Dijkstra’s Algorithm.

The proof for the algorithm involves using induction on the number of elements explored.

If a new node has been inducted into the explored area S – then its shortest path has been found. But assuming there is a path which exists that leads to the node v. We must show that path is no less than this one.

We do so by analysing the path. Let x be the last node till which the path has been explored and y be the first that goes out of the explored area.

We know the length of the other path is clearly greater than the path to x plus x-y path. However, if that path was to be shorter than the path to v, then the Algorithm would have inducted y into the area and not the node v. hence clearly the path isn’t shorter and hence we have proved it.

Optimization includes – updating d[v] when only lesser than and also using a priority min queue for selecting the next edge.