

Fundamentals of Biomedical Image Processing HW 1

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September 22, 2025

1 Theorem questions

1. (a) The picture size is 1024×1024 pixels, and each pixel contains 256 intensity levels(8 bits,i.e., 1 byte). Therefore, the total data size is $1024 \times 1024 \times 1 = 1,048,576$ bytes. Since each packet requires 10 bits to transmit 1 byte of data, the total number of bits to be transmitted is 10,485,760 bits. With the baud rate of 56k, the transmission time is $10,485,760 \div 56000 \approx 187.25(sec) \approx 3.12$ minutes.
- (b) With the baud rate of 3000k, the transmission time is $10,485,760 \div 3,000,000 \approx 3.495(sec) \approx 0.058$ minutes.
2. $V = \{1, 2\}$, so the graph would be Fig 1:

				q
	3	2	3	2
	2	2	1	3
	1	3	3	2
	2	2	3	4
p				

Figure 1: The grid graph with $V = \{1, 2\}$ (gray cells are passable)

- (a) shortest-4: Only up, down, left, right movements are allowed. So the path would be:

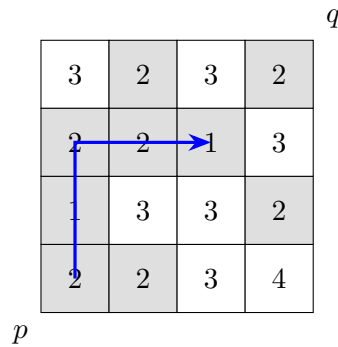


Figure 2: No 4-connected path (q is 4-blocked)

As the Fig2 shows, there's no path from last step (3, 3) to node $q(4, 4)$, so the length is **infinity**.

- (b) shortest-8: Up, down, left, right, and diagonal movements are allowed. So the path would be:

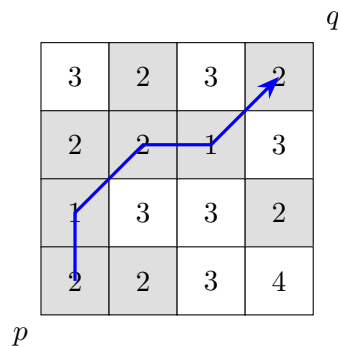


Figure 3: shortest-8 path (length = 4)

As the Fig3 shows, it takes 4 steps to reach from $p(1, 1)$ to $q(4, 4)$, so the length is **4**.

- (c) shortest-m: The path can only move to the 8-neighbors with the minimum value.
So the path would be:

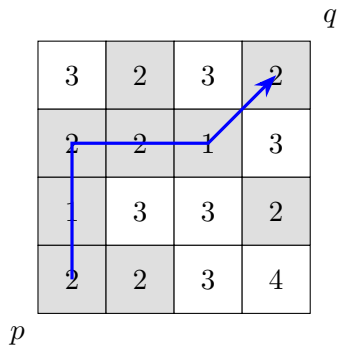


Figure 4: shortest-m path (length = 5)

As the Fig4 shows, it takes 5 steps to reach from $p(1, 1)$ to $q(4, 4)$, so the length is **5**.