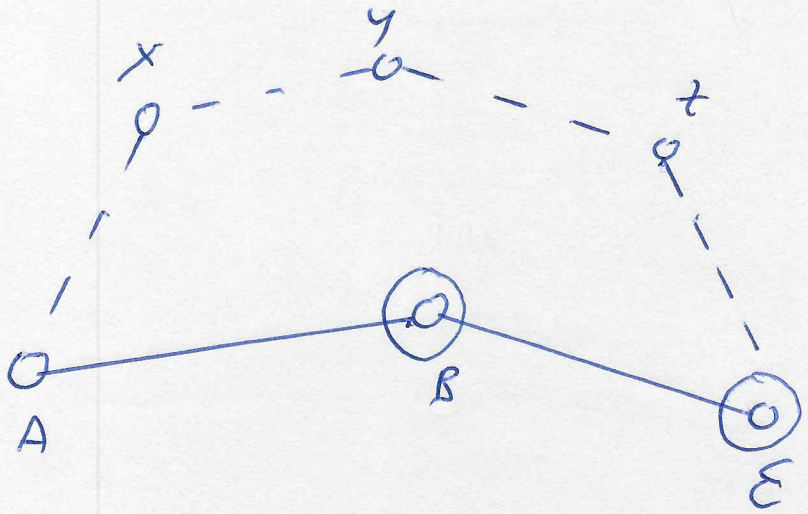
Dijkstra Algorithm proof (see Tanenbaum *Computer Networks*, various editios)

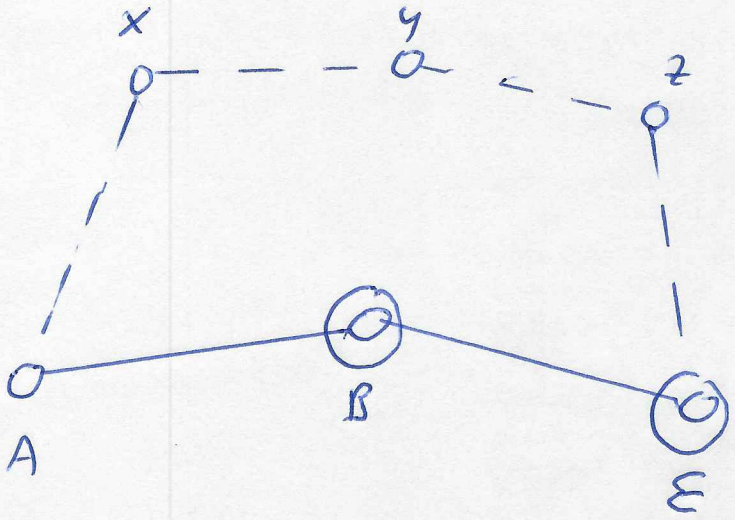


Why does circling the smallest distance/cost in a row give you the optimal distance/cost for that node to the root?

Consider the diagram. At each circling (making node permanent) implicitly creating path to root from circled node.

If circle node E, is ABE the shortest path (B circled earlier)?

(See reverse side)



Two cases (to see if AXYZE shorter):

I) **Node Z already circled.**

If so, node E already checked/probed on round following one where Z circled.

So path AXYZE has not escaped our attention and cannot be shortest path.

II) **Node Z still not circled.**

Either:

(a) The label value at Z is greater than or equal to E's value, so AXYZE not the shortest path.

(b) The label value at Z is less than E's, so Z is circled first but this hasn't happened.

Thus circling the smallest uncircled number in a row gives the optimal distance/cost for that node to the root.