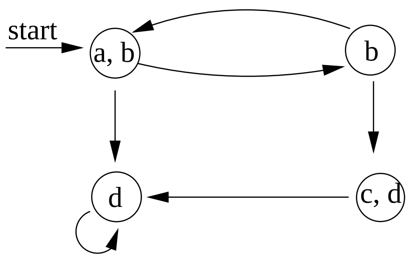
15817 Assignment 4

Exercise 1. Run SMV on `simple-01.smv` (on the Assignments page of the course website). (You can download SMV and run it on your computer, or you can run Cadence SMV on the Andrew Unix servers. See the Assignments page for more info.) (You don't need to turn in anything for this exercise.)

Exercise 2. Consider the Kripke structure and CTL formulas given below:



1. $\mathbf{EG}\, d$
2. $\mathbf{EF}\ \mathbf{EG}\, d$
3. $\mathbf{EF}\ \mathbf{AG}\, d$
4. $\mathbf{AG}\ \mathbf{EF}\, d$
5. $\mathbf{A}\,[b\,\mathbf{U}\,c]$
6. $\mathbf{A}\,[b\,\mathbf{U}\,d]$

The above Kripke structure has four states, `Sab`, `Sb`, `Sd`, and `Scd`. Encode the Kripke structure as an SMV model. Encode the CTL formulas as specifications to be checked of the model. (Please keep them in order.) Run SMV on your file and print out the results of whether each property is true or false.

Turn in: (A) a printout of your SMV file, and (B) a printout of the results of whether each property is true or false. (Don't include the traces or stats, just the final answers for each property.)

Exercise 3. Let us say that a state s_{A} is *reachable* from a state s_0 iff s_{A} is on some path starting with s_0.

a. From the definitions in the slides, it is easy to see that $[s_0 \models \mathbf{AG}\, f]$ means the following: for every path π starting with s_0, $[\pi^i \models f]$ holds true for every $i \geq 0$. Prove that $[s_0 \models \mathbf{AG}\, f]$ is true iff f is true for every path that starts with a state reachable from s_0. ("Iff" means "if and only if"; remember to prove both directions.)

b. Write a CTL* state formula that means the following: "path formula f is true for some path that starts with a state reachable from the present state". That is, your state formula should be true in a state s_i iff f is true for some path that starts with a state reachable from s_i.

c. Write a CTL formula that means the following: "From every state reachable from the present state, it is possible to reach a state in which atomic proposition `req` is true."