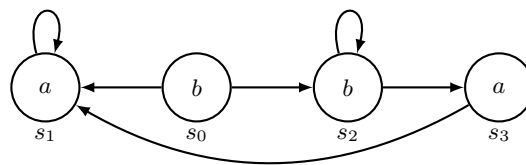


VU Programm- und Systemverifikation

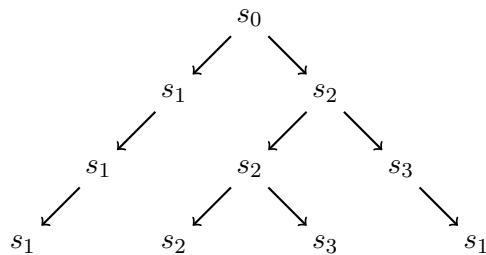
Solution: Temporal Logic and Model Checking

June 5, 2017

Consider the following Kripke Structure:



- Fix s_0 as the initial state and give the computation tree for three steps.



- Describe the following formulas in natural language. For each formula, in which states of the Kripke structure does it hold? (Note that we do not consider s_0 as special initial state here.)

(a) $a \wedge \mathbf{X} a$

s_1, s_3

(b) $\mathbf{E} \mathbf{F} (\mathbf{E} \mathbf{G} b)$

s_0, s_2

(c) $\mathbf{F} \mathbf{G} a$

s_1, s_3

(d) $\mathbf{E} \mathbf{G} b$

s_0, s_2

- Encode the following statements in temporal logic using the propositions given in quotes:

(a) One does not make the same “mistake” twice in life.

$\mathbf{G} (\text{mistake} \rightarrow \mathbf{X} \mathbf{G} \neg \text{mistake})$

- (b) It is always the case that if the “sun” is shining, and there is no “eclipse” then it is not “dark”.

A G ((sun \wedge \neg eclipse) \rightarrow \neg dark)

- (c) Whenever a process wants to “enter” the critical section, it will eventually be granted “access”.

G (enter \rightarrow F access)

- (d) Whenever a student “fails” the test, there will be a “test” a weak later. (Every step takes a weak).

G (fails \rightarrow X test)

- (e) This assignment is “given” five times in a row.

F (given \wedge X given \wedge X X given \wedge X X X given \wedge X X X X given)