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Data-structure Rewriting

Abstract

In general, the expressions considered in functional languages are represented as labelled trees (e.g. terms). These expressions are well suited for encoding classical data-structures such as lists or trees. However, real-world programs handle much more complex data-structures with structure sharing and cycles such as circular lists or doubly-linked lists. In many cases, the use of such complex data structures is mandatory for efficiency reasons, namely time and space complexity of algorithms. These data-structures are formally defined as particular graphs, called term-graphs.

We will introduce a class of term-graph rewriting systems which allows one to define functions operating on data-structures with pointers. This class will be defined following both the algorithmic and the algebraic approaches. We then discuss the confluence property of such systems and introduce a new modal logic tailored to describe graph transformations and discuss some of its properties.