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Assignment 3

TDT4200

Debug & Optimization

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Chapter 1

Debugging

1.1 Task A - test01.c

malloc allocates memory on the heap, but is lost when mem is reassigned. mem now points to the string Hello which resides on the stack, and the uninitialized memory from malloc is lost (also never freed).

1.2 Task C - reverseParams.c

Line 11: malloc should be 10 + 1 to account for null character and be compatible with current Line 16 index

Line 14: strcpy without bounds check. Will potentially write out of bounds, and too long writes may write outside heap block and corrupt heap metadata.

Line 14: strcpy signedness mismatch, gives compiler warning, but C stdlib treats all char args as unsigned char according to <string.h>, so no negative effect.

Line 16: index variable is initialized to 10, but should be 9 if it is to fit inside currently

allocated mem. will cause 1 invalid read.

Line 22: lastChar is not guaranteed to be initialized.
Empty string ("") on my system causes segfault if it is
the last element in the arg vector

Line 31++: character swapping bounds allow characters
outside range to also be shifted by + or - 32 indices.

Line 47: the call to free() may zero the first 8 bytes
so if malloc() returns pointer to same space, leftover
chars will be printed for next param.

In valgrind, this behaviour seems to occur randomly.

Line 59: missing newline (can cause defines and includes
from others to be merged with first line of next file,
commenting it out. luckily modern compilers will prevent this.)

Chapter 2

Optimization

2.1 Task B

```
its-015-04:~/tdt4200/ex03/climb$ time make run  
./newImageIdea 1
```

```
real    0m6.335s  
user    0m4.528s  
sys     0m0.034s
```

2.2 Task C

- Time: 24.52
- Energy: 89.72
- EDP: 2199.95

2.3 Task F

- Size 2: 57506436
- Size 8: 662042304

2.4 Task G

- Changed to row major in the outer loops
- Precalculated loop bounds using MIN and MAX to remove if checks
- Removed the for loops for each color by adding a color variable for each one