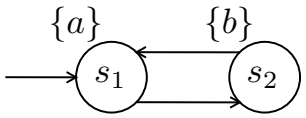

Figure 1: Transition system for problems 5 and 6

CDS 270 (Fall 09) - Assignment 8 (Due Tuesday, Dec. 1)

Throughout this assignment, if the question asks you to construct an automaton or a transition system, a picture will suffice.

Consider the following four LTL formulas over $AP = \{a, b\}$:

$$\begin{aligned}
\Phi_1 &= \Diamond\Box a \Rightarrow \Diamond\Box b \\
\Phi_2 &= \Box(a \Rightarrow b) \\
\Phi_3 &= \Box(a \vee b) \wedge \Diamond\Box a \\
\Phi_4 &= \Box a \vee (a \mathcal{U} b).
\end{aligned}$$

For each formula Φ_i do the following:

1. Find $Words(\Phi_i)$ and $Words(\neg\Phi_i)$
2. Classify $Words(\Phi_i)$ as invariance, safety, liveness, or neither safety nor liveness.
3. If $Words(\Phi_i)$ is safety property, but not invariance, construct a nondeterministic finite automaton, $\mathcal{A}_i$, such that $\mathcal{L}(\mathcal{A}_i) = BadPref(Words(\Phi_i))$.
4. If $Words(\Phi_i)$ is not a safety property, construct a nondeterministic Büchi automaton, $\mathcal{A}_i$, such that $\mathcal{L}_\omega(\mathcal{A}_i) = Words(\neg\Phi_i)$.
5. Let TS be the transition system depicted in Figure 1. If you constructed an automaton in question 3 or 4, construct $TS \otimes \mathcal{A}_i$.
6. Determine if $TS \models \Phi_i$.