**What are minimal spanning trees all about?**

Suppose you are designing how a utility such as electricity, gas, or water should be delivered to a new community. A network of wires or pipes is needed to connect all the houses to the utility company. Every house needs to be connected into the network at some point, but the route taken by the utility to get to the house doesn’t really matter, just so long as a route exists.

The task of designing a network with a minimal total length is called the *minimal spanning tree* problem.Minimal spanning trees aren’t only useful in gas and power networks; they also help ussolve problems in computer networks, telephone networks, oil pipelines, and airlineroutes. However, when deciding the best routes for people to travel, you do have to takeinto account how convenient the trip will be for the traveler as well as how much it willcost. No-one wants to spend hours in an airplane taking the long way round to a newcountry just because it is cheaper. The muddy city algorithm may not be much use forthese networks, because it simply minimizes the *total* length of the roads or flight paths.

Minimal spanning trees are also useful as one of the steps for solving other problems ongraphs, such as the “travelling salesperson problem” which tries to find the shortest routethat visits every point in the network.There are efficient algorithms (methods) for solving minimal spanning tree problems. Asimple method that gives an optimal solution is to start with no connections, and addthem in increasing order of size, only adding connections that join up part of the networkthat wasn’t previously connected. This is called Kruskal’s algorithm after J.B. Kruskal,who published it in 1956.For many problems on graphs, including the “travelling salesperson problem”, computerscientists are yet to find fast enough methods that find the best possible solution.