The Cayley-Graph of the Queue Monoid: Logic and Decidability

Faried Abu Zaid
Technische Universität Ilmenau, Automata and Logics Group
faried.abu-zaid@tu-ilmenau.de

Chris Köcher
Technische Universität Ilmenau, Automata and Logics Group
chris.koecher@tu-ilmenau.de
https://orcid.org/0000-0003-4575-9339

Abstract

We investigate the decidability of logical aspects of graphs that arise as Cayley-graphs of the so-called queue monoids. These monoids model the behavior of the classical (reliable) fifo-queues. We answer a question raised by Huschenbett, Kuske, and Zetzsche and prove the decidability of the first-order theory of these graphs with the help of an - at least for the authors - new combination of the well-known method from Ferrante and Rackoff and an automata-based approach. On the other hand, we prove that the monadic second-order of the queue monoid's Cayley-graph is undecidable.

2012 ACM Subject Classification Theory of computation → Logic, Theory of computation → Models of computation, Information systems → Data structures

Keywords and phrases Queues, Transformation Monoid, Cayley-Graph, Logic, First-Order Theory, MSO Theory, Model Checking

Digital Object Identifier 10.4230/LIPIcs...