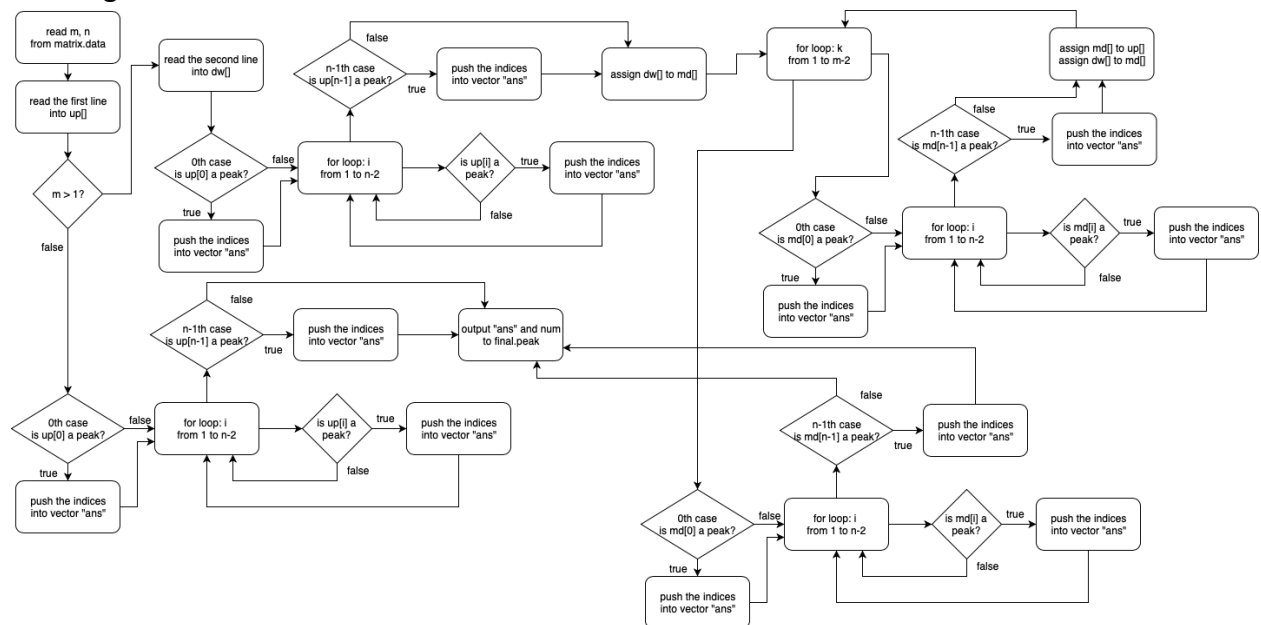


1060622202 Report

1. Project Description

a. Program Flow Chart



b. Description

- Checks if every element's neighborhood is greater or equal to itself. Thus, the time complexity is $O(m * n)$.
- Reads three lines of input from file for every operation, so the space complexity is $S(\min(m, 3) * n)$.
- Instead of using conditional statements to check the boundary elements, edge elements and corner elements are tackled outside the for loop. Only elements with four neighbors are in the for loop.
- In each iteration of the loop, check the middle line's peaks. At the end of each iteration, swap the memory of the first line with that of the second line, then swap the memory of the second line with that of the first line.
- Checks the number of rows to avoid special case $m = 1$ and allocations of extra memory, which lowers the space complexity and time complexity.

c. Git version control

I tried to grasp the concept of "commit", but failed a couple of times, leading to multiple rewrites.

What's more, I find it even more confusing when I read about "branch".

Thanks to the help of my classmates, I am able to gradually come to an understanding of how git works.

```
bfbf031 (HEAD) small fix on string declaration
ae1686d fixed swap and m=1 case
c64de86 fixed output format
146e086 first line comparing bug fixed
fc709e4 fixed argc and argv
c663106 test output
53d29c2 fixing output
e72314d merged a couple branches
19940db Merge branch 'alg_outfile'
16c4caf (alg_outfile) fixed another output
2824d83 (alg_test) fixed output
cb612ba fixed alg and outfile
9374395 fixed output and alg
c686c00 (new_alg) new_alg
34bf85d (fix_infile) fixed infile arguments
916145e (measure_time) fixed time output
cfd6363 time measurement added
9408623 (out_file) fixed output format
4a70bb1 fixed ofstream declaration
0a01e84 output to file added
da644cf (branch3) completed indices output
8103434 fixed the indices to correct output
1fec8e2 (branch2) argument-taking added
23c5512 (branch1) fixed middle iteration parameter m
3140b4e Parametrization added
a316f1e first try, argv not array type
f4ddeaf added cstdio header file
4a41bce seems to work ver.1
```

2. Test Case Design

- a. To maximize the number of operations, the dimension is set to $1000 * 1000$.
- b. The testcase consists of four parts, each with different designs and purposes.
- c. The upper left quarter is checkered with peaks, whose purpose is to test if the program could differentiate peaks from non-peaks.
- d. The upper right quarter is a square filled with peaks which is surrounded by uniform minimum data. This design is to test whether the program can detect adjacent peaks and to test if non-peaks would affect its neighboring peak detections (as in lowest right elements of the quarter).
- e. The lower left quarter is designed to test the boundaries of the matrix. The program is supposed to detect that edges are peaks while the corner is not.
- f. The lower right quarter is a collection of peaks to test the program's ability to detect multiple adjacent peaks with identical value.
- g. To make comparing numbers difficult, all numbers are almost the maximum of data type integer.