

CS 344 Assignment 3

Craig Perkins, Alex Tang, Steve Grzenda

Due April 4, 2014

Problem 1

Assume we have a function $\text{Dist}(a,b)$ which returns the distance between two sets of coordinates using the distance formula in constant time and a function $\text{Min}(a,b,c,\dots)$ which can return the minimum val of the input in constant time

0.1 Algorithm

```
function Takeshi(red[], blue[]):
    redIndex = 0; blueIndex = 0;
    minRope = Dist(red[0], blue[0]);
    while (redIndex  $\neq$  length(red) AND blueIndex  $\neq$  length(blue)):
        if (Dist(red[redIndex+1], blue[blueIndex+1])  $\leq$  minRope):
            redIndex++; blueIndex++;
        else if (Dist(red[redIndex + 1], blue[blueIndex])  $\leq$  minRope):
            redIndex++;
        else if (Dist(red[redIndex], blue[blueIndex+1])  $\leq$  minRope):
            blueIndex++;
        else:
            minRope = Min(Dist(red[redIndex+1], blue[blueIndex]), Dist(red[redIndex], blue[blueIndex+1]),
                          Dist(red[redIndex+1], blue[blueIndex+1]))
```

This algorithm will run in worst case $O(n + M) * O(1)$ where n is the length of the red path and m is the length of the blue path and the $O(1)$ is the cost of calling Dist on two points.

Problem 2

A.

B.

Problem 3

A.

B.

Problem 4

Given the list of international conflicts in the last ten years, create a graph where each vertex represents a country. Create an edge between two vertices if there is a conflict between those two countries. Next, check if it is bipartite using the following algorithm:

ALEX WILL FILL THIS IN

If this graph is bipartite, then it is possible to make the assignment. Each of the two tables will consist of all the vertices of each disjoint set of the bipartite graph.