AI Planning for Autonomy

# Solution Problem Set III: Choosing Heuristics

1.

- $F = \{at(x,y), visited(x,y) \mid x, y \in \{0,\ldots,m-1\}\}$
- $O = \{move(x,y,x',y')$:
  - Prec: $at(x,y)$
  - Add: $at(x',y'), visited(x',y')$
  - Del: $at(x,y)$

  | for each adjacent $(x,y)(x',y')$, and $(x',y') \notin$W }
- I = {at(0,0), visited(0,0)}
- G = {visited(x,y) | (x,y) ∈ V}

2.

This is an open question, here we provide a few heuristic function examples. But do feel free to explore other heuristic function. More of this question are discussed for class or on LMS forum.

hints: Walls should also be taken under consideration. Manhattan distance is already an approximation for maze distance.

- $x$ and $y$ are coordinates representing current location of agent, and $V'$ are the coordinates that remain to be visited.
- a. $h_g(s)$= $|V'|$ (goal-counting heuristic)

  b. $h_c(s)$= $\min_{x_g,y_g \in V'}$ $Manhattan\_distance(x,y,x_g,y_g)$
  (Manhattan distance to closest unvisited coordinate)

  c. $h_f(s)$= $\max_{x_g,y_g \in V'}$ $Manhattan\_distance(x,y,x_g,y_g)$
  (Manhattan distance to furthest unvisited coordinate)
- Both $h_c(s)$ and $h_f(s)$ are admissible and consistent, $h_f(s)$ dominates $h_c(s)$. $h_g(s)$ is an approximation for "pre-condition & delete relaxation" heuristic. The relaxation heuristic is admissible and consistent, but not its approximation. $h_g(s)$ is admissible and consistent in this problem.
- All of them are in $O(n)$
- A*. Using the A* from **slides** will guarantee find an optimal solution with an admissible heuristic.