Abstract Semantics of Synchronous Languages: The Example Esterel

We give an abstract denotational semantic model for the synchronous programming language Esterel, which is used for the description and implementation of reactive process control systems. We base this semantics on a functional model of behaviour. We describe the input and output histories of Esterel programs by streams carrying sets of signals. We represent the behaviour of an Esterel component mathematically by a stream processing function. The main difficulty in giving a semantics to Esterel consists in the idea of instantaneous reactions of Esterel programs to input signals. In our semantics, we overcome this problem by modelling the causality between the events in every time interval by an individual fixpoint construction. The semantic model fixes the meaning of Esterel.

Stichworte: Esterel; synchrone Sprachen; denotationelle Semantik; stromverarbeitende Funktionen

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