Advanced Artificial Intelligence, Winter 2004
Assignment 4a: Dynamic Programming/Markov Decision Processes
Due Wednesday, Feb 25, at 23:59est

Problems The issues at hand:

1. Download the MDP solver available at `http://plan.mcs.drexel.edu/courses/software/mdp/solver_010301.tar.gz` Documentation is included in the archive. You will need a Java Runtime Environment to use the program.
2. In this exercise we're modeling a probabilistic shortest path problem as an MDP and using the tool acquired in the previous step to solve the problem. The network in which we're interested is shown in Figure 1. It is the same network used in lecture and a description/picture may also be found in the slides for this week. We're concerned with an agent moving from the first node to the tenth node.

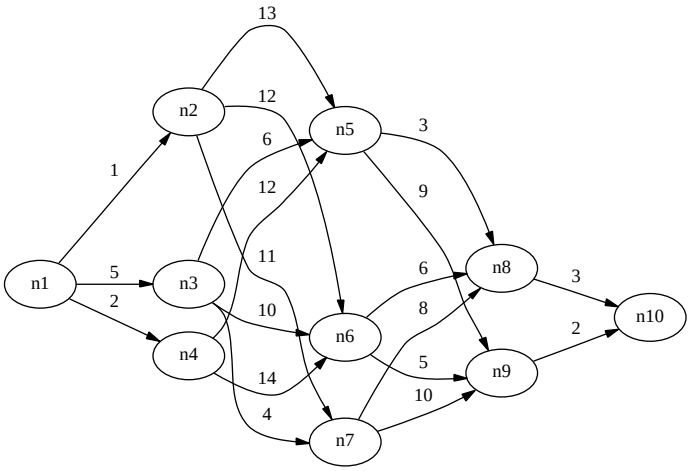

Figure 1: The network to be used.

3. Each edge in the network represents an action which can be taken from the parent node—a decision to move to a successor node along that edge. Sixty percent of the time the action is successful and the agent moves to the desired node. The other successor nodes split the remaining 40% evenly. For example, a decision to move from $n1$ to $n2$ lands in $n2$ 60% of the time and each of $n3$ and $n4$ 20% of the time.
4. Formulate this problem as a Markov decision problem. You should transcribe this in the format of the solving tool as described in its documentation.
5. Using the tool, solve for a policy to traverse the network. What path is determined as optimal? How do the expected values compare to the one obtained by solving the problem without considering the probabilities? Using the focus capability of the tool, generate a plot of the value function for nodes $n1$, $n5$, and $n9$. The solver uses an iterative algorithm to develop the value function, and this plot shows its change over time. Explain in your writeup what this graph tells us about the properties of the algorithm.

Submission Writeups of this assignment are to be mailed to `taaai@itcsl.cs.drexel.edu` by Wednesday, February 25, at 23:59est. All files are to be archived in a tar gz or zip file for submission. The archive should include a writeup in PostScript or PDF or doc form and the input file used for the solver. No late submissions or documents in other forms will be accepted.