



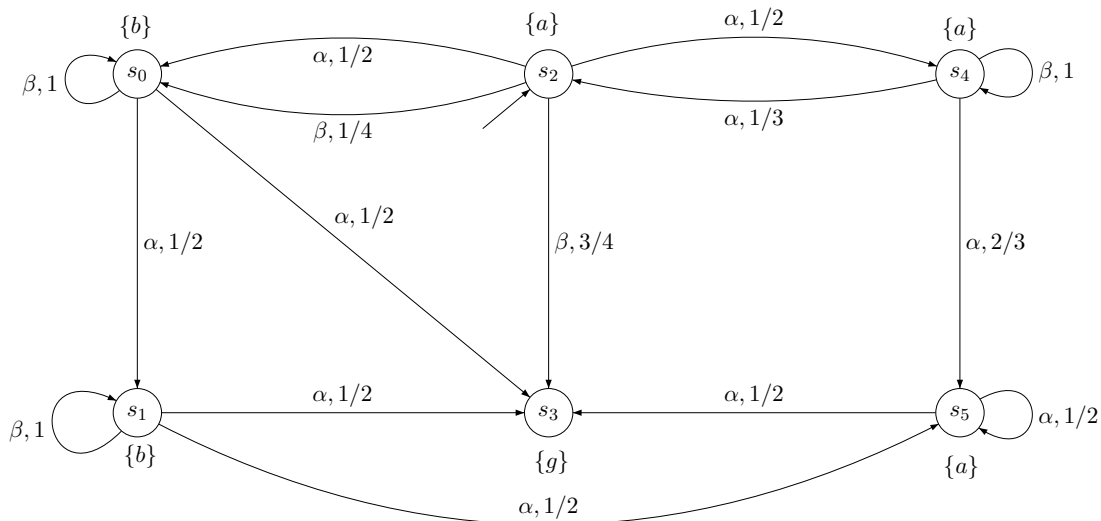
Modeling and Verification of Probabilistic Systems
Summer term 2014

– Series 7 –

Hand in on June 26 before the exercise class.

Exercise 1

(7 points)



Consider the MDP M as shown above. Find out the satisfaction sets of the following properties or list the probabilities of all states, give the used policies, and describe their properties:

- a) $\mathbb{P}_{\geq 0.5}(\bigcirc a)$
- b) $\mathbb{P}_{\geq .6}(\bigcirc b)$
- c) $\mathbb{P}_{< .3}(\diamond g)$
- d) $Pr^M(s \models (\square \diamond a))$
- e) $Pr^M(s \models (\square \diamond a \wedge \neg \square \diamond b))$

Exercise 2

(3 points)

Consider the following objective:

$$Pr^{\mathfrak{S}}(\diamond G_1) \geq p_1 \wedge Pr^{\mathfrak{S}}(\diamond G_2) \geq p_2$$

Provide an MDP $\mathcal{M} = (S, Act, \mathbf{P}, \iota_{init}, AP, L)$, two subsets $G_1, G_2 \subseteq S$, and two probabilities p_1, p_2 , such that the above objective *cannot* be met by any memoryless policy \mathfrak{S} , but *can* however be met by a randomized memoryless policy \mathfrak{S} ! (Obviously you should provide a description of the memoryless randomized policy \mathfrak{S} .)