

Θ^2 operation is To be deleted.

$$\rightarrow \alpha_{i-1} < 1/2$$

$\rightarrow$ No contraction

$$\phi_{i-1}^n = c_i + \phi_i - \phi_{i-1}$$

$$= 1 + \left(\frac{\text{size}_i}{2} - \text{num}_i \right) - \left(\frac{\text{size}_{i-1}}{2} - \text{num}_{i-1} \right)$$

$$= 1 + (-\text{num}_i) - (-\text{num}_{i-1} + 1)$$

$\rightarrow$ Contraction = 2

$$c_i = \text{num}_i + 1$$

$$\frac{\text{size}_i}{2} = \frac{\text{size}_{i-1}}{2} = \text{num}_{i-1} = \text{num}_i + 1$$

$$c_i^n = c_i + \phi_i - \phi_{i-1}$$

$$= (\text{num}_i + 1) + \left(\frac{\text{size}_i}{2} - \text{num}_i \right) - \left(\frac{\text{size}_{i-1}}{2} - \text{num}_{i-1} \right)$$

$$= (\text{num}_i + 1) + ((\text{num}_i + 1) - \text{num}_i) - (2 \cdot \text{num}_i + 2 - (\text{num}_i + 1))$$

$$= 1 \quad \alpha_{i-1/2} \text{ also consto}$$

→ Shortest path problems

→ single source

→ single destination

→ single pair

→ all pairs

→ BFS

→ how to verify, d labels

→ Relaxation

→ Exponential algo

d values are upper bounds.

→ Bellman-Ford

→ DAG

→ Dijkstra, what happens when -ve edges are allowed?