Introduction

This is the final lab of CSE115! For this lab you will complete the 2048 game.

In lab 6 you laid out the basic model-view structure of the 2048 game.

In lab 7 you made the model a little more flexible by using a HashMap, and built the core functionality of the game.

By the end of lab 8 your game must:

- Have a 4 by 4 board [tasks 1 & 2]
- Handle the left, right, up and down arrow keys to move numbers on the board in all four directions [tasks 4 & 5]
- Randomly place a new number into an unoccupied square on the 4 by 4 board [task 3]
- Combine like numbers (2 combined with 2 produces 4, 4 combined with 4 produces 8, etc) in all four directions [tasks 5 & 6]

In addition there are some opportunities for extra credit (see below).

Tasks for lab 8

Here is a list of the functionality you need to build for lab 8. We have arranged the items in order so that later tasks build on earlier ones. You don't have to do things in this order, but you might find it helpful.

1) [10 points] Modify your model so that it has a 4x4 board.

2) [10 points] Modify your user interface so that is displays a 4x4 board.

3) [20 points] Modify your 'add a new tile to the board' code so that it adds a tile to an unoccupied position on the 4x4 board, at random.

4) [25 points] Revise your model so that it handles movement not only left and right, but also up and down.

5) [10 points] Modify your KeyListener to handle all four arrow keys: `KeyEvent.VK_LEFT`, `KeyEvent.VK_RIGHT`, `KeyEvent.VK_UP`, and `KeyEvent.VK_DOWN`.

6) [25 points] Revise your model so that it handles combination of like tiles in any direction: left, right, up and down.

   YOU MUST COMPLETE (1) – (6) BEFORE CONTINUING ON WITH THE FOLLOWING. Graders will grade functionality in order, and will stop here if (1) – (6) are incomplete. If you complete (1) – (6) you can score full credit for lab 8 (100 points). You can earn extra credit in the lab component of the course by completing additional functionality, as described below. You may need to explore

beyond the course material to successfully complete some of the extra credit functionality.

7) [20 points] Add scoring: every time two tiles combine the result is added to the score. Show the current score in the UI.

8) [20 points] After a player no longer has any moves the game must stop and announce "no more moves" to the player. After this the player must have the opportunity to start a new game.

   Also, the program must remember, and display, the high score for all games in a given execution of the program. In other words, if four games are played during a single run of the program, and the scores earned are 128, 696, 552, and 268, then the high score displayed during each of those games must be 0, 696, 696 and 696.

9) [20 points] Modify the game so that it stores the high score to a file, thereby maintaining an all-time high score across executions of the program.

   In other words, if two games are played during a single run of the program, and the scores earned are 128 and 696, the program is terminated and then run again, and another two games are played, with scores 552 and 268, then the high score displayed during each of those games must be 0, 696, 696 and 696.

Advice

Start early. Ask questions early. Consult your notes. Plan to put in time outside of your scheduled recitation to complete lab 8.

If you are not making progress after attending recitation, reviewing your notes and seriously working on the lab for 1-2 hours outside of recitation, see a TA or your instructor during office hours.

If you do not attend recitation other students may be given priority at office hours. You are expected to come to both recitation and office hours with specific questions demonstrating an understanding of the code you have written.

Fair warning

All lab 8 submissions will be screened for inappropriate collaboration and outright copying by plagiarism software. The penalty for cheating is failure in the course for all involved.

Submitting your project to Web-CAT

Submit the lab to Web-CAT as usual, making sure to select the correct section. There will be no automated grading of this lab – it will be manually graded. **Dues dates are listed on the course website.**