

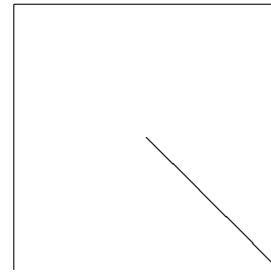
PROBLEM

You own a square parcel of land (with sides of length 1 furlong). There is a buried telephone cable running across your property; you don't know where it is, but you know it runs in a straight line. After receiving a measly \$15 from a class action suit against the phone company, that you can only spend by giving back to them, and which isn't nearly the amount they bilked you out of in the first place, you decide to rent a trencher and exact revenge. However, the trencher is expensive to operate. What is the shortest length of a trench (or set of trenches) you can dig across your property that guarantees you will cut the cable?

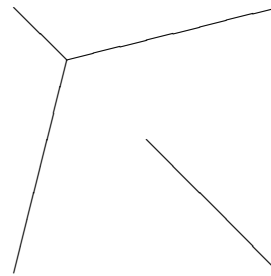
For example, you could dig a trench all the way around your property, for a total of 4 furlongs. Cutting around just three sides, though, would still guarantee you hit the cable, and requires only 3 furlongs. The winner will be the student who submits the best solution.

Source: Bernd Kawohl

Better still, one can do as Dave Stone '91 did (length: $2 + 1/\sqrt{2} \approx 2.7071$):

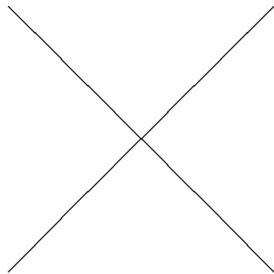


We can improve this slightly by letting the L in the above solution pull tight the way a soap film would (length: $\frac{\sqrt{3}+2}{\sqrt{2}} \approx 2.6390$):



SOLUTION

A very popular approach is an X (length: $2\sqrt{2} \approx 2.8284$):



This can be improved by letting the above X pull tight much the way a soap film would, with trenches meeting at 120° angles (length: $\sqrt{3} + 1 \approx 2.73205$):

