

1 Jan 10, 2006

1.1 Symbols

$\forall$ for all

$\exists$ there exists

$\Rightarrow$ implies / only if / is sufficient for

$\Leftrightarrow$ if and only if / is necessary and sufficient for

$\in$ is an element of

1.2 BFS

Let $1, 2, \dots, j, \dots, k$ be the assigned labels and V_j has the *smallest* label and unlabeled neighbors. Label the neighbor $k + 1$.

1.3 DFS

Let $1, 2, \dots, j, \dots, k$ be the assigned labels and V_j has the *largest* label and unlabeled neighbors. Label the neighbor $k + 1$.

1.4 Graphs

Assuming $d_{i,j} > 0$:

- $|path| \geq |subpath|$
- Subpath of shortest path must itself be shortest
- Any shortest path contains at most $n - 1$ arcs
- $P_1 \leq P_2 \leq P_3 \leq \dots \leq P_{n-1}$

1.5 Shortest Path (Dijkstra)

0. Vertes V_0 with $l_0^* = 0$
 V_i get temp labels
 $l_i = d_{0,i}$ (direct arc)
 $l_i = \infty$ (no direct arc)
1. Pick $l_k = \min_i l_i$
 $l_k \leftarrow l_k^*$
2. $l_i \leftarrow \min[l_i, l_k^* + d_{k,i}]$

2 Jan 12, 2006

2.1 Min Spannig Tree (Prim)

0. Vertes V_0 with $l_0^* = 0$
 V_i get temp labels
 $l_i = d_{0,i}$ (direct arc)
 $l_i = \infty$ (no direct arc)
1. Pick $l_k = \min_i l_i$
 $l_k \leftarrow l_k^*$
2. $l_i \leftarrow \min[l_i, d_{k,i}]$

2.2 Min Spannig Tree Compared to Shortest Path

0. Same
1. Same
2. $l_i \leftarrow \min[l_i, d_{k,i}]$

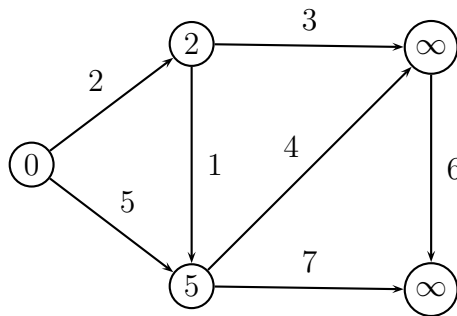
In general, $l_i \leftarrow \min[l_i, \alpha l_k^* + \beta d_{k,i}]$

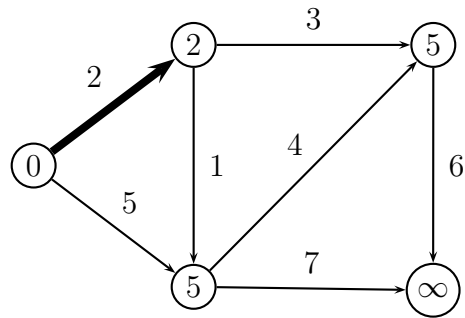
2.3 Other Optimal Paths

$$L(e_1, e_2, e_3, \dots, e_n) = L(L(e_1, e_2, e_3, \dots, e_{n-1}), e_n)$$
$$L(e_1, e_2, e_3, \dots, e_n, e_{n+1}) \geq L(e_1, e_2, e_3, \dots, e_n)$$

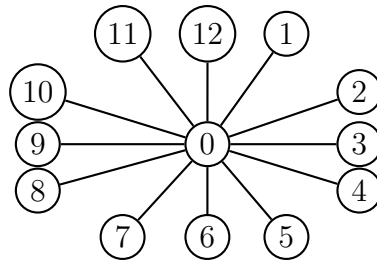
Then a path may be found where L is minimized

2.4 Shortest Path Example

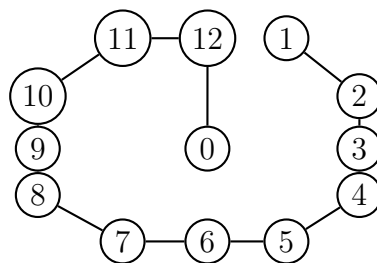




3 Shortest Path From 0 to All



4 Minimum Spanning Tree



5 Minimum Clock Tree

