Addenum to PROD Reference Manual: Syntax of CTL formulas

Additon of a CTL Model checker

An addition to section 5.3 Ordinary commands, page 32.

check *ctl_formula*

This model checks the CTL formula *ctl_formula*. (See the description of *ctl_formula* in Section 5.4.4 .)

An addition to section 5.4.4 Formulas, page 38.

ctl_formula ::=

- **(** *ctl_formula* **)**

  This has the value of *ctl_formula*.

- *expression*

  The result of this is a boolean truth value B. Let x be the evaluation node. If the value of *expression* in x is 0, then B is false. Otherwise B is true.

- **false**

  The value of this is the boolean value false.

- **true**

  The value of this is the boolean value true.

- **not** *ctl_formula*

  The result of this is a boolean truth value B. Let x be the evaluation node. If the value of *ctl_formula* in x is true, then B is false. Otherwise B is true.

- **eu (** *ctl_formula* **,** *ctl_formula* **)**

  The result of this is a boolean truth value B. Let M be the Kripke structure corresponding to the reachability graph of the system, x be the evaluation node, f_1 the leftmost *ctl_formula*, and f_2 the rightmost *ctl_formula*. B is true iff for some fullpath $(s_0, s_1, \ldots)$, such that $s_0 = x$, $\exists i\,[i \geq 0 \wedge M, s_i \models f_2 \wedge \forall j\,[0 \leq j < i \Longrightarrow M, s_j \models f_1]]$.

- **au** (*ctl_formula* , *ctl_formula*)

  The result of this is a boolean truth value B. Let M be the Kripke structure corresponding to the reachability graph of the system, x be the evaluation node, f_1 the leftmost *ctl_formula*, and f_2 the rightmost *ctl_formula*. B is true iff for all fullpaths $(s_0, s_1, \ldots)$, such that $s_0 = x$, $\exists i\,[i \geq 0 \wedge M, s_i \models f_2 \wedge \forall j\,[0 \leq j < i \Longrightarrow M, s_j \models f_1]]$.

- **ef** (*ctl_formula*)

  This is a shorthand for the *ctl_formula:* `eu (true, ctl_formula)`.

- **af** (*ctl_formula*)

  This is a shorthand for the *ctl_formula:* `au (true, ctl_formula)`.

- **eg** (*ctl_formula*)

  This is a shorthand for the *ctl_formula:* `not (af (not (ctl_formula)))`.

- **ag** (*ctl_formula*)

  This is a shorthand for the *ctl_formula:* `not (ef (not (ctl_formula)))`.

- **ex** (*ctl_formula*)

  The result of this is a boolean truth value B. Let M be the Kripke structure corresponding to the reachability graph of the system, R the reachability relation between system states, x the evaluation node, and f_1 the subformula *ctl_formula*. B is true iff iff $M, t \models f_1$ for some state t such that $(x, t) \in R$.

- **ax** (*ctl_formula*)

  The result of this is a boolean truth value B. Let M be the Kripke structure corresponding to the reachability graph of the system, R the reachability relation between system states, x the evaluation node, and f_1 the subformula *ctl_formula*. B is true iff iff $M, t \models f_1$ for all states t such that $(x, t) \in R$.

- *ctl_formula* **and** *ctl_formula*

  The result of this is a boolean truth value B. Let x be the evaluation node. If the value of the leftmost *ctl_formula* in x is true, then B is the value of the rightmost *ctl_formula* in x. Otherwise B is false.

- *ctl_formula* **or** *ctl_formula*

  The result of this is a boolean truth value B. Let x be the evaluation node. If the value of the leftmost *ctl_formula* in x is true, then B is true. Otherwise B is the value of the rightmost *ctl_formula* in x.