The Combined Task Allocation and Path Finding Problem

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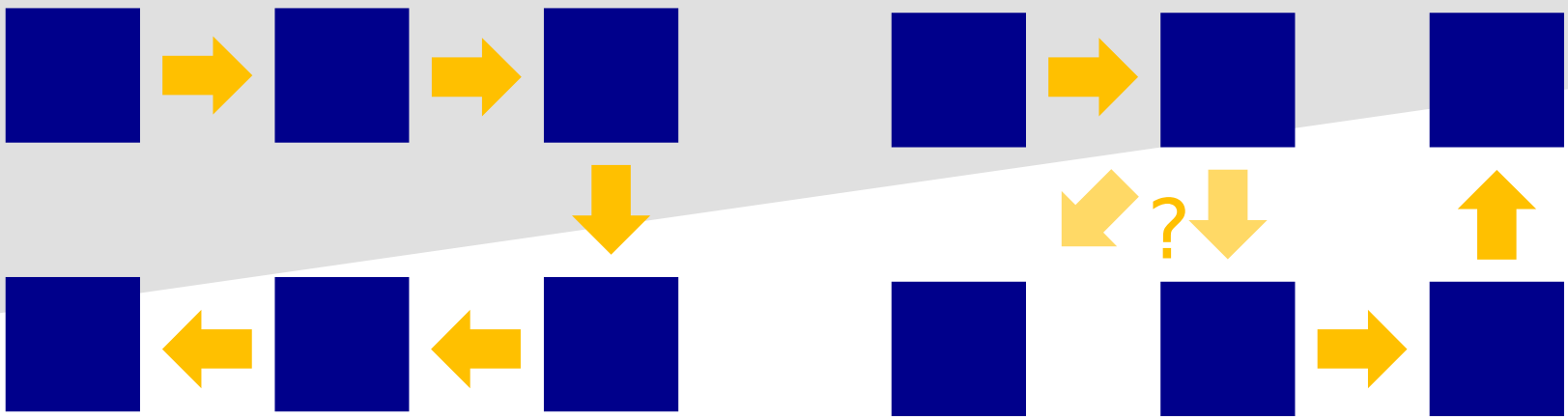
Motivation



Motivation

- Fixed order of production steps
- Fixed production cycle
- Problems:
  - Variants
  - Disturbances

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- Flexible allocation of production station
- Distributed layout
- Use case for AGVs
- Robustness through flexibility
- Higher complexity

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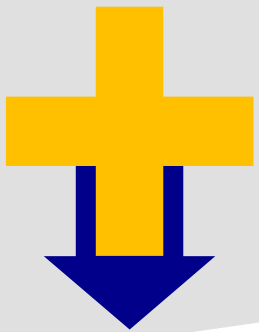
Literature

Multi agent path planning



Multi agent task allocation

Combined Problem

Problem Formulation

Jobs:
[5.4, 8.3 → 1.1, 3.2,
6.0, 7.1 → 9.1, 9.0,
...]

Agents:
[(8.9, 3.2), (4.3, 5.2),
(4.0, 9.8), ...]

Allocation:
Agent1: [Job1, Job3],
Agent2: [Job2],
...

Paths:
Agent1: [(8.9, 3.2, t:0),
(7.3, 4.3, t:1), ...],
Agent2: [(4.3, 5.3, t:0), ...],
...

$$min \sum_{j \in J} X(g_j)$$

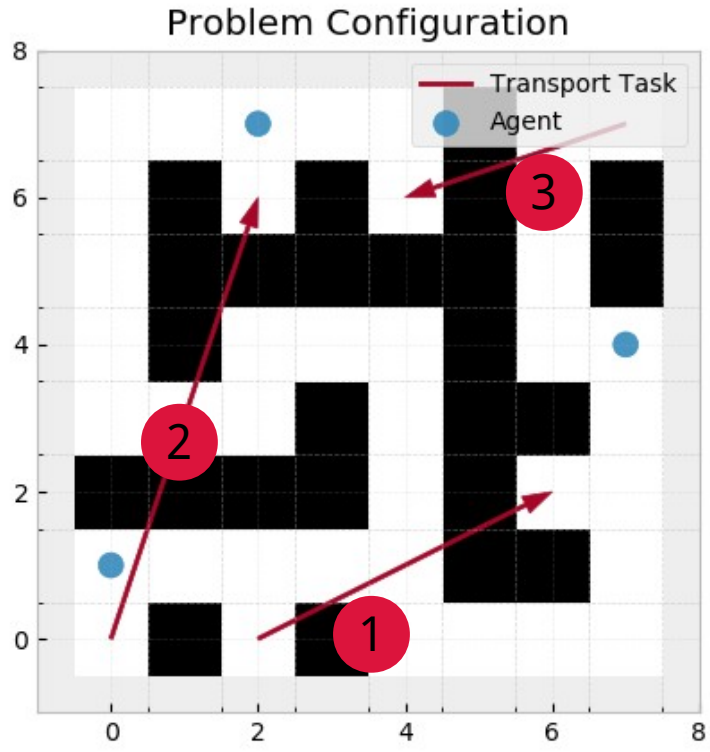
$$s_j, g_j, x_{i0}$$

$$A : i \rightarrow [j_0, j_1, ...]$$

$$X : x_i \rightarrow t$$

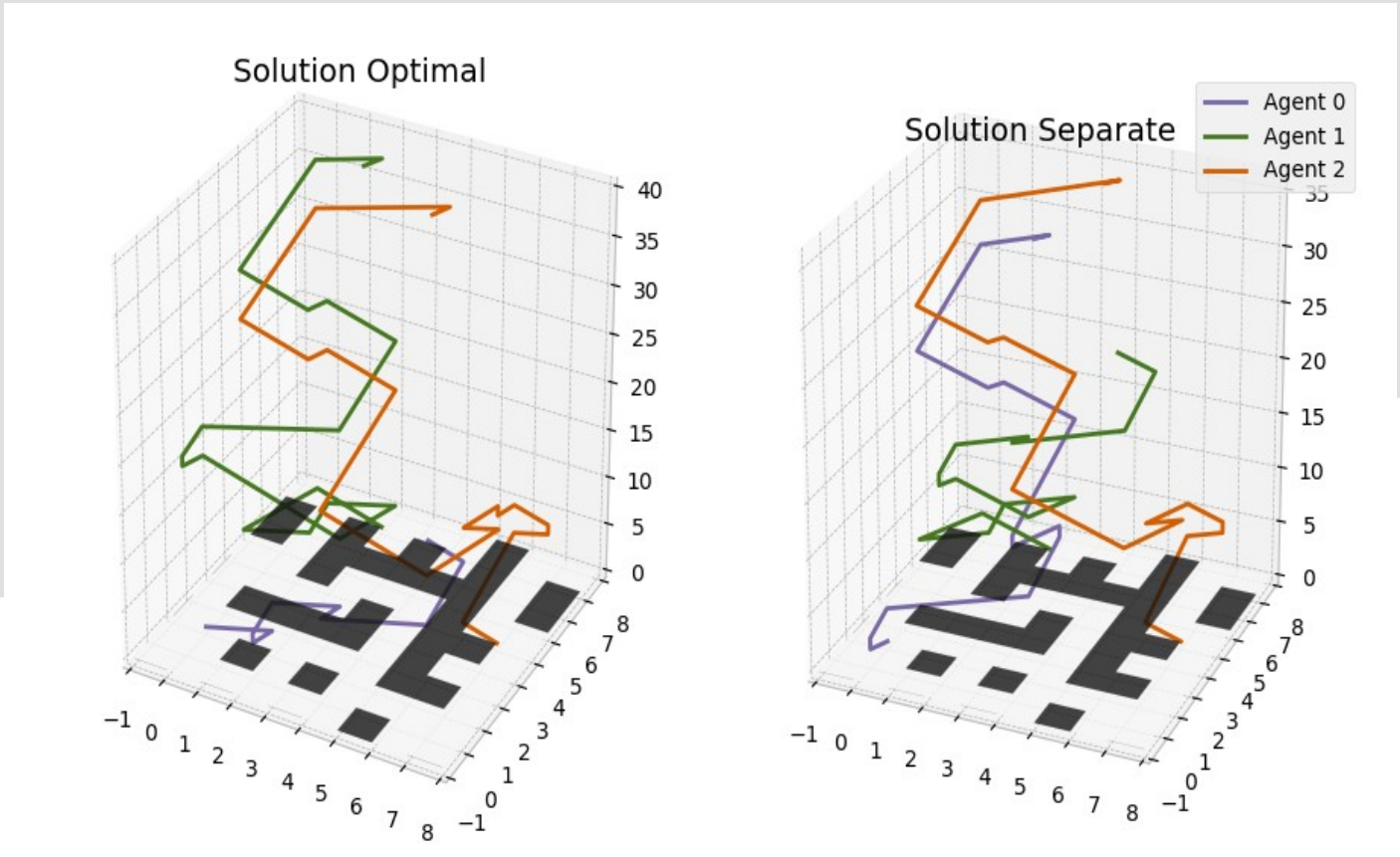
$$\nexists t, i_1, i_2, X(x_{i_1}) = X(x_{i_2})$$

Examples I


Problem Configuration
Transport Task
Agent
1
2
3
0
2
4
6
8
0
2
4
6
8

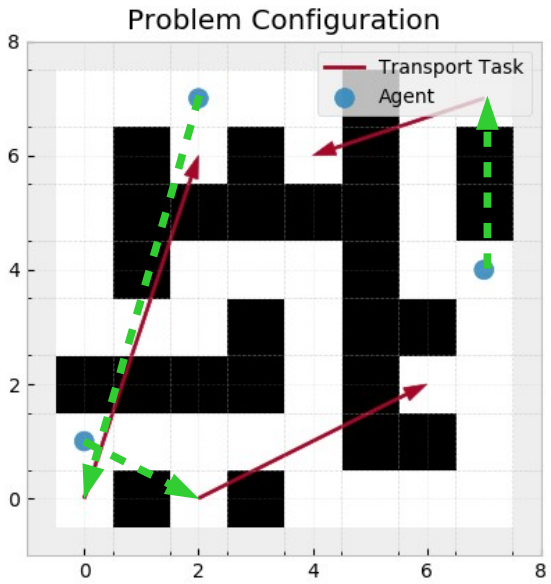
Examples I

Costs:
(per job:)
[14. 40. 37.]
(total:)
91.0

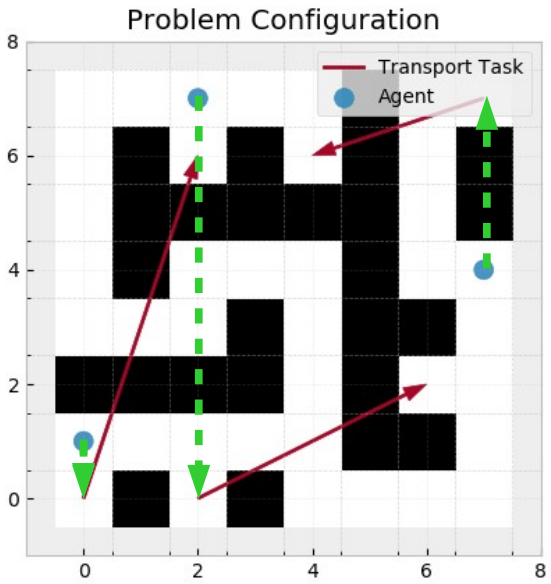


Costs:
(per job:)
[28. 30. 36.]
(total:)
94.0

Examples I

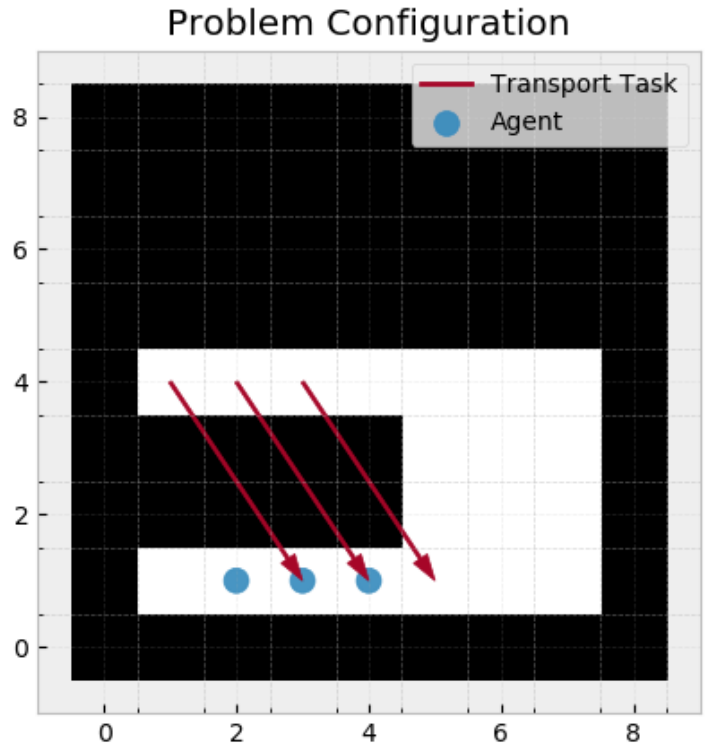


((0,), (1,), (2,))

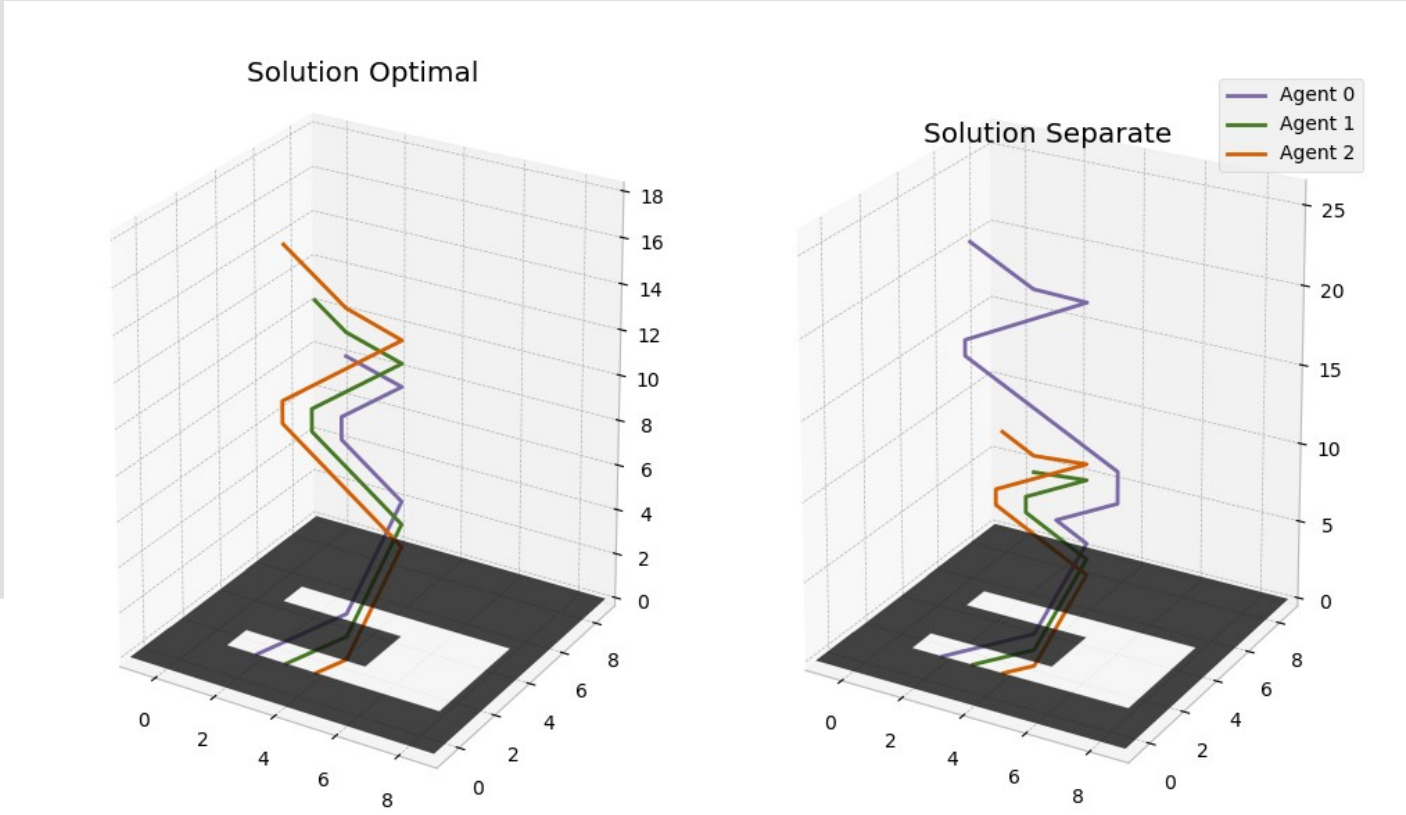


[(1,), (0,), (2,)]

Examples II



Examples II



Next Steps

Optimal Planner

Distributed Planner

Real Live Industrial Demo

Roadmaps

Deep Learning

EU Project

Let's talk about it!

(at screen 3)

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https://ct2034.github.io/miriam/

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