

First-Order and Temporal Logics for Nested Words

Alur, R., Arenas, M., Barceló, P., Etessami, K., Immerman, N., & Libkin, L. (2007, July). First-order and temporal logics for nested words. In 22nd Annual IEEE Symposium on Logic in Computer Science (LICS 2007) (pp. 151-160). IEEE. <10.1109/LICS.2007.19> Accessed 28 May 2022.

Abstract

Nested words are a structured model of execution paths in procedural programs, reflecting their call and return nesting structure. Finite nested words also capture the structure of parse trees and other tree-structured data, such as XML. We provide new temporal logics for finite and infinite nested words, which are natural extensions of LTL, and prove that these logics are first-order expressively- complete. One of them is based on adding a "within" modality, evaluating a formula on a subword, to a logic CaRet previously studied in the context of verifying properties of recursive state machines. The other logic is based on the notion of a summary path that combines the linear and nesting structures. For that logic, both model-checking and satisfiability are shown to be EXPTIME-complete. Finally, we prove that first-order logic over nested words has the three-variable property, and we present a temporal logic for nested words which is complete for the two- variable fragment of first-order.

Keywords

Boolean functions, XML, Navigation, Automata, Inspection, Computer science, Logic design.