

# System Description: NuSMV

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## System architecture

NuSMV is an open source symbolic model checker []. The latest NuSMV version 2.4.0, recently released, features an extended language, including treatment for bit vectors, and provides the basis for the NuSMV SMT solver, that has been developed to enter the QF\_UFBV32 category in SMT-COMP'06. In the following, unless otherwise specified, by NuSMV we mean the SMT solver.

NuSMV is composed of a preprocessor, and a solver.

### The Preprocessor

The preprocessor parses the input problem, simplifies it, and then eliminates functions symbols by means of Ackerman's expansion. In this phase, simplification rules based on the theory of Bit Vectors are applied. In particular, constant terms are evaluated, and variables that are forced to assume a specific value are detected; such variables are then eliminated from the problem, and are dealt with in a specialized manner during Ackerman's expansion.

### The Solver

The resulting problem is a formula built out of constraints over bit vector variables. Satisfiability is reduced to computing a relational product, i.e. an existential quantification over a set of variables, a standard operation in symbolic model checking. Optimized NuSMV routines for the computation of relational product trade a potentially explosive, monolithic relational product with several operations on a restricted number of variables.

## Implementation

Both the NuSMV model checker and the NuSMV solver are entirely written in C. The model checker is available at <http://nusmv.itc.it/>.

## Expected performance

According to our preliminary tests, the NuSMV solver is quite effective on the benchmarks of the competition, and we expect it to be able to complete all the selected benchmarks within the time out.

## SMT-COMP Problem Divisions and seed number

NuSMV will only compete in the QF\_UFBV32 SMT-COMP'06 Problem Division.

**Seed number:** 16052002