

**Lab 3 · Debugging a C Program Using gdb***Lecturer: Shudong Hao**Date: See Canvas*

In this lab, we are going to get familiar with GNU debugger (gdb), which allows us to set breakpoints and then inspect the internal states of a program. gdb can be used to debug C program, which is the main topic of this lab. After writing assembly, we can also use gdb to debug assembly programs, and it'll be the content of another lab in the future.

**1 Lab Task**

Download the `handout.zip` provided. The main function is declared in the file `main.c`, and the other two files have declaration and definition of an array data structure and its functionality.

This program creates an integer array. It fills in the first half of the array with even numbers from 0 to 18, and the second half with odd numbers from 1 to 19. It then checks if some numbers are in the array. When functioning properly, the code should have the following printed out on your terminal:

```
1 Empty array created
2 0
3 0 2
4 0 2 4
5 0 2 4 6
6 0 2 4 6 8
7 0 2 4 6 8 10
8 0 2 4 6 8 10 12
9 0 2 4 6 8 10 12 14
10 0 2 4 6 8 10 12 14 16
11 0 2 4 6 8 10 12 14 16 18
12 0 2 4 6 8 10 12 14 16 18 1
13 0 2 4 6 8 10 12 14 16 18 1 3
14 0 2 4 6 8 10 12 14 16 18 1 3 5
15 0 2 4 6 8 10 12 14 16 18 1 3 5 7
16 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9
17 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9 11
18 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9 11 13
19 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9 11 13 15
```

```
20 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9 11 13 15 17
21 0 2 4 6 8 10 12 14 16 18 1 3 5 7 9 11 13 15 17 19
22 Number 6 not in Array Contains not working properly
23 Number 30 not in Array
```

The code provided to you, however, has some bugs in the implementations in `buggy.c` when you compile your code using the command:

```
1 gcc buggy.c main.c -w
```

Your job is to use gdb **ONLY** to debug the program and find all the bugs in the three files provided. Do not use `printf()` or any thing other than gdb to debug.

#### Deliverable

- (1) Modified `main.c`, `buggy.c`, and `buggy.h`: all bugs should have been modified right in the code, and pointed out using comments. Do not change file names.
- (2) A **PDF** lab report: for each bug you found, you should provide a screenshot of gdb and a brief description of how you used gdb commands to find the bug. Lastly, a screenshot of the successfully executed program without any errors or bugs. Any report in non-PDF format is not allowed.

No need to zip all files; just submit the four files separately on Canvas.