Categorical semantics of imperative programming language in coalgebras

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Formal description of programming languages belongs to important methods serving for understanding exact meanings of programs and helping to implement compilers. Semantics of programming languages is concerned with the interpretation of programs written in programming languages [**?**]. The main role of semantics is to predict the outcome of program execution [**?**]. The semantics can be viewed as a function which maps syntactic elements to the semantic domains.

We provide a new approach to defining semantics of programming language in terms of categories in this approach. Our model is a category of states where category objects are states during the program execution. The dynamics of program execution is modeled by category morphisms that expresses change of states [**?**]. Morphisms are defined as functions $[\![S]\!] : s \to s'$ where S stands for statement and s, s' for states.

Each language construct corresponds to certain dynamics captured in coalgebras. The behavior of programs is described by a (final) coalgebra $X \to F(X)$ where the functor F captures the kind of behavior that can be observed [**?**]. In other words, generated computer behavior amounts to the repeated evaluation of a coalgebraic structure on an algebra of terms [**?**, **?**].

In this approach we present how to describe program behavior by observing states that are elements of some state space and how to define the coalgebra. We illustrate our approach on a simple imperative language consisting of five Dijkstra's construct.

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