Vaucanson 1.4.1

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Vaucanson is an on-going project of a free software platform dedicated to the manipulation of finite state automata. 'Finite state automata' is to be understood in the broadest sense: Vaucanson supports *weighted* automata over a free monoid, and *weighted transducers*, that is, weighted automata over products of two free monoids.

From user's point of view, the platform consists in two main components:

The Vaucanson library is a `C++` library that implements objects for automata, rational expressions, as well as algorithms on these objects. This library is written under the static genericity paradigm.

TAF-Kit is a *command-line interface* to the library that allows user to execute Vaucanson's algorithms without any knowledge of `C++` nor of Vaucanson API. This interface is instantiated for a predefined set of commonly used automaton types.

The platform is coupled with two other communication modules:

An `XML` format for automata and expressions, called Fsm XML, aims at being a general purpose interchange format for weighted automata and regular expressions. It is used as the normal, and default, input and output format for TAF-Kit and thus for the communication between TAF-Kit and Vgi.

A Graphical User Interface called Vgi and especially dedicated to Vaucanson, allows to describe automata and to visualize the result of operations on automata in an interactive and graphical way. All functions defined in TAF-Kit can be called via the menu of Vgi.

The Vaucanson platform is currently under a thorough revision and its core is rebuilt with a new design that changes the interface and the associated API. The ultimate version of the first phase of the project, coined Vaucanson 1.4, has been presented at FSMNLP 2011, and eventually released in September 2011. It is accessible through the TAF-Kit only, which is also the only part that is documented.

The novelty of the Vaucanson 1.4.1 version, just released in July 2012, is the integration of the Graphical User Interface Vgi. Vgi is designed to provide a sophisticated yet user-friendly interface for the user to interact with the platform more effectively.

The Vaucanson platform is designed and realised by Vaucanson Group. This work is supported by the ANR-10-INTB-0203 project since March 1st, 2011.

The Graphical User Interface Vgi is designed and realised at the Computation Theory Laboratory, EE Dept., National Taiwan University in Taipeh. It is supported by the NSC-100-2923-E-002-001-MY3 project since January 1st, 2011.

VAUCANSON 1.4.1 and VGI can be downloaded from the VAUCANSON PROJECT site:

`http://www.vaucanson-project.org`

where all relevant informations for the installation, as well as complete TAF-KIT and VGI user manuals, are to be found.

TAF-KIT stands for *Typed Automata Function Kit*. In the static generic programming paradigm used in the VAUCANSON library, the *types* of the automata that are treated have to be known at compile time. The command-line interface TAF-KIT is a set of programs called from the `shell` and used to chain operations on automata. At the installation of VAUCANSON, TAF-KIT is therefore compiled for several predefined types of automata.

TAF-KIT does not allow to write new algorithms nor to manipulate new types of automata, but it makes it possible, without efforts, to use *already programmed* functions on automata of *predefined types*. TAF-KIT gives a *restricted access* to VAUCANSON functionalities, but it is a *direct access*, without any need of programming skill. A basic familiarity with Unix command syntax only is sufficient to make use of TAF-KIT.

The type of an automaton is determined by: (a) the fact it is an automaton over a free monoid, or over a product of two free monoids, (b) the type of the generators of the free monoid(s), (c) the weight semiring. The weight semiring can be $\mathbb{B}$, $\mathbb{Z}$, $\mathbb{Q}$, $\mathbb{R}$, $\mathbb{F}_2$, $\mathbb{Z}$min, or $\mathbb{Z}$max. The generators may be *characters*, *integers* or *pairs* of these. At the installation of VAUCANSON, TAF-KIT is instanciated for 18 combinations of weights and generators types.

Besides basic editing commands, most of 'classical' operations on automata, together with less classical ones, are available in the TAF-KIT instances: from transformations of automata into expressions and back to operations such as quotient, product, and shuffle, from operations for Boolean automata such as determinisation or computation of the universal automaton to operations on transducers such as composition or evaluation, from reduction of automata with weights in a field to transformation of automata over pairs into transducers.

The architectural design of VGI comprises of a hierarchy of layers, making it robust, extendable and portable. In addition to those basic drawing functionalities existing in typical graphical user interfaces, the VGI allows the user to read/store geometric information associated with layouts of automata from/to their external representations kept in XML files, as well as to call TAF-KIT commands directly. Advanced visualization techniques such as semantics-based layouts and focus+context display and navigation are being developed, hoping to reveal more insight into the evolution of an automaton in the process of the application of algorithms.

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