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MSc in Computer Science and Engineering

Learning and Decision Making 2016-2017

Homework 1. Markov chains

1. (a)

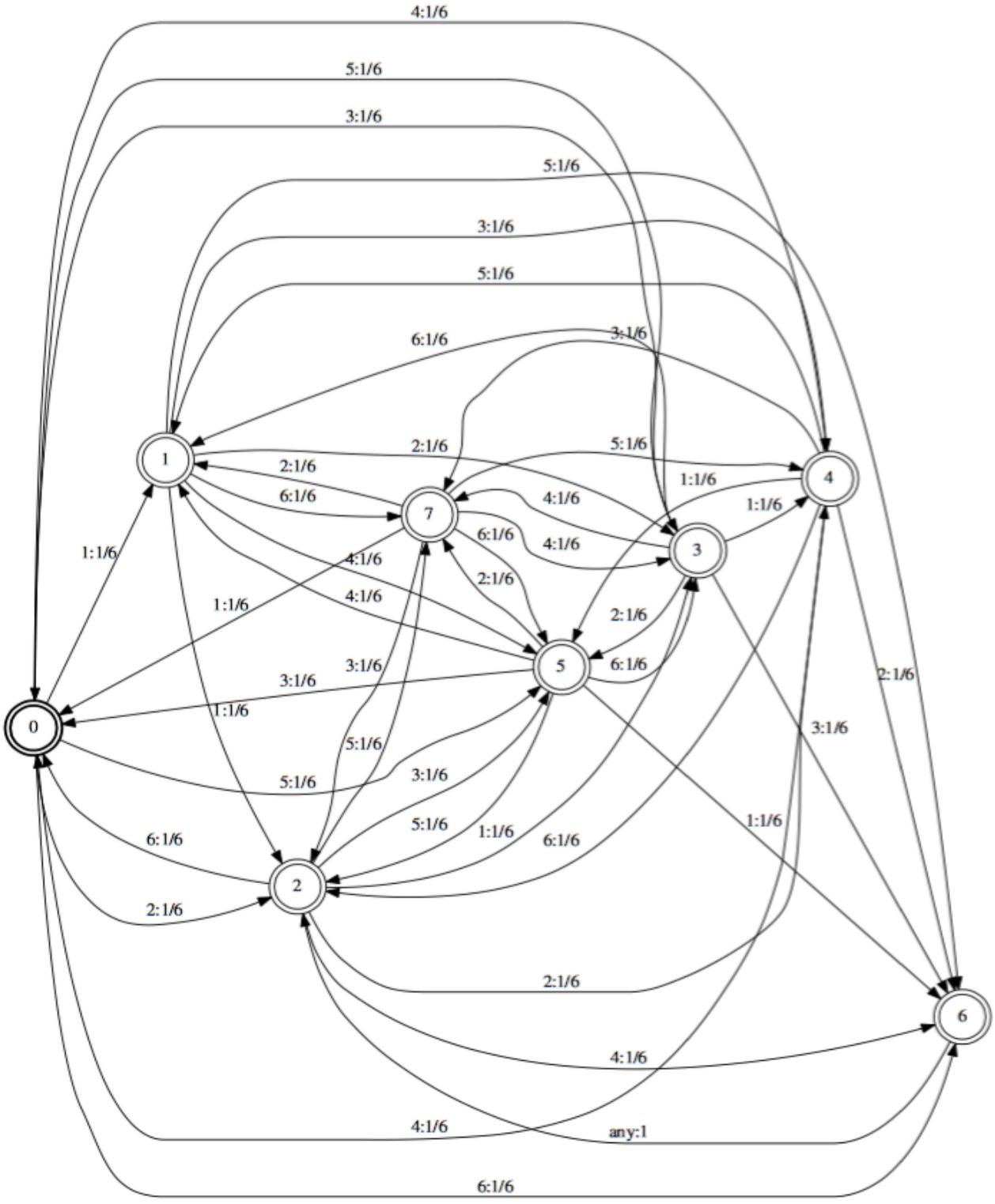

Figure 1 - transition diagram representing the motion of the player

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The states from the board are represented by the numbers. The state and number translation is the following:

- Go = 0
- Vermont Avenue = 1
- Jail = 2
- Virginia Avenue = 3
- Free Parking = 4
- Marvin Gardens = 5
- Go to Jail = 6
- Pennsylvania Avenue = 7

The transitions are labeled with a <number>:<probability>. The <number> on the label represents a possible number on the dice and <probability> represents the probability of getting that number. The only exception in this syntax is in state 6 (Go to Jail) which only has a transition with the label "any:1" to the state 2 (Jail) which means that if a player ends in state 6 at some time T, in T+1 the player will be in state 2.

(b)

χ = {0, 1, 2, 3, 4, 5, 6 ,7} - the set of possible states

$$P = \begin{matrix} 0 & 1/6 & 1/6 & 1/6 & 1/6 & 1/6 & 0 \\ 0 & 0 & 1/6 & 1/6 & 1/6 & 1/6 & 1/6 \\ 1/6 & 0 & 0 & 1/6 & 1/6 & 1/6 & 1/6 \\ 1/6 & 1/6 & 0 & 0 & 1/6 & 1/6 & 1/6 \\ 1/6 & 1/6 & 1/6 & 0 & 0 & 1/6 & 1/6 \\ 1/6 & 1/6 & 1/6 & 1/6 & 0 & 0 & 1/6 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 1/6 & 1/6 & 1/6 & 1/6 & 1/6 & 0 & 0 \end{matrix}$$

so the Markov chain model will be represented by: M(χ , P)

(c)

μ_0 = [1, 0, 0, 0, 0, 0, 0, 0]

what's μ_3?

$\mu_3 = \mu_0 P^3$ = [0.11111111 0.10648148 0.10648148 0.11574074 0.12037037 0.12037037, 0.11111111 0.10185185]