Bug Report – Q4 Bubble Sort

# Bug observation 1: Boundary error

Program fails to stop at the second last element in the input array.

* Input: **int n = 6, input[] = {{10, 'c'}, {2, 'B'}, {-5, 'k'}, {12, 'z'}, {77, 'a'}, {-42, '?'}};**
* Expected: for loop exits when i = 4
* Actual: for loop exits i = 5

A computer screen shot of a program

Description automatically generated

## GDB Analysis:

* Breakpoint placed at line 46 in Question4.c, right after the for loop completes 1 iteration
* Because the maximum index of the array is 4, GDB recognized that the variable “next” (array[i+1]) holds a value that’s out of range.

## Possible root cause:

Line 29 incorrectly used the <= logical operator instead of <

# Bug Fix Validation 1:

Line 29 corrected to **for(i = 0; i < size - 1; i++).** Actual outcome matched.

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# Bug Observation 2: Behavioural error

Program fails to swap elements when the subsequent one is greater than the current.

* Input**: int n = 6, input[] = {{10, 'c'}, {2, 'B'}, {-5, 'k'}, {12, 'z'}, {77, 'a'}, {-42, '?'}};**
* Expected: Swap {10, 'c'} with {2, 'B'} because 10 > 2
* Actual: Modified {2, 'B'} but did nothing to {10, 'c'}

Before swap (shown left) and after swap (shown right)

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## GDB Analysis:

* Breakpoint placed at line 35 in Question4.c, right as the program enters the conditional
* GDB indicates that the swapping algorithm didn’t correctly switch element i and i+1’s indices.

## Possible root cause:

The variables in the swapping algorithm are placed wrong.

# Bug Fix Validation 2:

Corrected lines 40-44 to

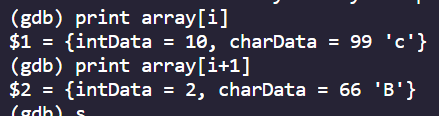
**array[i].intData = array[i + 1].intData;**

**array[i].charData = array[i + 1].charData;**

**array[i + 1].intData = temp.intData;**

**array[i + 1].charData = charData;**

Actual output matched. Before swap (shown on left) and after swap (shown on right) below.

 A computer screen shot of white text

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