Assignment A5: Monte Carlo Probabilistic Agent

CS 4300
Fall 2017

Assigned: 17 October 2017

Due: 9 November 2017

For this problem, handin a lab report pdf (include name, date, assignment and class number in pdf) which studies the performance statistics of an agent using Monte Carlo methods to solve for likelihhoods of pits and Wumpus in the Wumpus world. Create an agent which uses rules (as in my hybrid agent in code/A5 - but remove the theorem proving stuff) to search for the gold while using the Monte Carlo method to estimate the liklihood in unexplored cells and then to priortize them based on their likely safety. Specifically, the agent should:

1. Include attempt to locate Wumpus and shoot it.
2. Never give up (i.e., die trying).
3. Use MC to update pit and Wumpus likelihoods given new percepts.
4. Compute score for each scenario (as described in the text); you may use the CS4300_WW1 function in code/A5 for this (it has 2 helper functions: CS4300_get_percept, CS4300_update).
5. Use 50, 100 and 200 MC samples, and determine a mean score for each on each of the given set of test boards numbered 1:250 (see class data/A5 subdir, the file is A5_boards.mat) in terms of a mean, variance and confidence interval. Compare these to the same agent without MC estimates to determine what impact MC has on scores. Report your results in a manner similar to that shown in Table 1.

	Mean Score	*Number Successes*	*Number Failures*
No MC			
50 Samples			
100 Samples			
200 Samples			

Table 1. Table for Results Reporting.

Name the MC agent: *CS4300_MC_agent*.

You should handin the report pdf as well as all the source code used in the study. The code should conform to the style requested in the class materials (including function names – should have CS4300_ prefix; headers should be indented correctly).

In addition, please turn in a hardcopy of the report in class before the start of class on November 9, 2017.

Write a lab report in the format (please do not deviate from this format!) described in the course materials.

Discuss the statistical framework to establish a confidence interval on the means, and the hypothesis test.

Create a function to estimate pit and Wumpus likelihoods:

```
function [pits,Wumpus] =
CS4300_WP_estimates(breezes,stench,num_trials)
% CS4300_WP_estimates - estimate pit and Wumpus likelihoods
% On input:
%     breezes (4x4 Boolean array): presence of breeze percept at cell
%       -1: no knowledge
%        0: no breeze detected
%        1: breeze detected
%     stench (4x4 Boolean array): presence of stench in cell
%        -1: no knowledge
%         0: no stench detected
%         1: stench detected
%     num_trials (int): number of trials to run (subset will be OK)
% On output:
%     pits (4x4 [0,1] array): likelihood of pit in cell
%     Wumpus (4x4 [0 to 1] array): likelihood of Wumpus in cell
% Call:
%     breezes = -ones(4,4);
%     breezes(4,1) = 1;
%     stench = -ones(4,4);
%     stench(4,1) = 0;
%     [pts,Wumpus] = CS4300_WP_estimates(breezes,stench,10000)
% pts =
%    0.2021    0.1967    0.1956    0.1953
%    0.1972    0.1999    0.2016    0.1980
%    0.5527    0.1969    0.1989    0.2119
%         0    0.5552    0.1948    0.1839
%
% Wumpus =
%    0.0806    0.0800    0.0827    0.0720
%    0.0780    0.0738    0.0723    0.0717
%         0    0.0845    0.0685    0.0803
%         0         0    0.0741    0.0812
% Author:
%     <Your Name>
%     UU
%     Fall 2016
%
```

and an MC agent:

```
function action = CS4300_MC_agent(percept)
% CS4300_MC_agent - Monte Carlo agent with a few informal rules
% On input:
%     percept (1x5 Boolean vector): percept from Wumpus world
%       (1): stench
%       (2): breeze
%       (3): glitter
%       (4): bump
%       (5): scream
% On output:
%     action (int): action to take
%       1: FORWARD
%       2: RIGHT
%       3: LEFT
%       4: GRAB
%       5: SHOOT
%       6: CLIMB
% Call:
%     a = CS4300_MC_agent(percept);
% Author:
%     <Your name>
%     UU
%     Fall 2017
%
```