

Project #1: Tetris 俄羅斯方塊

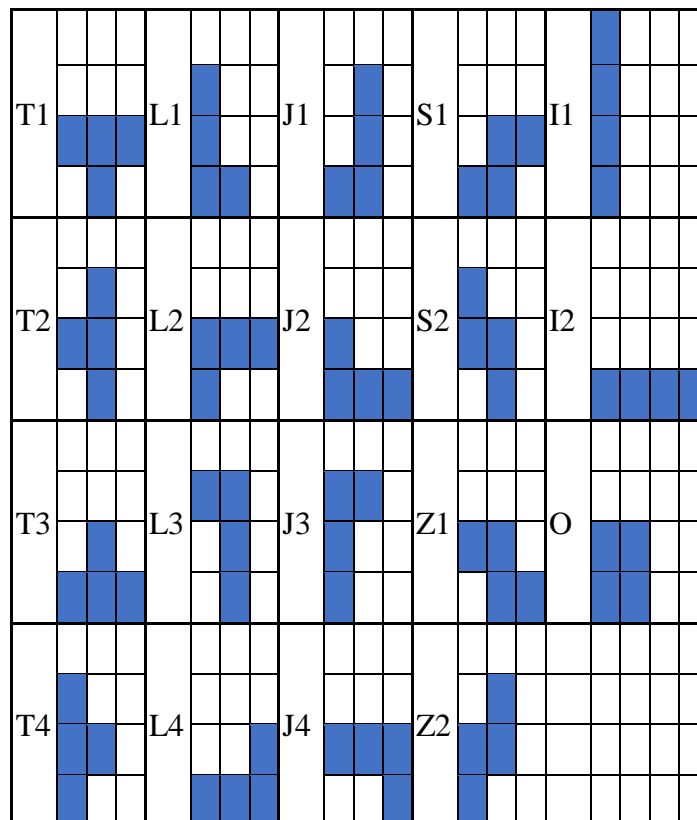
1. Project Objective:

Apply the knowledge learned from the course of data structures and implement a fun T.

2. Project Description

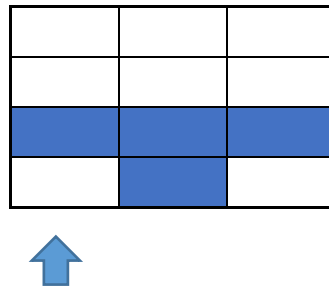
Tetris is a tile-matching puzzle game. Given an initially empty $m * n$ game matrix, a sequence of blocks falls down the playing matrix and stop when the bottom touches either the ground or other resting blocks. If these resting blocks form a solid horizontal line without gaps then the line disappears and any blocks above it fall down to fill the space. Any solid horizontal line should disappear after each block adjustment. The game terminates either if any block exceeds matrix vertical boundary after all solid horizontal lines are removed or the input sequence of blocks is exhausted.

Blocks are game pieces with geometric shapes composed of four square blocks each. Use the following symbols for the sequence of falling blocks in your prepared test case.



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Note that the reference point of each block is defined as the lower left corner of the enclosing bounding box of the block cells (colored blue). For instance, the reference point of T1 block is as indicated below.



Starting column

3. Test Case

Every student has to design and submit a test case prepared as a text file, named **“tetris.data”**. The first line of the file contains two numbers, specifying the number of rows (m) and the number of columns (n) of the game matrix. The last line should always contain the keyword “End”. In between, each line shall first have the selected block symbol and the starting column the lower left corner of the corresponding block to fall on. Note that the row and column all start from index 1.

a. Example:

```
10 5
I1 5
I2 1
O 4
L3 3
End
```

This case describes a game matrix of 10 rows and 5 columns.

b. Valid Test Case

The matrix size should be no more than 40*15 and the number of blocks to fall should be less than 1000. If any part of the falling block exceeds the game matrix horizontal boundary is deemed illegal.

c. Test Case Competition

TAs will use all test cases collected from the class to evaluate your algorithm.

4. Output file

Output the final content of the game matrix into a file named **“tetris.final”** from the top row to the bottom row. Use “1” to indicate the matrix cell is occupied, and “0” otherwise. Do not leave a

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single space between matrix cells.

The final output of the last example:

```
0 0 0 0 0
0 0 0 0 0
0 0 1 1 0
0 0 0 1 0
0 0 0 1 0
0 0 0 1 1
0 0 0 1 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
```

5. Project Submission Rules

- a. First submission: submit both your test case and program to LMS following the set deadline.
- b. Final submission: submit both your revised program and project report. The deadline is one week after the first submission. In between, we will open all test student cases for program revision.
- c. Please use GitHub for source code control and show your program development history. Please follow the version control rules when doing programming.

6. Grading Policy

- a. Algorithm Quality (60%)
 - i. First Submission Basic Test (30%): TAs will provide three open test cases. For each test case your program can pass and find the correct solution, you receive 10% credit.
 - ii. Final Submission Correctness Test (30%): If there are total N valid test cases and you pass p test cases, then you receive $30\% * \left(\frac{p}{N}\right)$ credit.
 - iii. Illegal implementations receive zero scores: If your program cannot compile or execute on our testing platform, then you get no score. Also, you should use only standard C++11 library, and should not use assembly codes. Note that our testing platform is a simple machine which supports only standard CPUs, supports no GPU, nor other non-CPU instructions, and is not connected to internet.
 - iv. The execution time is limited to at most five minutes.
- b. Test cases (20%)
 - i. Illegal test cases receive zero scores.

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- ii. Basic test (10%): If your test case can pass through both your own program and TA's program, you receive 10% credit.
 - iii. Test strength (10%): suppose f students fail to produce correct result of your test case, then you receive $10\% * (f/N)$ credit, where N is the total number of students.
- c. Report & Demo (20%)
- 1. The report file should be named "**report.pdf**".
 - 2. Each person should reserve a 15-min demo with TA. During the 1-on-1 demo, TA's will ask you questions related to your project report, test case and your implemented code. TA may ask you to compile and execute your program on spot.
 - 3. Your project report is recommended to follow this outline:

- 1) Project Description
 - 1-1) Program Flow Chart
 - 1-2) Detailed Description
- 2) Test case Design
 - 2-1) Detailed Description of the Test case

Note: The project report is limited to 10 pages.

Note: Your report can be either in Chinese or in English, or mixed.

Etiquette

- a. **Do not plagiarize others' work, or you will fail this course.**
- b. **No acceptance of late homework.**
- c. **Please frequently check the class website announcements for possible updates.**