

# Hierarchical Decompositions and Termination Analysis for Generalized Planning (Abstract Reprint)

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## Abstract

This paper presents new methods for analyzing and evaluating generalized plans that can solve broad classes of related planning problems. Although synthesis and learning of generalized plans has been a longstanding goal in AI, it remains challenging due to fundamental gaps in methods for analyzing the scope and utility of a given generalized plan. This paper addresses these gaps by developing a new conceptual framework along with proof techniques and algorithmic processes for assessing termination and goal-reachability related properties of generalized plans. We build upon classic results from graph theory to decompose generalized plans into smaller components that are then used to derive hierarchical termination arguments. These methods can be used to determine the utility of a given generalized plan, as well as to guide the synthesis and learning processes for generalized plans. We present theoretical as well as empirical results illustrating the scope of this new approach. Our analysis shows that this approach significantly extends the class of generalized plans that can be assessed automatically, thereby reducing barriers in the synthesis and learning of reliable generalized plans.

## References

[Srivastava, 2023] Siddharth Srivastava. Hierarchical decompositions and termination analysis for generalized planning. *J. Artif. Intell. Res.*, 77:1203–1236, 2023.