

CPSC 413: Exercise Set 2

A cellphone company needs to place cellphone towers along a straight road so as to provide coverage to all the houses on the road. Each cellphone tower covers a radius of 4km along the road. The company needs an algorithm that will give the locations of cell phone towers so that all houses are covered by the range of some tower, and wants to use the least number of towers possible.

1. One possible greedy algorithm would be to find the house with the most number of houses with 4km of it, and place a tower there. We then remove those houses from the list, find the next house with the most number of houses within 4km, and place a tower there. Give a counter-example to show that that does *not* always give the least number of towers necessary.
2. Give pseudocode for a greedy algorithm that does work, and prove that the solution is optimal.
3. Give a tight asymptotic bound for the worst case running time of this algorithm.