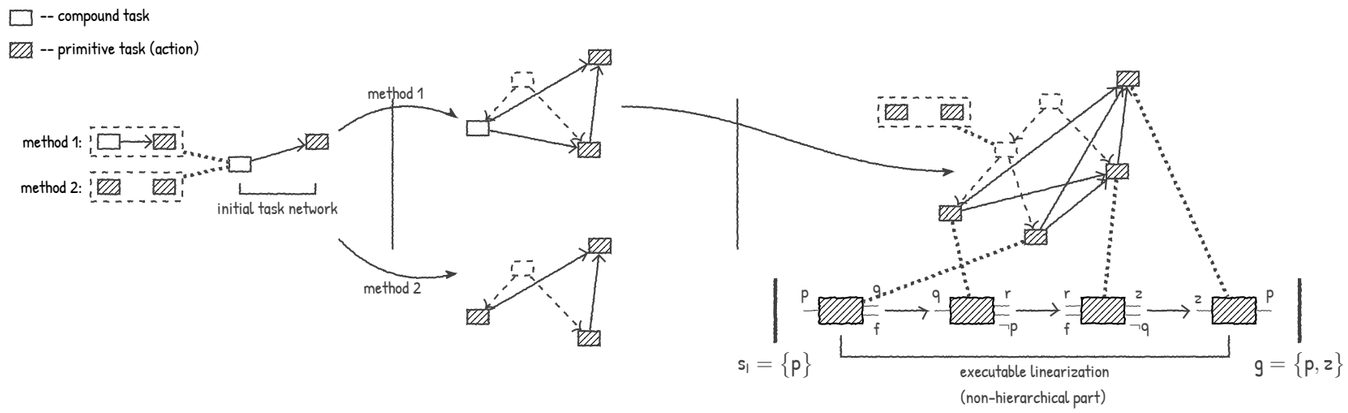
On the Computational Complexity of Plan Verification, (Bounded) Plan-Optimality Verification, and Bounded Plan Existence

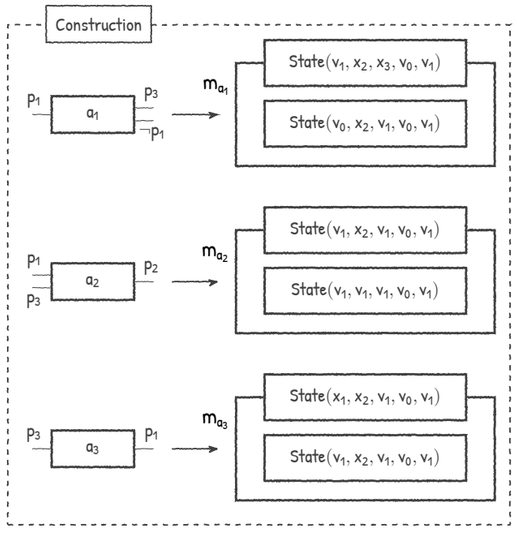
Songtuan Lin[1] Conny Olz[2] Malte Helmert[3] Pascal Bercher[1]
[1]School of Computing, The Australian National University, Australia
[2]Institute of Artificial Intelligence, Ulm University, Germany
[3]Department of Mathematics and Computer Science, University of Basel, Switzerland
[1]{songtuan.lin, pascal.bercher}@anu.edu.au [2]conny.olz@uni-ulm.de [3]malte.helmert@unibas.ch

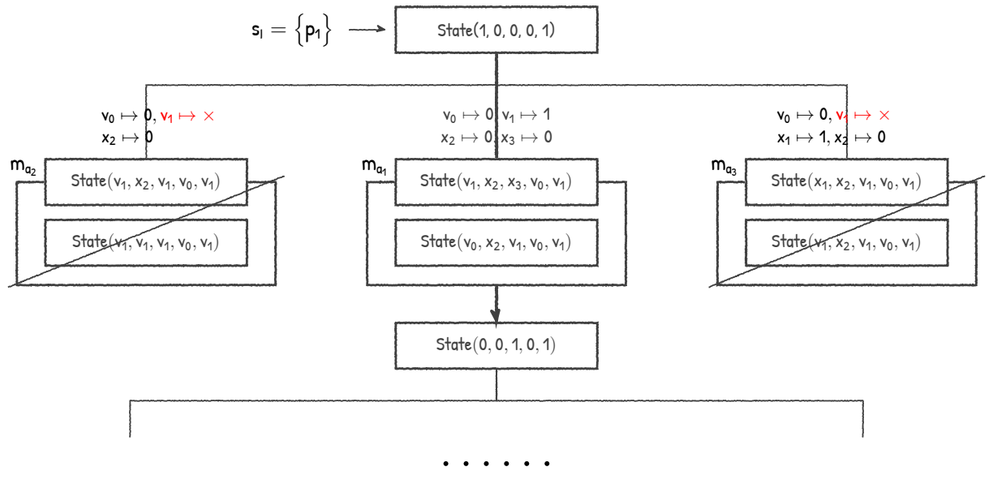


Results

		Plan Verification	k-length Plan Existence: k in binary	k-length Plan Existence: k in unary	Plan Optimality Verification	Bounded Plan Optimality Verification: plan given	Bounded Plan Optimality Verification: only plan length given
Classical	ground	In P	PSPACE-complete	NP-complete	coNP-complete	coNP-complete	PSPACE-complete
	lifted	In P	NEXPTIME-complete	NP-complete	coNP-complete	coNP-complete	coNEXPTIME-complete
Hierarchical	ground	NP-complete	NEXPTIME-complete	NP-complete	coNP-complete	coNP-complete	coNEXPTIME-complete
	lifted	PSPACE-hard In NEXPTIME	NEXPTIME-hard In 2NEXPTIME	PSPACE-hard In NEXPTIME	PSPACE-hard In coNEXPTIME	PSPACE-hard In coNEXPTIME	coNEXPTIME-hard In co2NEXPTIME

How a decomposition hierarchy simulates state transitions:





Objective

We studied the computational complexity of several problems centered at the bounded plan existence problem.

1. The plan verification problem.
2. The bounded plan existence problem.
3. The (bounded) plan optimality verification problem.

Problems and their relations