National Yang Ming Chiao Tung University
Department of Electrical Engineering
Data Structures, Fall 2022

December 14, 2022
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Programming Assignment #6

Sorting

1 Problem Description

Sorting is one of the most frequently used algorithms in data processing. Many problems can be efficiently solved with sorted data. In this programming assignment, you are asked to apply any sorting algorithm to the following data processing problem.

- **Pairing** The pairing problem is to find a set of pairs, (i, j), in an integer array satisfying the following constraints, where i and j are the array indices.
  - Constraint 1 : $i < j$;
  - Constraint 2 : $|Array[\ i\ ] - Array[\ j\ ]| \leq A$, where A is a constant;
  - Constraint 3 : $|i - j| \leq B$, where B is also a constant;

You should output the number of pairs satisfying those constraints.

2 Input/Output Format

A sample input and the corresponding sample output are given below.

Sample Input	Sample Output
1 -5 -10 7 2 3 10 3	7

The first line of the input file gives n integers in the array starting from index 0 to index $n - 1$, where n could be as large as 10^6. The second line of the input file give the constant numbers, A and B. Based on the sample input, the integer pairs which satisfy the constraints include (0, 1), (0, 3), (1, 2), (1, 4), (3, 4), (3, 5), and (4, 5), and the number of pairs is 7. Therefore, you will need to output 7 in the output file.

3 Command-line Parameter

In order to correctly test your program, you are asked to add the following command-line parameters to your program.

[Your file name] [input file name] [output file name]

(e.g., StudentID sample.in sample.out)

4 Submission Information

Your program must be written in the C/C++ language, and can be compiled on the Linux platform. The source files of your program must be named with "[your student ID].h" and "[your student ID].cpp". To submit your program, please archive both executable and source files of your program into a single zip file, named "[your student ID].zip", and upload to E3.

5 Due Date

The zip file must be submitted through E3 before 23:59, December 21, 2022.

6 Grading Policy

The programming assignment will be graded based on the following rules:

- Pass sample inputs with compilable source code (50%)
- Pass five hidden test cases (50%)

The submitted source codes, which are copied from or copied by others, will NOT be graded. There will be 25% penalty per day for late submission.