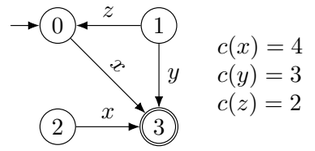
Our compositional theory of factored transformations allows understanding merge-and-shrink in terms of the properties of its components.

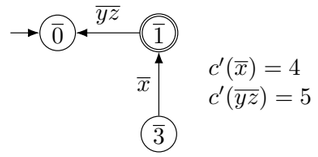
- almost entirely new theory
- define desirable properties of transformations
- heuristic properties induced by transformation properties
- complete characterization of the conditions under which transformations have properties
- first theory on pruning
- first full formal account of factored mappings
- complete characterization of merge-and-shrink transformations

Merge-and-Shrink: A Compositional Theory of Transformations of Factored Transition Systems
Silvan Sievers and Malte Helmert
University of Basel, Switzerland
University of Basel

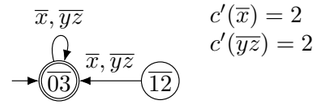
Example of Transformations



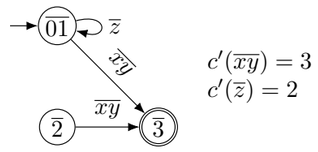
(a) Original transition system.



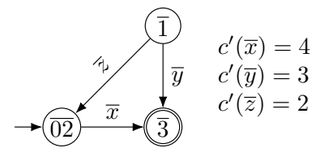
(b) Arbitrary transformation (not an abstraction).



(c) Abstraction (not induced).



(d) Induced abstraction (not exact).



(e) Exact transformation.

Shrinking: Properties

- abstraction (conservative + induced)
- local heuristics are preserved if h-preserving
- exact (abstraction + refinable) iff based on bisimulation

Merging: Properties

- exact

Label Reduction: Properties

- conservative but not induced or refinable in general
- exact iff induced/refinable
- **coNP**-complete to determine if label reduction is induced/refinable
- atomic label reduction exact iff based on Θ-combinabilty

Pruning: Properties

- leads to inadmissible heuristics in general
- exact if keeping exactly the backward-reachable states
- forward-admissible/forward-perfect heuristics if keeping exactly the forward-reachable or alive states