

## Assignment 2

(Deadline: Nov. 11. Late submission will be considered as 0 point.)

### 1. (30 points)

(1) Construct a k-d tree with the following nodes with a root (30; 40):

(30; 40); (5; 25); (10; 12); (70; 70); (50; 30); (35; 45)

(2) Construct a k-d tree with the following nodes with a root (8; 6):

(8; 6); (10; 1); (5; 8); (9; 7); (2; 1); (3; 5); (1; 7); (7; 10); (2; 9); (6; 2)

2. (30 points) Calculate the first 10 elements of the Halton sequence in 3D. For simplicity, you can use the smallest 3 prime numbers as the base.

### 3. (40 points)

(1) (15 points) Recall the concept of admissible heuristic. If  $h_1$  and  $h_2$  are both admissible, which of the following heuristics are also guaranteed to be admissible?

(a)  $h_1 + h_2$ ;

(b)  $h_1 * h_2$ ;

(c)  $\max(h_1, h_2)$ ;

(d)  $\min(h_1, h_2)$ ;

(e)  $\alpha h_1 + (1 - \alpha)h_2, \alpha \in [0,1]$ .

(2) (25 points) (True or False. A concise explanation is required.) Consider an optimal path that is calculated with Uniform-Cost Search. If we add a positive constant to every step cost, the optimal path may change.