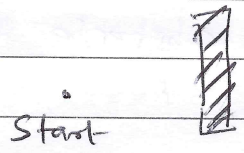
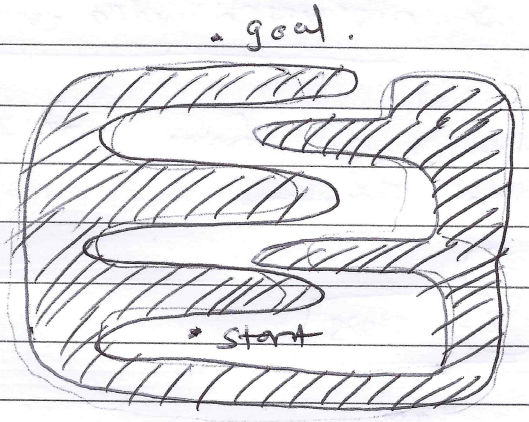
Homework 1

Problem 1

(a) Bug 1 travels more than Bug 2



(b) Bug2 travels more than Bug 1



Problem 3

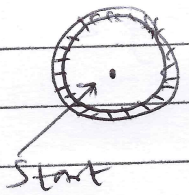
Bug0 → ① head towards goal
② follow obstacle until you can head towards goal again
③ continue

Completeness →

An algorithm is complete, if in finite time it finds a path if such a path exists or terminates with failure if it does not.

(2)

Consider the following scenario →

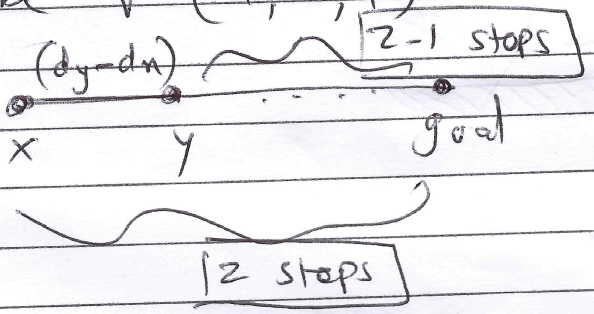


· A path does not exist.
But BugO fails to terminate since it keeps following the obstacle indefinitely.

∴ NOT COMPLETE

Problem 2 * discussed idea with Kevin Yu.

Let optimal value to go from x to goal in z steps with starting fuel value of f. be $V^*(x, z, f)$



Optimal x = optimal y in + cost(x, y)
in z steps z-1 steps

DP equation can be formulated as follows →

$$\therefore V^*(x, z, f) = \min \begin{cases} V^*(y, z-1, 0) + P_x \cdot (d_y - d_x - f) & P_y \le P_x \\ V^*(y, z-1, B-(d_y-d_x)) + P_x \cdot (B-f) & P_x > \end{cases}$$

∴ if $P_i \leq P_{i+1} \quad \forall i \in 1 \ldots n$
we fill the gas full tank at i^{th} station

if $P_i \geq P_{i+1} \quad \forall i \in 1 \ldots n$
we fill just enough gas to reach the $i+1^{th}$ gas station.

Initial condition:

↳ Starting vertex x_0
↳ starting fuel level B
↳ Reach goal in $n-1$ steps. (n including x_0)

Problem 4

↳ Comments are inline
↳ Readme has the instructions to execute.
