COSC2430 Hw3: Game 2048 solver

(lists and stacks practice)

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1. Introduction

You will create a C++ program to solve a 2048 game. Read a file that has a matrix. Then, by following the rules, you should find a movement sequence to merge the numbers into one number. Output your movement sequence to a file.

2. Input and Output

1) Input file

The input file will never empty. It always contains two parts:

a) A number k (k>0, k is an integer) stands for the size (size=width=height) of the matrix.

b) A group of numbers a_{ij} (a_{ij} >=0, a_{ij} is an integer, 1<=i<=k, 1<=j<=k), stand for the cells of the matrix.

2) Output file

The output file contains the moves. It should not contain spaces in between each direction number. If the input matrix cannot be merged to one number, “Impossible” should be outputted (case sensitive).

3. The Rules and Operations

1) Create the matrix: By reading the input file, you should be able to create a matrix filled with the numbers. Each number corresponds to one cell. After reading the example 1 from below input11.txt, you should be able to create a matrix as follow Table 1:

Table 1

2	4	0	0
2	0	0	0
0	0	0	0
0	0	8	0

2) Move the cells: You can move all the greater than 0 numbers (except for 2048) by applying one direction operation. The up, right, down and left move were coded with numbers 1, 2, 3 and 4. If the initial matrix doesn't need move (e.g., only one cell with a number greater than 0), use number 0 as final output. After applying the number 2 (right) operation to the Table 1, the result should be as Table 2:

Table 2

0	0	2	4
0	0	0	2
0	0	0	0
0	0	0	8

3) Merge operation: When moving numbers to one side, two identical

numbers can be merged to the double value of the numbers. The merge only happens when one number is unmovable, while another identical number still moving towards this unmovable number. For each move operation, one number can only merge once. An example shows the before and after of the number 2 (right) move operation as Table 3: The two 4's in the right (after) matrix cannot be merged because the red 4 is an immediate result of last merge of two number 2.

Table 3

0	0	0	0
2	2	4	8
0	0	0	0
0	0	32	16

before

>

0	0	0	0
0	4	4	8
0	0	0	0
0	0	32	16

after

4) The Walls: A special number 2048 will never move in the matrix. It can be treated as a wall. It can block all the numbers along the coming direction. The number 2048 doesn't represent a mergeable number, you don't need to try to merge it. An example shows how it works after number 2 move when a wall exists in Table 4:

Table 4

0	0	0	0	0
2	2	2048	4	4
0	0	0	0	0
0	0	0	0	0
0	4	0	0	0

before

>

0	0	0	0	0
0	4	2048	0	8
0	0	0	0	0
0	0	0	0	0
0	0	0	0	4

after

5) Requirement: You must use a stack to solve this problem.
6) Additional requirements: If you can solve the problem with multiple sequences, you should output the sequence which with the smallest value. For example, if the result has two achievable move sequences like 12345 and 132, you should output 132 only.
7) The total length of the move sequence will not exceed 12 movements.

4. Program specification and Examples

Your source code will be compiled and tested by the TAs. The result file should be written to another text file (output file), provided with the command line. Notice the input and output files are specified in the command line, not inside the C++ code. All the necessary parameters will be in the command line when calling your program, so you don't need to worry about the missing parameter problem. When calling your program, the command format would be one of the two standard types as below. Also notice the quotes in the program call.

The general call to the executable is as follows:

merge "input=input11.txt;output=output11.txt"

Call example with another command line type.

merge input=input11.txt output=output11.txt

Example 1 of input and output

input11.txt
4
2 4 0 0
2 0 0 0
0 0 0 0
0 0 8 0

Command line:
merge input=input11.txt output=output11.txt

output11.txt
122

Example 2 of input and output

input12.txt
5
0 0 0 0 0
2 2 2048 4 4
0 0 0 0 0
0 0 0 0 0
0 4 0 0 0

Command line:
merge "input=input12.txt;output=output12.txt"

output12.txt
412

Example 3 of input and output

input13.txt
3

2 2 2
0 0 0
0 0 0

Command line:
merge input=input13.txt output=output13.txt

output13.txt
Impossible

5. Turn in your homework

Homework 3 need to be turned in to our Linux server, follow the link here http://cosc2430.coolpage.biz/homework.html.

Your program should output result within 1 second, longer will be killed by system, so don't try to use brutal force as the time is not enough.

Make sure to create a folder under your root directory, name it hw3 (name need to be lower case), only copy your .cpp and .h files, no testcase or other files needed.

Homework is individual. Your homework will be automatically screened for code plagiarism against code from the other students and code from external sources. Code that is copied from another student (for instance, renaming variables, changing for and while loops, changing indentation, etc, will be treated as copy) will be detected and result in "0" in this homework. The limit is 50% similarity. Here are some previous homework which been found copy each other (the main function has been deleted).

ps. This document may have typos, if you think something illogical, please email TAs for confirmation.