Assignment 02
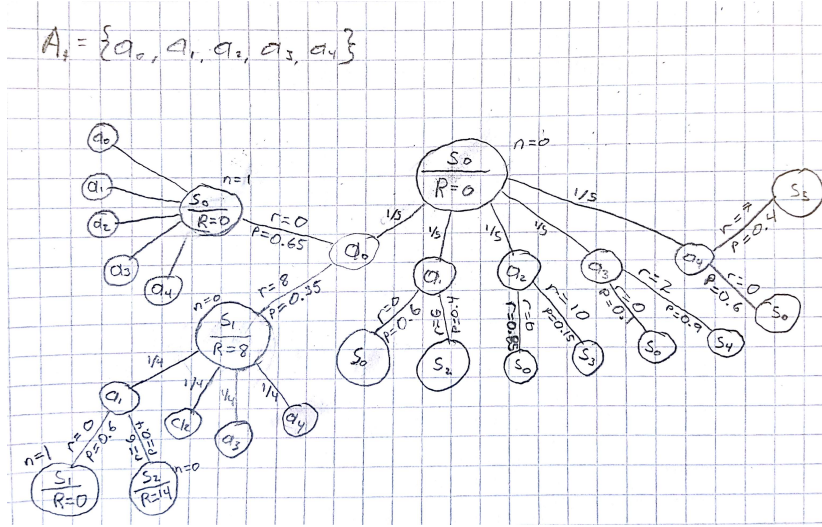
Roberto Cai Wu

May 9, 2017

1 Formulate this problem as a Markov Decision Process!

Figure 1: State space

Figure 1: State space

To describe the state space for the task, we define 5 actions $A = a_0, a_1, a_2, a_3, a_4$. Each action will solve one particular task, so a_0 will solve task 1, a_1 will solve task 2, a_2 will solve task 3, a_3 will solve task 4, and a_4 will solve task 5. A state is represented by s_i, with s_0 being the initial state. Each state contains a total reward R and a number of times it has been in that state.

A part of the state space is shown in Figure 1. The starting state is s_0 which represents a state when we have no task solved. In this starting state, we have five actions available. Each action has a probability p of going to the next state and a probability $1 - p$ of staying in the same state. If task is solved, it means it goes to the next state and will give a reward r for solving the task. If a task is not solved, it will stay in the current state and increase counter n. The counter n represents how many times the state has been repeated and can not be > 2. This means the same task can not be attempted to be solved more than two times if it has not been solved.

2 Give an example for a process model where the Markov assumption is not justified.

Example: Consider a Markov Decision Process example of determining whether a door is open or closed.

States : s_0 = Door open, s_1 = Door closed

actions: a_0 = opening door, a_1 = closing door

Transition probabilities: 0.5 probability of opening door when attempting action to open door. 0.5 probability of closing door when attempting action to close door.

Reward: If door is open, we can get positive/high reward , if it is closed, we get negative/low reward.

Now, if we destroy one state, and consider one state: Door open, then we cannot determine completely as there can be chances that door can be closed. In this case, MDP is violated as states are not completely defined.