

State Space Transformation — A Specification Language and a Program Generator

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Programming Methodology is one of the main introductory courses in computer science at the Eötvös Loránd University. We use a relational model of programming to establish a deep mathematical understanding of small-scale programming. The main issues covered by our model are

- deriving correct programs by refining specifications,
- encapsulation, representation and implementation of types and
- recognition of problem patterns and reuse of existing solutions.

Our programming methodology course lays much emphasis on the latter. Basic reuse is achieved by *reducing* the problem to a known and more general one and specialising the solution accordingly. As expressed above, basic reduction requires the problem to be the *direct specialisation* of a known one. Advanced reuse involving state space transformation relaxes this requirement and allows to exploit less obvious analogies as well.

In 1995 we started a project at our department to capture our programming methodology by a specification language and a program generator. Our goal was to separate the mechanical aspects of working according to the methodology from those requiring insight. The mechanical tasks have to be performed by a program generator that takes input written in a specification language that both enables and forces the programmer to state all creative knowledge necessary for solving the problem.

In our article we are going to introduce the current state of our work, which is the specification language called A' and the corresponding program generator. A' has language capabilities to express and solve problems using

- direct reduction,
- nested direct reductions or
- reductions involving state space transformation.

The specification language is designed to be as high-level as possible without the need to incorporate pattern recognition or artificial intelligence techniques into the program generator. The result is a tool that covers most of the exercises of programming methodology courses related to problem reduction and state space transformation.