

Morin, Michael; Castro, Margarita P.; Booth, Kyle E. C.; Tran, Tony T.; Liu, Chang; Beck, J. Christopher

Intruder alert! Optimization models for solving the mobile robot graph-clear problem. (English) [Zbl 1402.90102](#)
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Summary: We develop optimization approaches to the graph-clear problem, a pursuit-evasion problem where mobile robots must clear a facility of intruders. The objective is to minimize the number of robots required. We contribute new formal results on progressive and contiguous assumptions and their impact on algorithm completeness. We present mixed-integer linear programming and constraint programming models, as well as new heuristic variants for the problem, comparing them to previously proposed heuristics. Our empirical work indicates that our heuristic variants improve on those from the literature, that constraint programming finds better solutions than the heuristics in run-times reasonable for the application, and that mixed-integer linear programming is superior for proving optimality. Given their performance and the appeal of the model-and-solve framework, we conclude that the proposed optimization methods are currently the most suitable for the graph-clear problem.

MSC:

- 90C11 Mixed integer programming
- 91A24 Positional games (pursuit and evasion, etc.)
- 90C59 Approximation methods and heuristics in mathematical programming

Keywords:

pursuit-evasion; graph-clear problem; constraint programming; mixed-integer linear programming; optimization; mobile robotics

Software:

[NetworkX](#)

Full Text: [DOI](#)

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