ASSIGNMENT 1

CS 2255 – COMPUTER SCIENCE II

Plantation

There are N trees in a plantation. Each tree is assigned an information card which notes the following information: location (x, y), type (coffee or tea).

The plantation manager wants to construct a fence around the plantation. For minimum cost, the fence length needs to be as short as possible.

The manager also wants to build a watering system based on tubes to let water runs from the pump to each tree. The location of the pump needs to be considered to minimize the total length of the used tubes.

Write a C program that can help the manager to do the above.

Guidance:

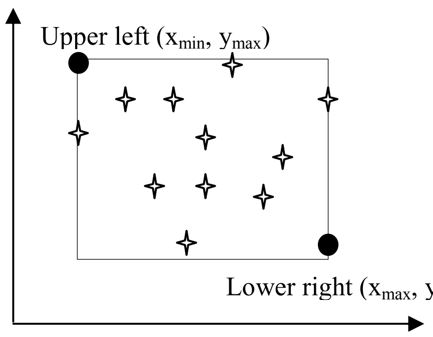
a) First, declare necessary C structs to represent the plantation.

// Declare struct
 	
struct ………………
{
 	
};
	//Declare more if needed.
	
	struct ………………
	{
	
	};
		//Declare more if needed.
		
		struct ………………
		{
		
		};

b) Write C functions to count trees of each type.

// Count trees of a specific type.
int countTrees(Plantation p, int type)
{
 	
}
	// Use countTrees function…
	// Count coffee trees.
	int countCoffeeTrees(………..………………)
	{
	
	}
	// Count tea trees.
	int countTeaTrees(……….……………………...)
	{
	
	}

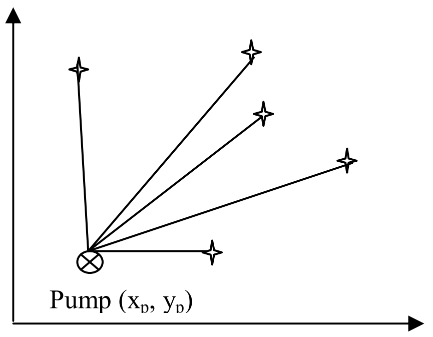
c) Write C functions to calculate the shortest fence length need to be built.


Upper left (x_{min}, y_{max})
Lower right (x_{max}, y_{min})

```
// Use functions in right column.
// Calculate perimeter of rectangular fence.
float calcFenceLength(....…….……………)
{



}
```

```
// Find upper left point.
Point findUpperLeft(Plantation p)
{



}

// Find lower right point.
Point findLowerRight(Plantation p)
{



}
```

d) Let the program calculate the minimum total length of used tubes.



```
// Use distance function.
// Calculate total length of tubes.
float calculateTotalLength(…………..…….)
{



}
```

```
// Find position of the pump.
// It's the center of all trees!!!
Point findPump(Plantation p)
{



}
// Calculate distance between two point.
float distance(Point p, Point q)
{



}
```

e) Let the program input and output through file.

Structure of file NongTrai.in

- First line: N (number of trees).
- The following N lines, line #i ($0 <= i <= N - 1$): X_i Y_i L_i
  (X_i Y_i: location of tree #i, L_i : type of tree #i (0-coffee, 1-tea).

Structure of file NongTrai.out:

- Line #1: S_0 S_1 (S_0: coffee tree count, S_1: tea tree count).
- Line #2: C_{min} (shortest fence length).
- Line #3: D_{min} (minimum total length of used tubes).