CS472 Assignment #3

This assignment has 2 problems, for a total of 100 points.

Submission Instructions

Please attach a PDF document with your answers to these questions as an attachment to your submission in Blackboard. Handwritten submissions are acceptable if scanned in a readable fashion into a PDF document. Points will be deducted if you do not follow these instructions.

1. (40 points) Write a function in your language of choice, that when given a reference to a vector of points in the x-y plane, returns a reference to a vector of points that define the convex hull of the given points in the parameter.

   HINTS:

   - For C++, make your life easier and use the `pair` classes from the Standard Template Library.

     ```
     1 using Point = pair<int,int>;
       vector<Point> & convexHull(vector<Point> &pointsVector);
     ```

   - For Python, define the points as being a tuple, and use a list of points.
   - Use the brute-force algorithm for finding the convex hull.

2. (60 points) An important problem in conservation management is determination of the home range of an animal population. Wildlife biologists solve this problem by tagging a sample population and tracking location reports on a map of the area in which the sample population lives. An estimate on the home range is computed by finding the convex hull of the 2-d point cloud formed on the map by the observation locations.

   Assume that we have a tagged population that is living in an area upon which we overlay a 1000 by 1000 meter grid. Write a program that reads a collection of observations from a data file (stored as x-y points, one per line, you will need to write a simple program that randomly generates one of these files) and determines the home range of the population by reporting the list of points that form the convex hull of the observation locations. Use the function from the previous question to find the convex hull.