Model Checking WS 2011: Assignment 7

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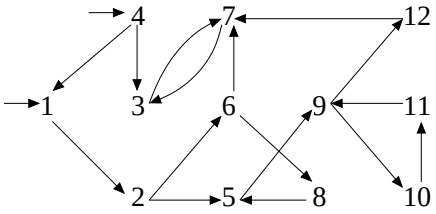
Exercise 25

Given a hash function that always returns the same constant hash value. How many collision list elements have to be visited altogether if n objects with different keys are inserted into a hash table with collision chains? Justify your answer and illustrate your solution with a drawing.

Exercise 26 *(compare with Exercise 21 from Assignment 6)*



Apply non-recursive DFS (see slides 56, 57) on the given graph with states $S := \{1,2,\ldots,12\}$ where the *state cache is implemented using bit state-hashing* with *one* hash function h as follows.

Let $h : S \to \{0,1,\ldots,15\}$ be a hash function which maps a state $s \in S$ to a 4-bit hash value where $h(s) := (2 \cdot s + 2)\%16$. Value $h(s)$ is used to index a hash table with $2^4 = 16$ 1-bit entries $b_0, b_1, \ldots, b_{15}$. Before DFS starts all b_i are set to 0.

Report the contents of `cache` (i.e. what b_i are set to 1) and `stack` and the value of `current` at the end of each iteration of the `while`-loop. Use the convention that states with *larger ID* are always *pushed first* on the stack, e.g. for initial states 1 and 4, 4 is pushed before 1. Assume that state 11 is the *only* bad state: `is_target(11)` is `true` and `false` otherwise.

Exercise 27

Let A_1, A_2 and A_3 be LTS defined as follows:

- $A_1 := (\{1,2\}, \{1\}, \{a_1, t, s\}, \{(1, a_1, 2), (2, t, 1), (1, s, 2)\})$.
- $A_2 := (\{1,2,3\}, \{1\}, \{a, b, t\}, \{(1, b, 2), (2, a, 3), (3, t, 1)\})$.
- $A_3 := (\{1,2\}, \{1\}, \{t, s\}, \{(1, s, 2), (2, t, 1)\})$.

Determine the set of local and global symbols for $A_1 \,||\, A_2 \,||\, A_3$ and each component LTS and draw the LTS for $A_1 \,||\, A_2 \,||\, A_3$.

Exercise 28

a) Given LTS A_2 from Exercise 27 and LTS $A_1 := (\{1,2\}, \{1\}, \{a_1, t\}, \{(1, a_1, 2), (2, t, 1)\})$, draw the LTS for $A_1 \,|||\, A_2$.

b) Why is the requirement $\Psi(a) \neq \emptyset$ in the definition of transitions in the asynchronous composition of multiple LTS necessary? Give a concrete example where the semantics will differ if this requirement is dropped.