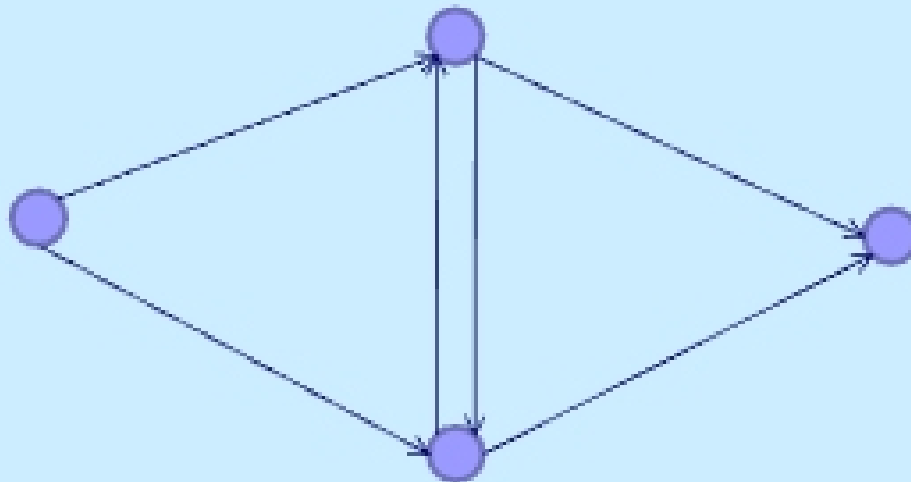


Complexity Analysis of Dijkstra's Algorithm

- ◆ **Update Time:** $\text{update}(j)$ occurs once for each j , upon transferring j from T to S . The time to perform all updates is $O(m)$ since the arc (i,j) is only involved in $\text{update}(i)$.
- ◆ **FindMin Time:** To find the minimum (in a straightforward approach) involves scanning $d(j)$ for each $j \in T$.
 - Initially T has n elements.
 - So the number of scans is $n + n-1 + n-2 + \dots + 1 = O(n^2)$.
- ◆ **$O(n^2)$ time in total.** This is the best possible only if the network is *dense*, that is m is about n^2 .
- ◆ We can do better if the network is *sparse*.

Theorem

Dijkstra's Algorithm works on any network with nonnegative arc - weights.



Counterexample

Dijkstra's algorithm may not work in a network with negative arc - weight.

