# Integrating Vehicle Routing and Motion Planning

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## Abstract[1]

There has been much interest in recent years in problems that combine high-level task planning with low-level motion planning. In this paper, we present a problem of this kind that arises in multi-vehicle routing. It tightly integrates task allocation and scheduling, who will do what when, with path planning, how each task will actually be performed. It extends classic vehicle routing in that the cost of executing a set of high-level tasks can vary significantly in time and cost according to the low-level paths selected. It extends classic motion planning in that each path must minimize cost while also respecting temporal constraints, including those imposed by the agent's other tasks and the tasks assigned to other agents. Furthermore, the planner is part of an interactive system and must operate within soft real-time constraints. We present an approach based on a combination of tabu search, linear programming, and heuristic search. We evaluate our system on representative problem instances and find that its performance meets the demanding requirements of the application. Our work demonstrates how integrating multiple diverse techniques can successfully solve challenging real-world planning problems that are beyond the reach of any single method.

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