Graph Algorithms

CS3104

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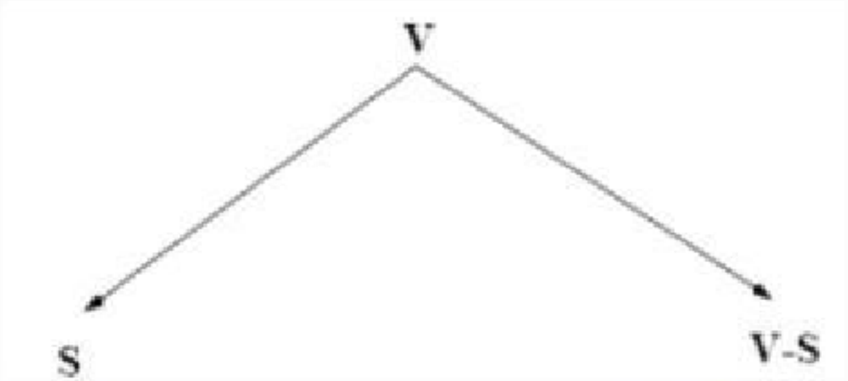
Dijkstra's Algorithm

- Single-source shortest path problem:
  - No negative-weight edges: $w(u, v) > 0, \ \forall \ (u, v) \in E$
- Each edge is relaxed **only once!**
- Maintains two sets of vertices:

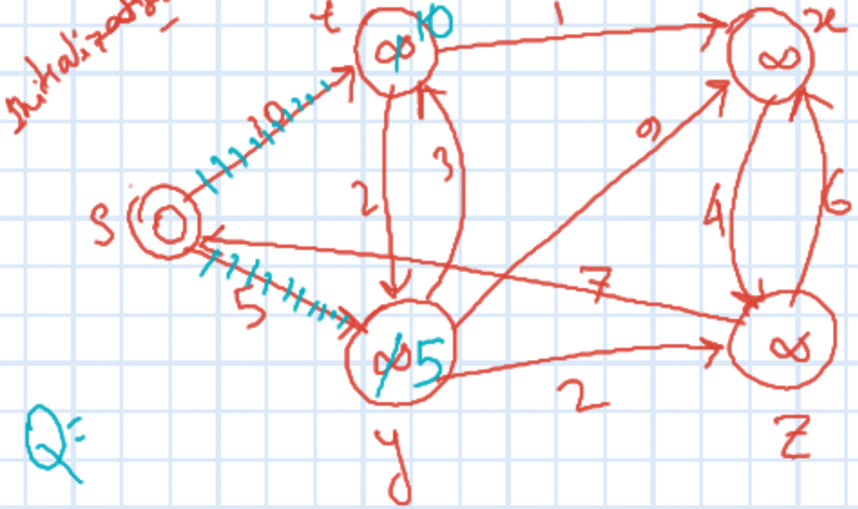


$d[v]=\delta(s, v)$ $d[v]>\delta(s, v)$

Dijkstra's Algorithm

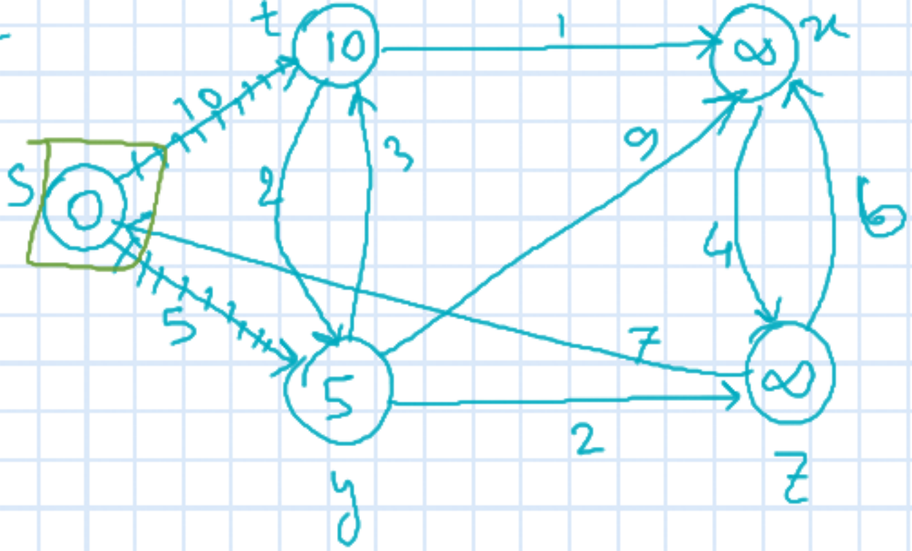
```
1.  INITIALIZE-SINGLE-SOURCE(V, s)
2.  S ← ∅
3.  Q ← V[G]
4.  while Q ≠ ∅
5.      do u ← EXTRACT-MIN(Q)
6.          S ← S U {u}
7.          for each vertex v ∈ Adj[u]
8.              do RELAX(u, v, w)
9.              Update Q (DECREASE_KEY)
```

Inicializacija:



Q:

Prim.1



S = {s}

Q = {t, x, y, z}