NAME

mcl, MCL – Model Checking Language (versions 3, 4, and 5)

DESCRIPTION

MCL (*Model Checking Language*) is an action-based, branching-time temporal logic suitable for expressing properties of concurrent systems. *MCL* is interpreted on Labelled Transition Systems (LTSs).

Three versions of *MCL* are currently available:

- *MCL* version 3 (regular alternation-free mu-calculus) [MS03, Mat06] is an extension of the alternation-free fragment of the modal mu-calculus [Koz83, EL86] with action predicates similar to those of *ACTL* [DV90] and regular expressions over action sequences similar to those of *PDL* [FL79]. In the temporal formulas of *MCL* version 3, the LTS actions are merely character strings.

  A description of *MCL* version 3 can be found in the **mcl3**(LOCAL) manual page.

  MCL version 3 is supported by the **evaluator3**(LOCAL) on-the-fly model checker.

- *MCL* version 4 (value-passing modal mu-calculus) [MT08] is an extension of *MCL* version 3 with data-handling constructs (data variables, expressions, parameterized fixed point operators, programming language constructs) and an infinite looping operator similar to that of *PDL-delta* [Str82], able to express fairness properties. In the temporal formulas of *MCL* version 4, the LTS actions are tuples containing channel names and data values, which can be extracted and used in calculations, as originally proposed in the RICO logic [Gar89].

  A description of *MCL* version 4 can be found in the **mcl4**(LOCAL) manual page.

  MCL version 4 is supported by the **evaluator4**(LOCAL) on-the-fly model checker.

- *MCL* version 5 (probabilistic value-passing modal mu-calculus) [MR18] is an extension of *MCL* version 4 with a probabilistic operator specifying the probability of transition sequences described using generalized regular formulas. *MCL* version 5 is interpreted on Probabilistic Transition Systems (PTSs) [LS91], whose transitions are labeled by actions containing channel names, data values, and probabilities.

  A description of *MCL* version 5 can be found in the **mcl5**(LOCAL) manual page.

  MCL version 5 is supported by the **evaluator5**(LOCAL) on-the-fly model checker.

BIBLIOGRAPHY

[DV90] R. De Nicola and F. W. Vaandrager. "Action versus State based Logics for Transition Systems." Proceedings Ecole de Printemps on Semantics of Concurrency, LNCS v. 469, p. 407-419, 1990.

[EL86] E. A. Emerson and C-L. Lei. "Efficient Model Checking in Fragments of the Propositional Mu-Calculus." Proceedings of the 1st LICS, p. 267-278, 1986.

[FL79] M. J. Fischer and R. E. Ladner. "Propositional Dynamic Logic of Regular Programs." Journal of Computer and System Sciences, no. 18, p. 194-211, 1979.

[Gar89] H. Garavel. Chapter 9 of "Compilation et verification de programmes LOTOS." PhD thesis,

Universite Joseph-Fourier Grenoble, 1989. Available from http://cadp.inria.fr/publications/Garavel-89-b.html

[Koz83] D. Kozen. "Results on the Propositional Mu-Calculus." Theoretical Computer Science, v. 27, p. 333-354, 1983.

[LS91] K. G. Larsen and A. Skou. "Bisimulation through Probabilistic Testing." Information and Computation, v. 94, no. 1, p. 1-28, 1991.

[MR18] R. Mateescu and J. I. Requeno. "On-the-Fly Model Checking for Extended Action-Based Probabilistic Operators." Springer International Journal on Software Tools for Technology Transfer (STTT), v. 20, no. 5, p. 563-587, 2018.

[MS03] R. Mateescu and M. Sighireanu. "Efficient On-the-Fly Model-Checking for Regular Alternation-Free Mu-Calculus." Science of Computer Programming, v. 46, no. 3, p. 255-281, 2003. Available from http://cadp.inria.fr/publications/Mateescu-Sighireanu-03.html

[MT08] R. Mateescu and D. Thivolle. "A Model Checking Language for Concurrent Value-Passing Systems." Proceedings of the 15th International Symposium on Formal Methods FM'08, LNCS v. 5014, p. 148-164, 2008. Available from http://cadp.inria.fr/publications/Mateescu-Thivolle-08.html

[Str82] R. S. Streett. "Propositional Dynamic Logic of Looping and Converse." Information and Control, v. 54, p. 121-141, 1982.

SEE ALSO

evaluator(LOCAL), **evaluator3**(LOCAL), **evaluator4**(LOCAL), **mcl3**(LOCAL), **mcl4**(LOCAL), **regexp**(LOCAL)

Additional information is available from the CADP Web page located at http://cadp.inria.fr

Directives for installation are given in files **$CADP/INSTALLATION_***.

Recent changes and improvements to this software are reported and commented in file **$CADP/HISTORY**.

BUGS

Please report bugs to Radu.Mateescu@inria.fr