

Learning Dynamic Algorithms for Automated Planning

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- PhD and postdoc in Basel, Switzerland
- since January 2021: assistant professor in AI at LiU
- **automated planning** and **machine learning**

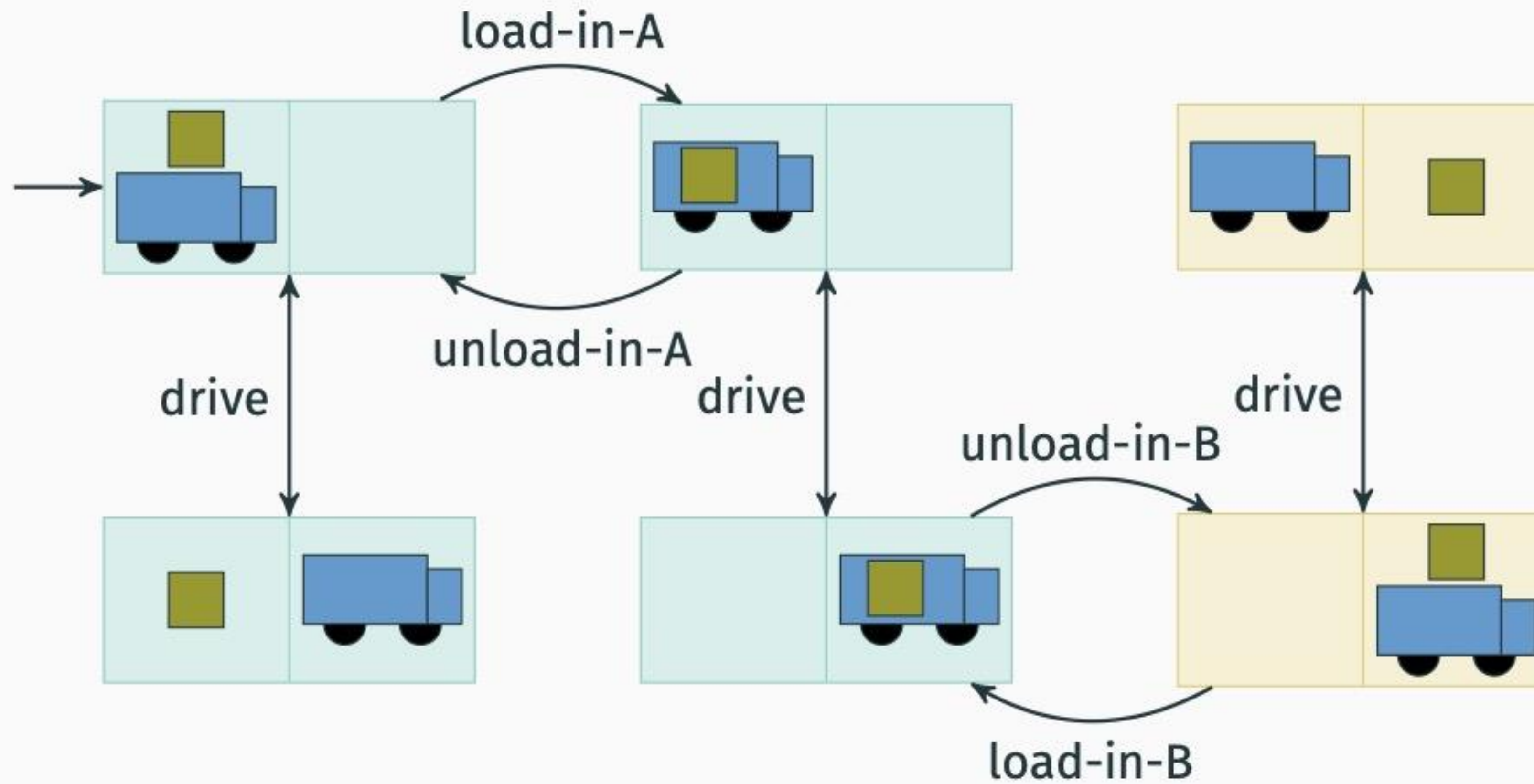
Automated planning

[images: public domain]



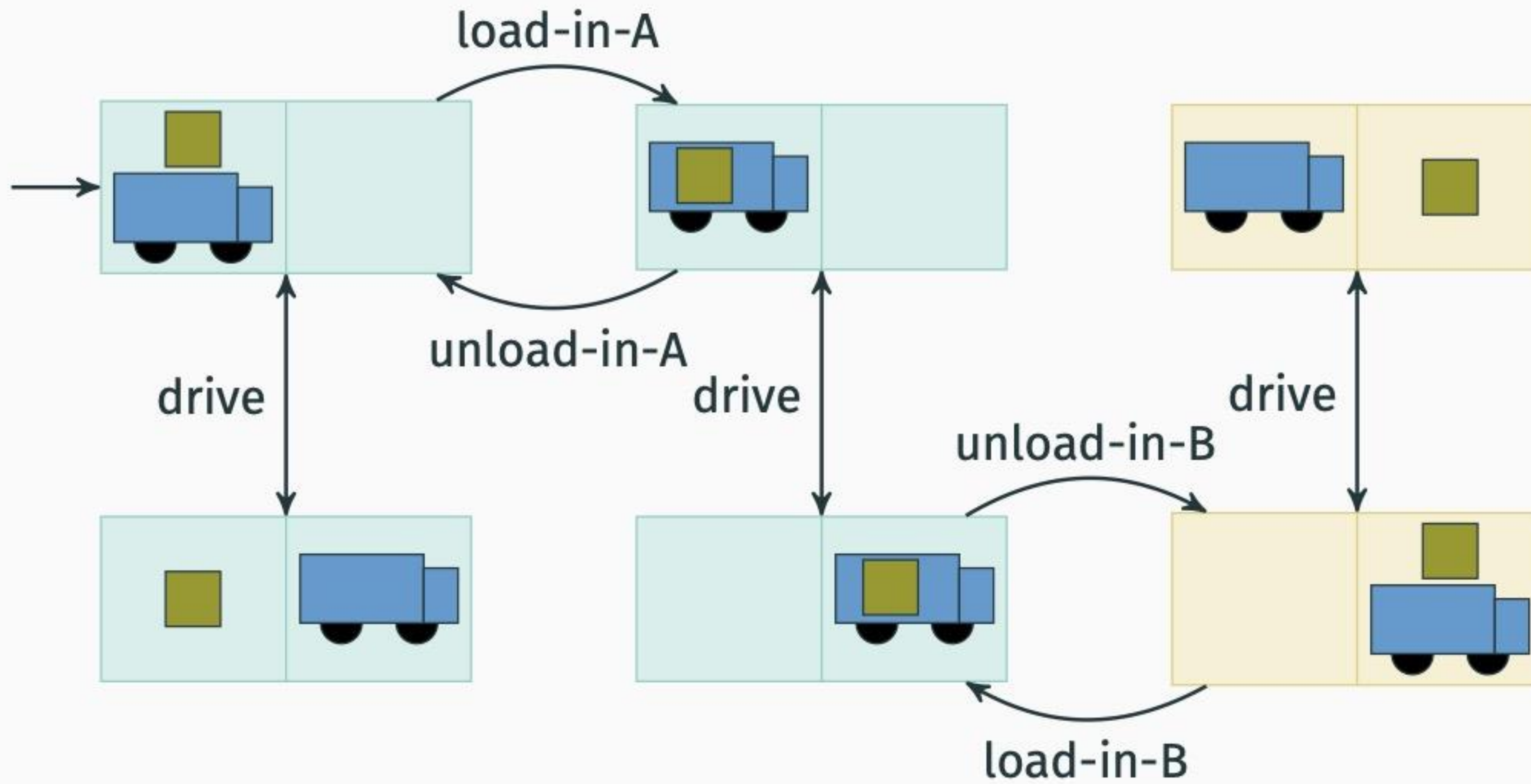
- find action sequence that achieves goal
- **classical planning**: deterministic, fully observable, domain-independent
- any plan or **cheapest plan**

Example task

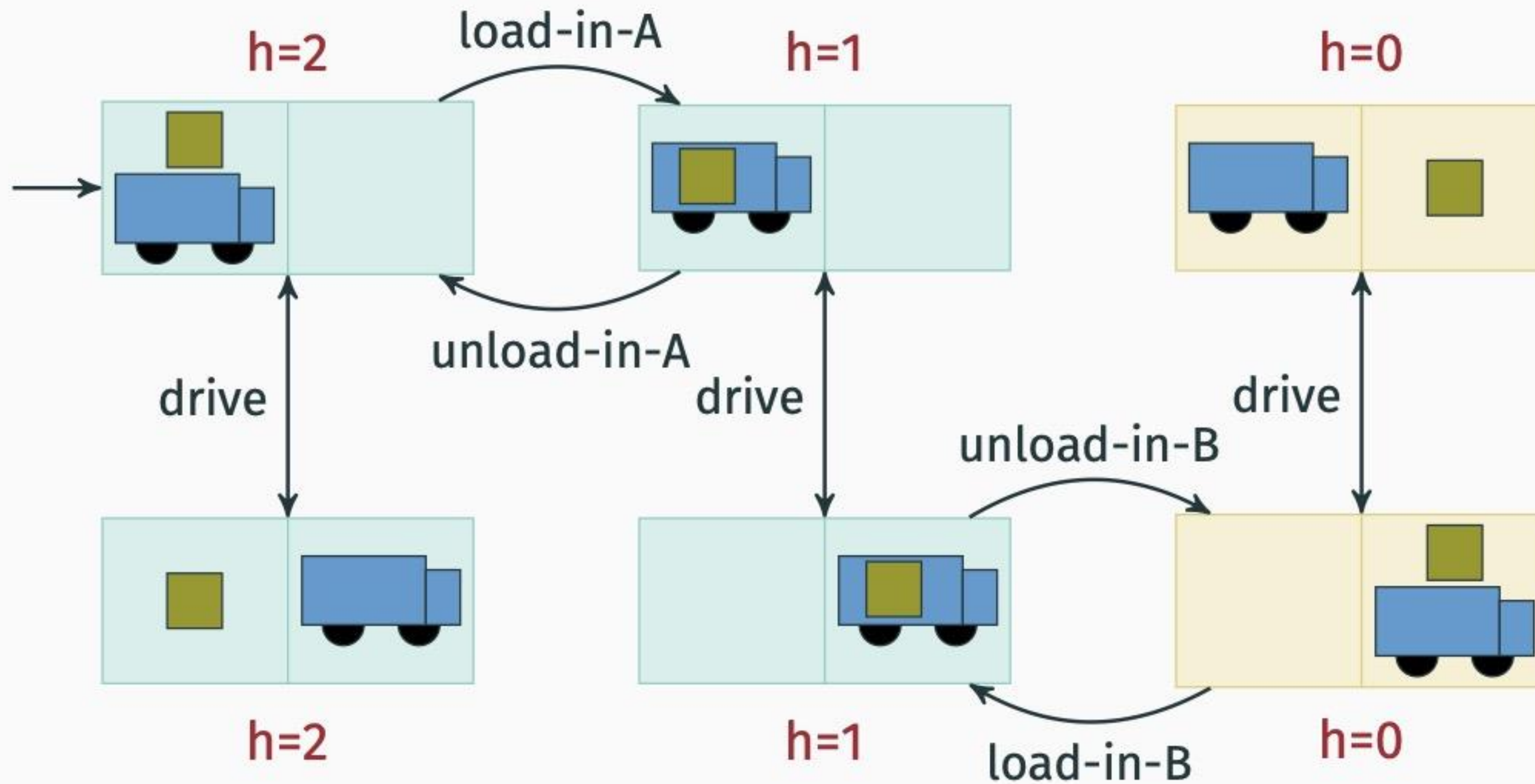


- actions cost 1
- breadth-first search?

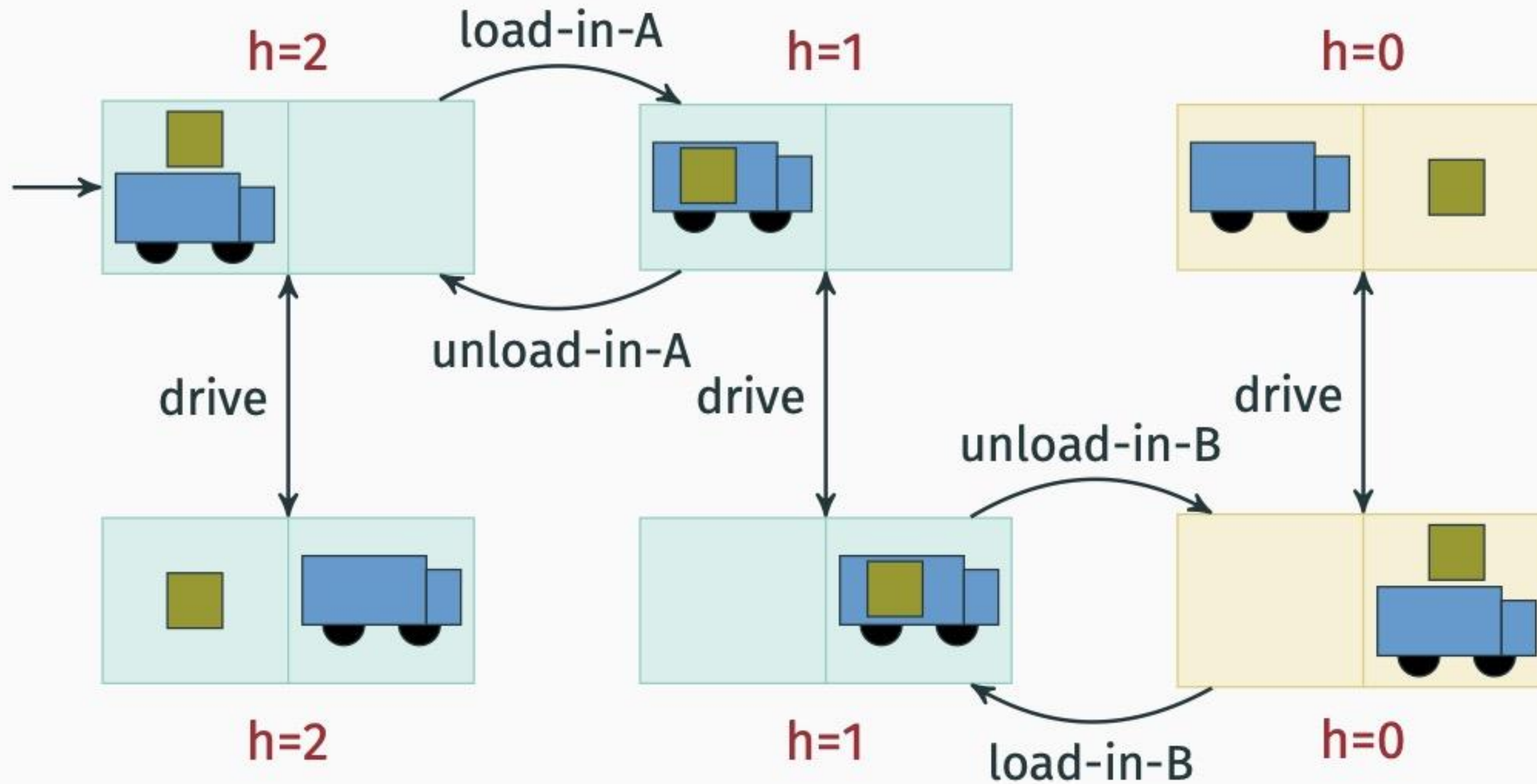
Heuristic search



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Heuristic search



- A^* with admissible heuristic \rightarrow optimal plan

How to create a heuristic?

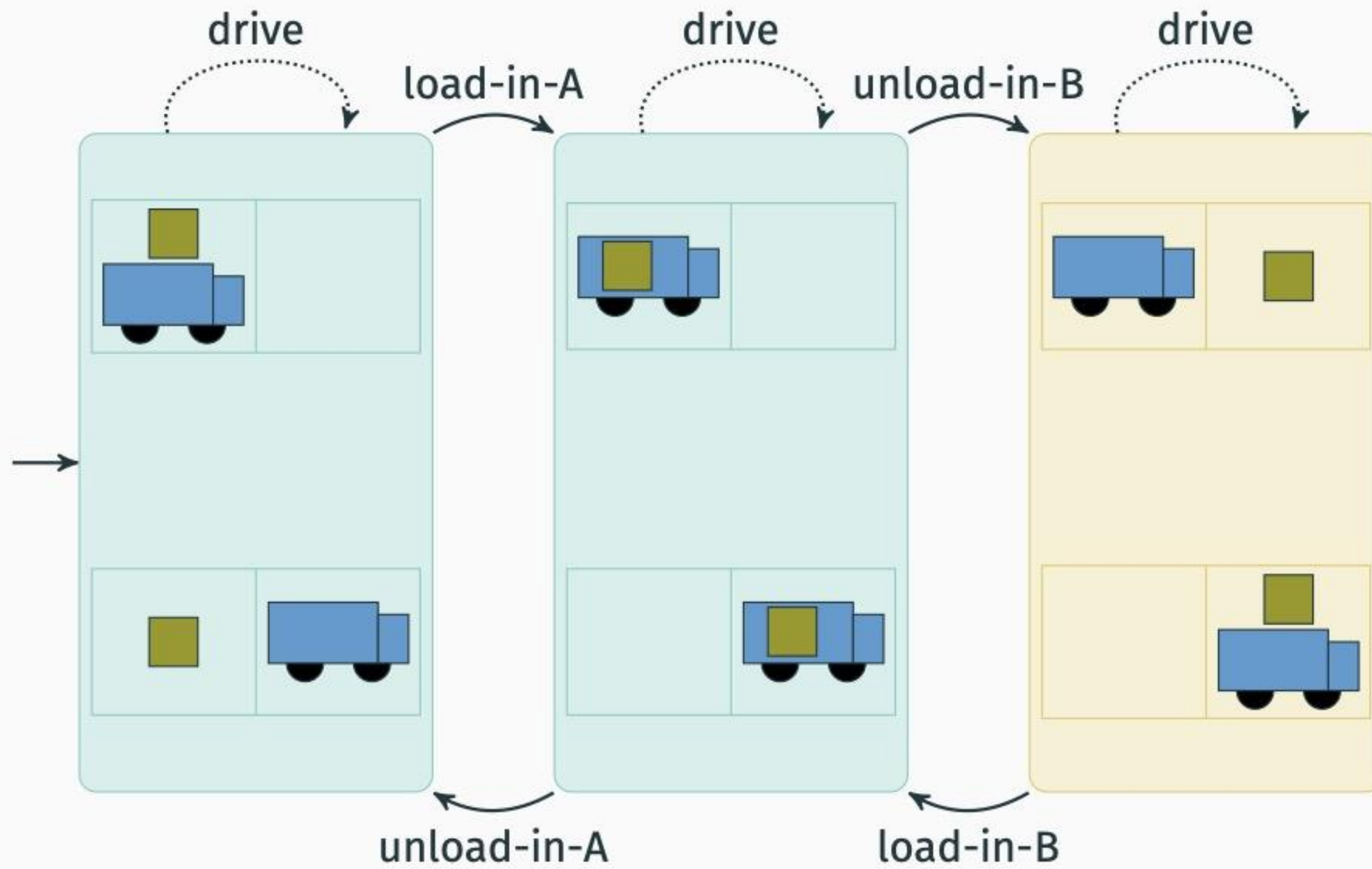
- simplify problem (remove constraints)
- solve simplified problem
- use solution cost as estimate

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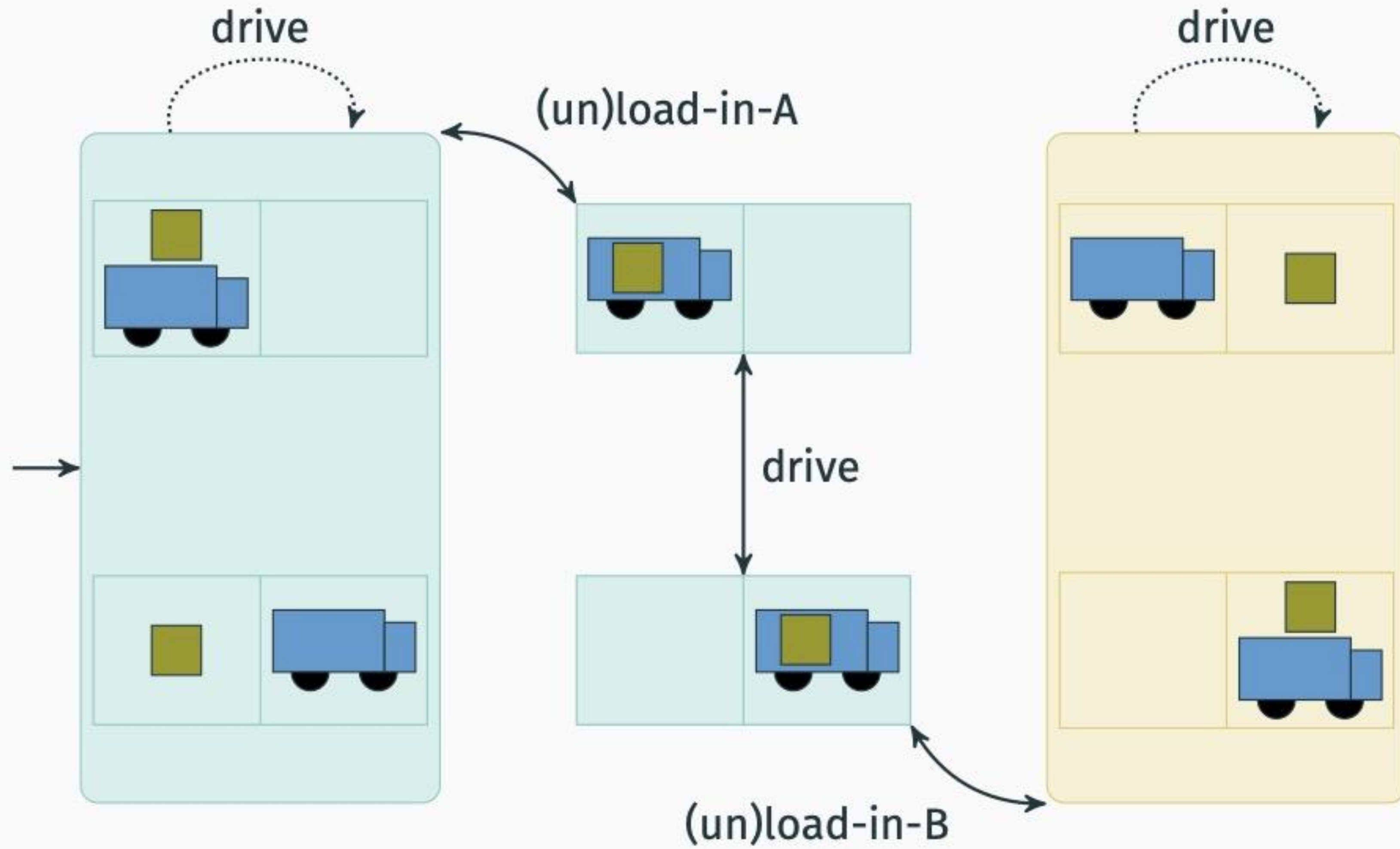
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→ **abstraction heuristics**

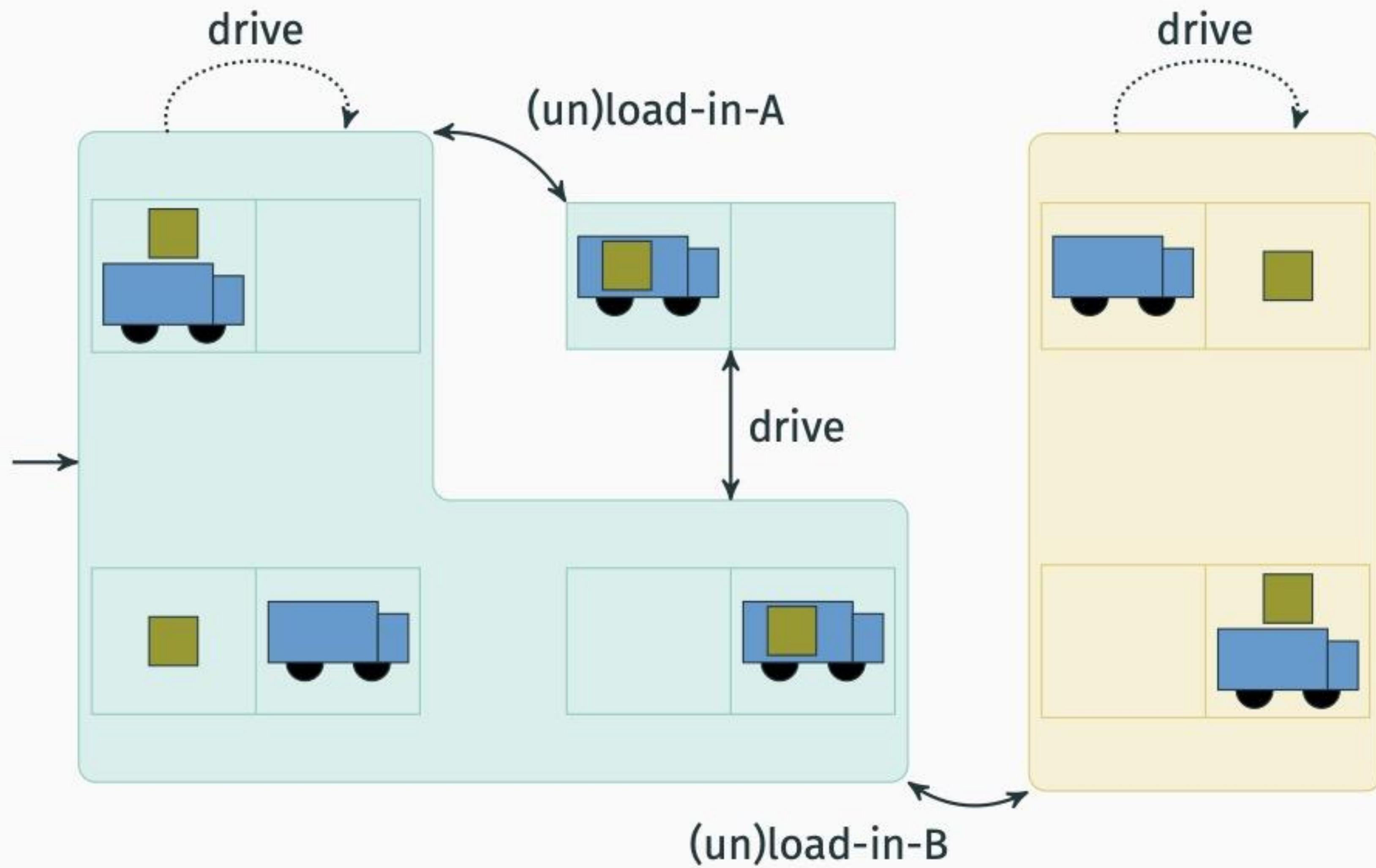
Example abstraction (projection)



Cartesian abstraction



Merge-and-shrink abstraction



How to build an abstraction?

- huge design space:
 - which states to combine?
 - how to decompose task?
- complex algorithms

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- **learn algorithms** automatically
- supervised learning
 - reinforcement learning

Let planners adapt to tasks dynamically

- heuristics
- search algorithms
- pruning

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