

Dijkstra's Algorithm Proof

For each node $u \in S$, $d(u)$ is the length of the shortest s - u path

Base Case: $|S|=1$, 1 is the smallest distance able to be travelled

Inductive hypothesis:

Assume $|S|=k \geq 1$

- let v be next node added to S , and let $u-v$ be the chosen edge
- the shortest path (su) plus (u,v) is an s - v path of length $\pi(v)$
- consider any s - v path P . We'll see that it is no shorter than $\pi(v)$
- Let $x-y$ be the first edge in P that leaves S , and let P' be the subpath to x
- P is too long as soon as it leaves S

