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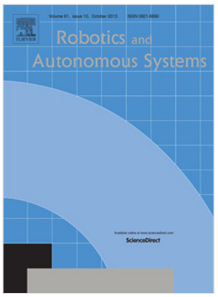

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Collaborative Online Planning for Automated Victim Search in Disaster Response

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Abstract

Collaboration is essential for effective performance by groups of robots in disaster response settings. Here we are particularly interested in *heterogeneous* robots that collaborate in complex scenarios with incomplete, dynamically changing information. In detail, we consider an automated victim search setting, where unmanned aerial vehicles (UAVs) with different capabilities work together to scan for mobile phones and find and provide information about possible victims near these phone locations. The state of the art for such collaboration is robot control based on independent planning for robots with different tasks and typically incorporates uncertainty with only a limited scope. In contrast, in this paper, we take into account complex relations between robots with different tasks. As a result, we create a *joint*, *full-horizon* plan for the whole robot team by optimising over the uncertainty of future information gain using an online planner with hindsight optimisation. This joint plan is also used for further optimisation of individual UAV paths based on the long-term plans of all robots. We evaluate our planner's performance in a realistic simulation environment based on a real disaster and find that our approach finds victims 25% faster compared to current state-of-the-art approaches.

Keywords: Search and rescue, Task allocation, Hindsight optimization, Path planning, Multi-robot teams, Particle filter