Plan merging

Aurélien SIMON

Potsdam University

Abstract. We are talking about plan merging here

1 Definition

1. Input for classical MAPF[1]: a tuple $\langle G, s, t\rangle$ where $G = (V, E)$ representing a graph, $s : [1, \ldots, k] \to V$ maps a "start" vertex to an agent. Finally, $t : [1, \ldots, k] \to V$ maps a "terminal" vertex to an agent. The output is a set of k single-agent plan, where a plan pi is denoted as a sequence of action $a_1, \ldots, a_n$, each of them being a function defined as $a : V \to V$.
2. Input for target assignment: a tuple $\langle G, s, p\rangle$, $G = (V, E)$ representing a graph, $s : [1, \ldots, k] \to V$ maps a "start" vertex to an agent and p maps k vertices as "ending vertices". The output would be a tuple $\langle G, s, t\rangle$ where $G = (V, E)$ representing a graph, $s : [1, \ldots, k] \to V$ maps a "start" vertex to an agent. Finally, $t : [1, \ldots, k] \to V$ maps a "terminal" vertex to an agent.
3. Another input for target assignment based on J. Yu and S. M. LaValle paper[2]: a tuple $\langle G = (V, E), R, s\rangle$, let R be a set of robot $R = \{r_1, \ldots, r_n\}$, s an injective function $s : R \to V$. We can then go back on the classic output $\langle G, s, t\rangle$.
4. Input for individual path finding would be the output of target assignment $\langle G, s, t\rangle$. As output, $\langle G, s, t, \theta\rangle$; for each robot r, we have $\theta[r] = \{\pi_1, \ldots, \pi_n\}$, where pi, considering r as a robot, is a plan satisfying:
   (a) $\pi[0] = s(r)$
   (b) let a a function that we can consider as an action, a movement $a : V \to V'$, we have then $\pi[|\pi|] = t(a_n(\ldots(a_1(s(r)))))$
5. Plan merging takes as input $\langle G, s, t, \theta\rangle$ (or maybe just $\langle G, \theta\rangle$ since we can deduce initial position and terminal position from plans) and gives as output a set of plan π where for each robot r we have a conflict-free plan π_r.

2 Definition in form

References

1. Multi-Agent Pathfinding: Definitions, Variants, and Benchmarks. Written by Roni Stern, Nathan R. Sturtevant, Ariel Felner, Sven Koenig, Hang Ma, Thayne T. Walker, Jiaoyang Li, Dor Atzmon, Liron Cohen, T. K. Satish Kumar, Eli Boyarski, Roman Barták
2. Structure and Intractability of Optimal Multi-Robot Path Planning on Graphs. Written by Jingjin Yu and Steven M. LaValle