CS188–Spring 2019 — Homework 1

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Due: Monday 2/4/2019 at 11:59pm (submit via Gradescope).
Leave self assessment boxes blank for this due date.
Self assessment due: Monday 2/11/2018 at 11:59pm (submit via Gradescope) For the self assessment, **fill in the self assessment boxes in your original submission** (you can download a PDF copy of your submission from Gradescope). For each subpart where your original answer was correct, write correct. Otherwise, write and explain the correct answer.
Policy: Can be solved in groups (acknowledge collaborators) but must be written up individually.
Submission: Your submission should be a PDF that matches this template. Each page of the PDF should align with the corresponding page of the template (page 1 has name/collaborators, question 1 begins on page 2, etc.). **Do not reorder, split, combine, or add extra pages.** The intention is that you print out the template, write on the page in pen/pencil, and then scan or take pictures of the pages to make your submission. You may also fill out this template digitally (e.g. using a tablet.)

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Collaborators	None

Q1.Search

(a)

Search Algorithm	A-B-D-G	A-C-D-G	A-B-C-D-F-G
Depth first search			$\surd$
Breadth first search	$\surd$		
Uniform cost search			$\surd$
A* search with heuristic h_1			$\surd$
A* search with heuristic h_2			$\surd$

(b) (i) A heuristic h is admissible (optimistic) if:0≤h(n)≤x(n),where x(n) is the true cost to a nearest goal. So $h_3(B) \in [0, 13]$, where 13 denotes 5+3+5.

(ii) Because h(A)-h(B)≤cost(A to B)=1 and h(B)-h(c)≤cost(B to C)=1, h(A)=10,h(C)=9, then $h_3(B) \in [9, 10]$.

(iii) $h_3(A)+g(A) = 10+0 = 10, h_3(C)+g(C) = 9+4 = 13, h_3(B)+g(B) = H_3(B)+5, h_3(D)+ g(D) = 7 + 10 = 17$, and if it is in order, then $13_3(B) + 5 \leq 17$, then $h_3(B) \in [8, 12]$.

Q2.n-pacmen search

(a) M tuples $((x_1, y_1), (x_2, y_2), ...(x_M, y_M))$encoding the x and y coordinates of each pacman.

(b) The number of pacmen:n
Number of squares where pacmen can go:M
So the state space is M^n.

(c) Each step, every pacman can move 4 directions or stop moving. So the upper bound of branching factor is $(4 + 1)^n = 5^n$

(d) In the tree, each level, the nodes that expanded is 5^n, and it has at most $\frac{M}{2}$ levels. So the bound number of total nodes is $5^{\frac{Mn}{2}}$.

(e) (i) Not consistent and not admissible.
Consider the situation that a square that there are three pacmen on its left, right, down. And the actual cost from this situation to goal is 1.(All of them move to the middle square) But $h_1 = 1 + 1 + 1 = 3 > 1$. So h_1 is not consistent and not admissible.

(ii) Consistent and admissible.
Because the every pacman moves by at most one unit vertically or horizontally at each time step. So $1/2 * 2 \leq 1$.And h(A)-h(B)$\leq$cost(A to B), satisfies consistent and admissible