URL: http://www.elsevier.nl/locate/entcs/volume44.html 4 pages

An Action Semantics Integrated Development Environment

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Abstract

We demonstrate the first public release of the ABACO system, an integrated development environment designed to support the construction and maintenance of action semantics descriptions. The system is formed by a set of tools like parser generators, specification processors, including sort checkers and interpreters for action semantic descriptions, and action interpreters which can execute actions written in action notation version 1 and action notation version 2. These tools are integrated in a graphical user interface environment, allowing a friendly design of new specifications and the immediate test of them. We expect that the ABACO system will improve the learning curve of action notation and its application to programming language design.

1 Introduction

Action semantics is a framework used to specify real programming languages [Mos92]. The framework is based on a formal notation, called action notation, which is used for describing programming languages. Action notation facilitates the design of complex programming languages by producing more readable specifications.

Although action semantics makes the process of describing programming languages easier, its use and learning in complex projects is still a challenge which can override its advantages if one cannot count on good support tools which can help the process of build and test programming languages specifications. We propose to demonstrate the ABACO system [MM99,Men98], an integrated development environment for action semantics.

2 The Abaco System

In order to facilitate the use of action notation, we design a system named Abaco (Algebraic Based Action COmpiler) to support it. This system is formed by an editing environment and support tools.

The editing environment enables the design of new programming languages and facilitates the reuse of parts of existing specifications. It is formed by a project manager, which shows the used modules and a specification editor that helps the building of specifications.

The support tools can be used to process and execute action semantics descriptions. The following tools form the system: the parser generator, the specification processor, the action interpreter, the action translator, and the document generator.

- The parser generator generates a parser for the defined language. It can also be used to generate a parser for action notation, based on its formal definition.
- The specification processor checks a programming language description and executes it. Execute a specification means to accept valid programs and give their semantics. The formal model used by the system is an algebraic specification language with syntax formed by a sub set of unified algebras [Mos88].
- The action interpreter is used to execute actions, produced by hand or automatically by specification processor. The action interpreter is able to recognize and execute the action notation version 1 [Mos92] and also the action notation version 2 [LMW00]. The execution result is the outcome of the action interpretation.
- The action translator implements the given specification using an object oriented programming language. The resulted code is able to execute independently of the interface. This module is not available in the current version and it is designed to a next version of the system.
- The document generator produces formatted document files from action semantics descriptions. The version 1 of the Abaco system is able to produce HTML and LaTeX formatted outputs.

These modules are integrated in an extensible graphical environment, allowing the definition of new tools like code generators, analyzers, etc. For a detailed presentation of the system see [MM99].

3 The Abaco Library

Besides the tools defined in the last section, the Abaco system defines some libraries to help the description of programming languages:

- the action library, which make available for the Abaco user the sorts existing

in action notation versions 1 and 2;

- the programming language components library, which defines parts of standard programming languages descriptions to be reused in new programming language descriptions (not available in the current version);
- the online documentation library, which describes action notation and can be used as reference for novice action semantics users.

4 Release and System Requirements

The first version of the ABACO System is available in the Recife Action Tools (RAT) website [RAT]. It is implemented using the second version of Java programming language and could be used in any system which supports Java. We tested the system using the following environment:

- An IBM compatible PC with a Pentium 233 MHz or higher processor;
- 32 MB of RAM memory;
- Sun JDK 1.3; and
- Linux and Windows operating systems.

5 Conclusions and Future Enhancements

ABACO presents a uniform environment which helps the design of programming languages using action semantics. It can be used as a development tool in the construction and maintenance of action semantics descriptions. It also can be useful in the learning of action notation.

We are planning to include in future versions of the system, the following functionalities:

- support for specifications written in the style found in the CASL [Mos99] specification language (used by action notation version 2);
- a syntax oriented specification editor;
- integrated code generators to produce automatic implementations of programming languages.

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