, that originally required the connectivity of the network for it to work, removing this requirement and allowing it to work in broader environments.

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I. Introduction

Big natural disasters and terrorist attacks in recent history have challenged the search and rescue (SAR) teams around the world in situations as the nuclear disaster in Fukushima. Many research teams around the world have been interested in the research of SAR robotics. For instance, in [1] it is shown how rescue robotics may impact in situations as the World Trade Center attack working together with humans. Particularly, there have been works as in [2] where the importance of the early SAR of victims is highlighted, since it is fundamental for the survival chances after the emergency. Particularly, robots can be employed by SAR teams (between other tasks) to detect victims at the first stages of the mission in order to reduce humans risk in dangerous environments as unstable terrains, zones heavily contaminated, or radioactive zones. In [3], it is presented multiple requirements and conditions to be considered in the robotic SAR missions such that to perform SAR operations efficiently with respect to the time and avoiding the risks of more humans.

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