

# FIT5047 First Theory Assignment

2022年3月31日 23:06

## 1 Tentative Control Strategies

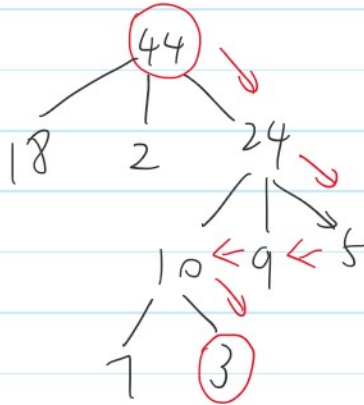
### (a) Depth First Search (DFS)

List the nodes according to their order of expansion:

[44, 24, 5, 9, 10, 3, 7, 2, 18, 4, 14, 6, 8]

list the nodes in the final search tree:

[44, 24, 2, 18, 5, 9, 10, 3, 7]



### (b) Breadth First Search (BFS)

List the nodes according to their order of expansion:

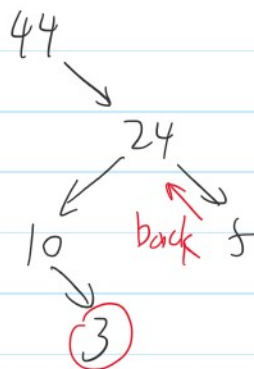
[44, 24, 2, 18, 5, 9, 10, 4, 14, 3, 7, 6, 8]

## 2 Backtracking

### (a) Right, Left, Middle

(b) [44, 24, 5, 10, 3, 7, 9, 18, 4, 14, 6, 8, 2]

(c) [44, 24, 5, 10, 3]



## 3 Algorithm A/A\*

(a) Sum of Manhattan Distance as the heuristic function.

$$H(n) = 1 + 2 + 1 + 0 + 0 = 4$$

(b)  $g(n)$  = sum of the cost of move

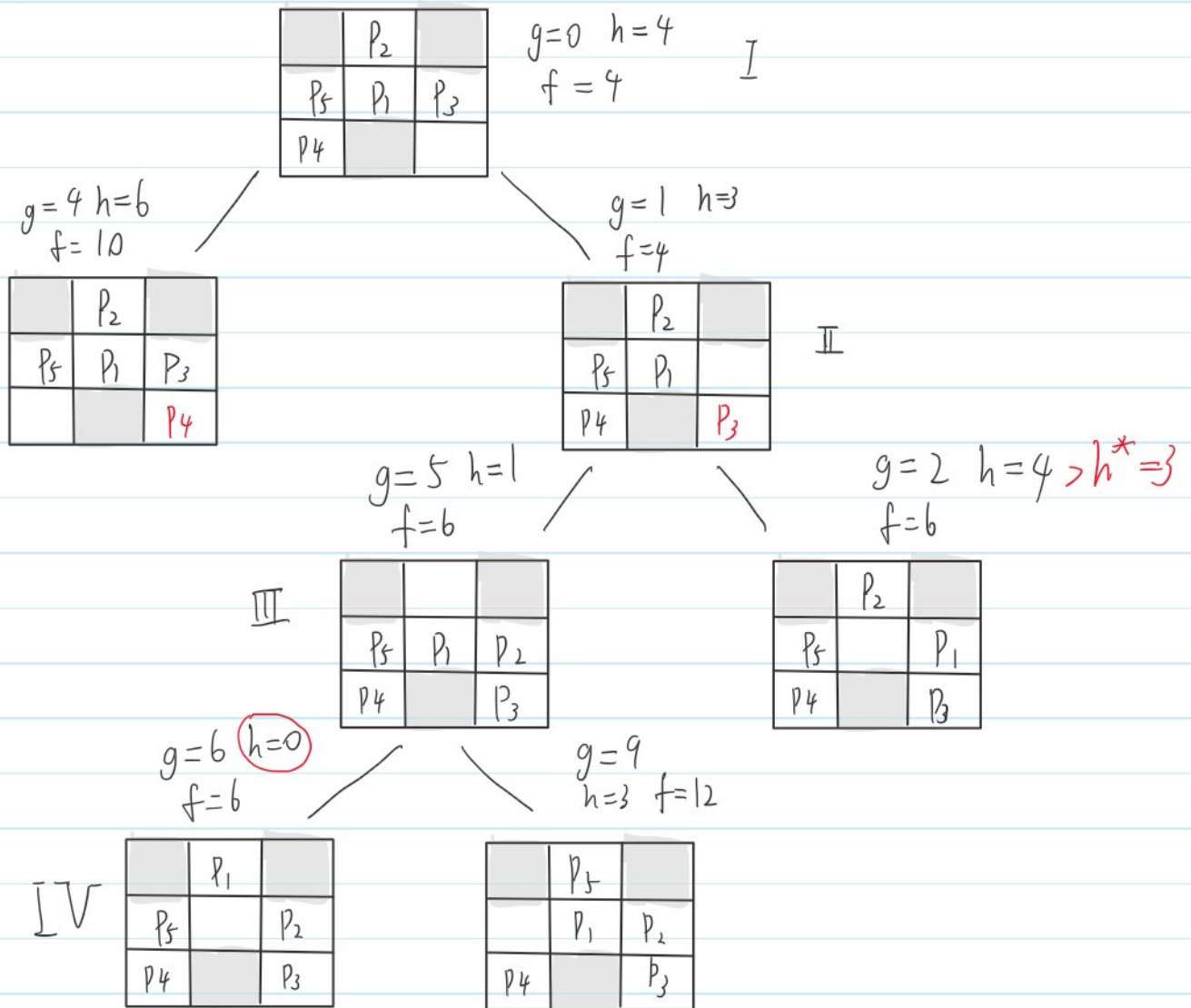
$$f(n) = g(n) + h(n)$$

Where  $g(n) > 0$  and  $h(n) \leq h^*(n)$  (minimum cost path to goal larger than estimate cost:  $h(n)$ )

(c)

where  $g(n) \geq 0$  and  $h(n) \leq h^*$  (minimum cost path to goal target)  
 than estimate cost:  $h(n)$

(c)



#### 4 Irrevocable Control Strategies

(a) representation

- genes: 0, 1 to represent the item is not chosen or is chosen.
- chromosomes: A 10-number string to represent the which items are selected in bag. 10 genes per chromosome. E.g. [1000000000] - the first item is selected.

(b) fitness function

Number of sum the usefulness value of chromosomes' picked items (which is 1)

(c) E.g. [1100000000]  $\rightarrow 2+3 = 5$  (fitness value)

A <sub>1</sub>	1	0	0	0	0	0	0	0	1	0	Gene
A <sub>2</sub>	0	1	1	0	1	0	0	0	0	0	Chromosome
A <sub>3</sub>	0	0	0	0	0	1	0	1	0	0	
A <sub>4</sub>	0	0	0	0	0	0	1	0	0	1	population

	Usefulness value	Probability
A1	10	22.2%
A2	12	26.6%
A3	10	22.2%
A4	13	28.8%

$$10/(10+12+10+13) = 22.2\%$$

$$12/(10+12+10+13) = 26.6\%$$

$$10/(10+12+10+13) = 22.2\%$$

$$13/(10+12+10+13) = 28.8\%$$

## 5 Adversarial Search

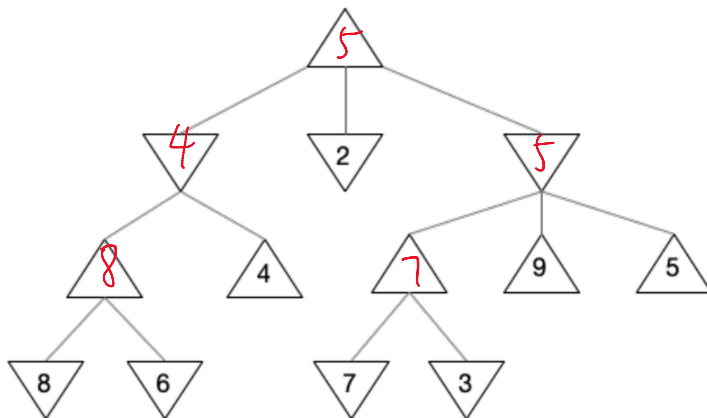
### (a) MINIMAX

Max

Min

Max

Min



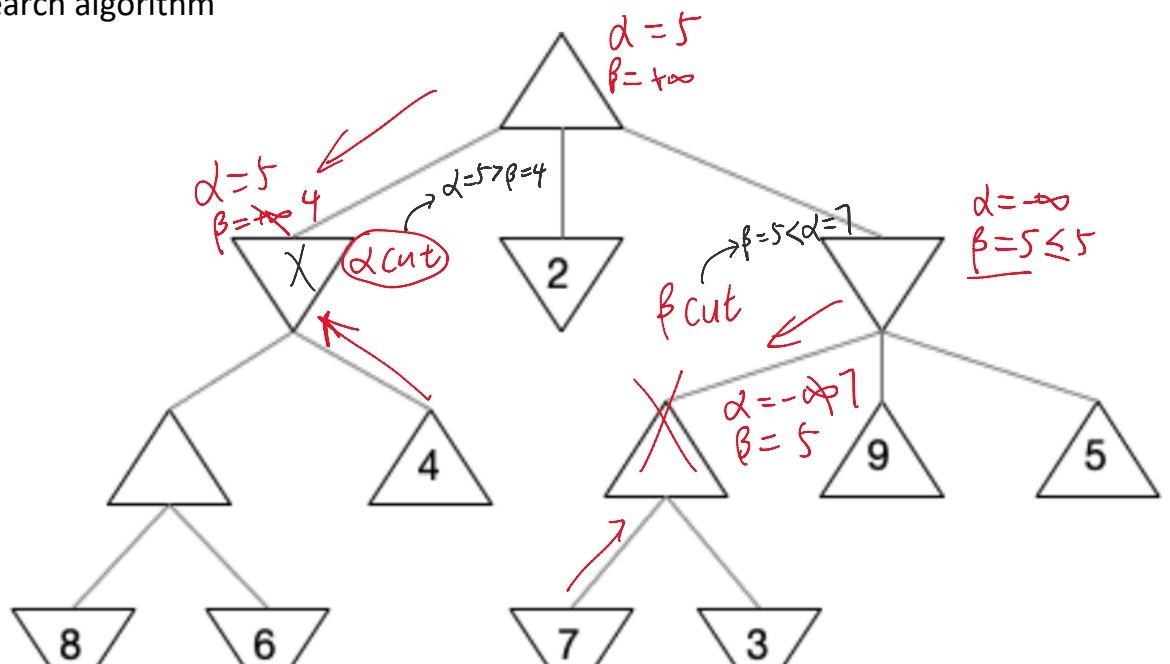
### (b) $\alpha$ - $\beta$ search algorithm

Max

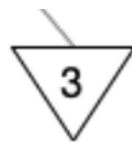
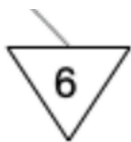
Min

Max

Min



Min



(c)

Max

$\alpha = 5$

Min

$\beta = 4$

$\beta = 5$

Max

$\alpha = 8$

$\alpha = 7$

