

Assignment A1: Random Actions in Wumpus World

CS 4300
Fall 2016

Assigned: 23 August 2016

Due: 1 September 2016

For this problem, handin a lab report pdf (include name, date, assignment and class number in pdf) which studies statistics for a Wumpus World exploring agent. You should handin the report pdf as well as the source code used in the study. The code should conform to the style requested in the class materials. You will find the Wumpus World Matlab code in the class code link, in subdir A1; use CS4300_WW2 (with a fixed board layout). In addition, please turn in a hardcopy of the report in class before the start of class on September 1, 2015. Two-person teams need to have one person do report sections 1,3,5, and the other do 2,4, and 6, and each their own part of section 7; these sections need to be attributed to the person doing them. 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 any hypothesis tests.

Part I

Provide a mathematical analysis of the percent of solvable 4x4 Wumpus boards for the number of pits 0,1 and 14 (using only actions FORWARD, RIGHT, LEFT); note that the gold and Wumpus should be placed on the board first. The gold, Wumpus and pits can go in any cell, but no two can be in the same cell. Provide an exact analysis (e.g., for 0 pits, all but one boards should be solvable). In addition, calculate a statistical answer as follows:

1. For the number of pits, p , ranging from 0 to 14
 - (a) Generate some number, N , of boards with p pits randomly distributed (also include the Wumpus and the gold, neither of which can be in a pit cell)
 - (b) Determine if the board is solvable (use Matlab function: CS4300_Wumpus_solvable).

- Using the above data, compute the mean percent solvable boards when choosing actions from the set $\mathcal{A} = \{FORWARD, RIGHT, LEFT\}$, as well as the variance and a 95% confidence interval.

Part II

For the Wumpus board given below, determine the likelihood that the agent described below arrives at the square with the gold.

- Develop an agent (named CS4300_agent1.m) function that randomly (uniformly) selects actions from FORWARD, RIGHT, LEFT in the Wumpus World. The starting location for each trial should be by $x = 1, y = 1$ and facing right (toward square $[2, 1]$).
- Run 2000 trials and determine the mean and variance of the number of steps the agent survives and the percentage of times the agent arrives at square $[3, 4]$. Also give the 95% confidence intervals for these.

The board layout is:

4		Pit	Gold	
3	Pit			
2		Pit	Pit	
1				
	1	2	3	4
	X			

Develop the agent function according to the following header:

```
function action = CS4300_agent1(percept)
% CS4300_agent1 - random agent example
%   It randomly either changes direction or moves forward
% On input:
%   percept (1x5 Boolean vector): percept values
%   (1): Stench
%   (2): Pit
%   (3): Glitters
%   (4): Bumped
%   (5): Screamed
% On output:
%   action (int): action selected by agent
%   FORWARD = 1;
%   ROTATE_RIGHT = 2;
%   ROTATE_LEFT = 3;
%   GRAB = 4;  -- NOT USED
%   SHOOT = 5;  -- NOT USED
%   CLIMB = 6;  -- NOT USED
% Call:
%   a = CS4300_agent1([0,1,0,0,0]);
% Author:
%   <Your name>
%   UU
%   Fall 2016
%
```