

PROGRAMMING ASSIGNMENT 3

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Due Date : 22.04.2022 (23:59:59)

Bejeweled Game

1 Introduction

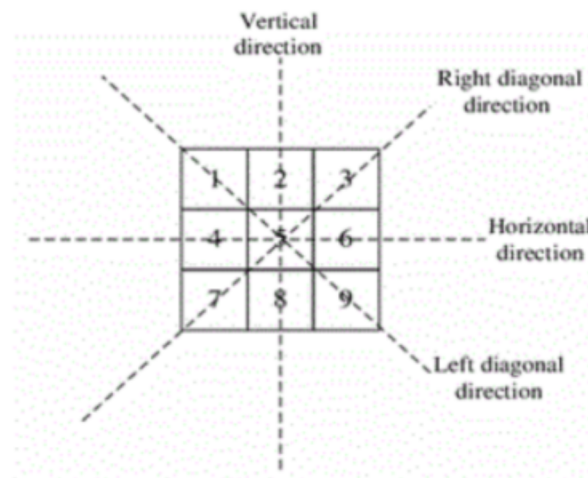
In this assignment, students recreate a simplified version of the game “Bejeweled” using Java. You will practice using abstract classes and/or interfaces for creating extendible programs.

2 Game

Bejeweled® is a puzzle game created by PopCap Games [1] in 2001. Various versions are available to play online, and on devices such as iPhone, iPad and Android. In this assignment, the game consists of a grid (of any size, e.g. 10x10) of “jewels”. Some example jewels are Diamond (D), Square (S), Triangle (T) and Wildcard (W). The goal is to find three jewels that are match in a row, column or diagonal by selecting the right coordinate. When this occurs, the three jewels are deleted, and other jewels fall from the top to fill in gaps. If the selected coordinate does not have any triple to match, then a warning message ("Please enter a valid coordinate") is displayed to the user and a new coordinate is requested.

Each jewel match in a different way. For the shape types defined as above, Diamond (D) can match with other Diamonds only in diagonal coordinates. Square (S) can match with its kind only in horizontal coordinate (x-axis). Triangle (T) can match with its kind only in vertical coordinate (y-axis). Wildcard (W) can match any jewel in any direction. Each jewel in a triple is worth a predetermined number of points. Diamond, Square, Triangle and Wildcard are scored as 30, 15, 15, 10 points respectively. So, a triple of all Diamonds will get 90 points, but a triple of 2 Diamonds and a Wildcard will be 70 points. The coordinate specified by user can be either first or last item in triple. The triplet should be searched using the rules defined below.

- If the coordinate contains a D, the program searches triple first in left (1 and 9) and then in right diagonal direction (3 and 7),
- If the coordinate contains an S, the program searches triple first in left and then in right horizontal direction,
- If the coordinate points to a T, the program searches the triple first in upward and then in downward vertical direction,
- If the coordinate contains a W, the program starts searching from vertical (2 and 8) followed by horizontal (4 and 6) and finally diagonals left (1 and 9) and right (3 and 7).



Using these jewels, let's follow a few steps of the game. Below example program prints the game grid first and ask user to select a coordinate. User selects index of array as [7][3] that means 8th row and 4th column in game grid. Selected coordinate corresponds to jewel T. In this case, program searches other two T's only in vertical coordinate to complete the triplet. Triplet of T jewels are deleted, and other jewels fall from top, leaving the top of the 4th column empty. Note that the rules for matching are applied using the Jewel type in the selected coordinate cell. If we had selected "5 1" the Diamond wouldn't have matched the W in "4 0" because the Diamond allows only matches with Diamonds. But, in the case of "4 0" the W matched with the D "5 1" because we are applying the rules for Wildcard. When the user enters E, first the games prints the total score and requests a username as input. **The user score should be appended to a file leaderboard.txt. as shown in Figure 1** The initial state of the leaderboard.txt file will be shared with you. You are expected the final version of leaderboard.txt. The program will print the rank of the current game and the total number of scores in the leaderboard.txt. The leaderboard file should only contain a name and a score in each line. **There will be no case that two or more player have equal points.**

```
Burak 45
Ahmet 90
Ali 35
Alex 40
```

Figure 1: Example of leaderboard.txt

An example of monitoring.txt file is given below:

Game grid:

```
D D S T W S D T W S
S W T D S W T S D T
D D S T W S D T W S
S W T D S W T S D T
W D S T D D S W T S
D D S T W S D T W S
S W D D S W T S D T
W D S T D D S W T S
D D S T W S D T W S
D D S T W S D T W S
```

Select coordinate or enter E to end the game: 7 7

```
D D S T W S D   W S
S W T D S W T   D T
D D S T W S D   W S
S W T D S W T T D T
W D S T D D S S T S
D D S T W S D T W S
S W D D S W T S D T
W D S T D D S W T S
D D S T W S D T W S
D D S T W S D S W S
```

Score: 40 points

Select coordinate or enter E to end the game: E

Total score: 40 points

Enter name: Alex

Your rank is 3/4, your score is 5 points lower than Burak and
5 points higher than Ali

Good bye!

Extending the jewels with Mathematical Symbols:

Along with the jewels defined above, you should implement the following mathematical symbol jewels as well. All Mathematical symbols are worth 20 points.

- “/” : Matches any other mathematical symbol jewel only in right diagonal. Search 3 first, then 7.

- “-“ : Matches any other mathematical symbol jewel by searching horizontally (4 and 6).
- “+” : Matches any other mathematical symbol jewel by searching first horizontally (4 and 6) then vertically (2 and 8)
- “\” : Matches any other mathematical symbol jewel only in left diagonal. Search 1 first, then 9.
- “|” : Matches any other mathematical symbol jewel vertically. Search 2 first, then 8.

Your submission should support all jewels in the set D, S, T, W, /, -, +, \, |. Your program will be evaluated using a grid containing a random subset of these Jewels. Also, your Object-oriented design should allow the addition of new jewels without changing too much code.

Your program should read the gameGrid.txt file for the initial grid and jewels. You should use abstract class and/or interfaces to implement common characteristics of the jewels. Your design should maximize reuse and minimize duplicate code. Make use of polymorphism in such a way that your game’s code does not have to change if we decide to add a new Jewel type.

3 Input Output Format

You will have two input file which are gameGrid.txt and command.txt and two output file which are monitoring.txt and leaderboard.txt. The format of them will be as follows:

- gameGrid.txt file has initial grid of the game. In this file, each jewels/mathematical symbols is separated by space and ending with new line.
- Command file contains coordinates entered at each step (two numbers separated by a space and ending with new line). Finally, to end the program it will contain an “E” character and a name for the leaderboard.
- We will give the initial state of the leaderboard.txt file. Leaderboard file should contain name and score of players. They should be separated by a space and ending with new line.
- You should use format of monitoring.txt shared with you for your output (monitoring.txt).

Execution and Test

You will use the Java Platform as described in the. The input files (gameGrid.txt and command.txt) should be given as an argument. The leaderboard.txt file will not use as an argument from command line, so it must be in the same directory as your java files. Upload your java files to your server account (dev.cs.hacettepe.edu.tr)

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- Compile your code (javac *.java, or javac Main.java)
- Run your program (java Main gameGrid.txt command.txt)

- Control your output file (monitoring.txt and leaderboard.txt).

Grading Policy

Task	Point
Submit	1
Clean code	10
Coding standard	5
Correct monitoring.txt	59
Correct leaderboard.txt	5
Report	20
Total	100

Submit Format

File hierarchy must be zipped before submitted (Not .rar, only .zip files are supported by the system)

```
- <studentid>.zip
  - <src>
    - Main.java, *.java
    - Report.pdf
```

Late Policy

You have three days for late submission. You will lose 10 points from maximum evaluation score for each day (your submitted study will be evaluated over 90, 80 and 70 for each late submission day). You have to submit your solution in deadline date + three days, otherwise it will not be evaluated.

Notes and Restrictions

- To find the rank in leaderboard, you should implement Comparable [2] interface. Use the sort and binarySearch methods in Collections [3] or Arrays [4] classes.
- Do not miss the submission deadline.
- Save all your work until the assignment is graded.
- Compile your code on DEV server before submitting your work to make sure it compiles without any problems on our server.
- Source code readability is a great of importance for us. Thus, write READABLE SOURCE CODE, comments and clear MAIN function. This expectation will be graded as “clean code”.

- Regardless of the length, use UNDERSTANDABLE names to your variables, classes and functions. The names of classes, attributes and methods should obey Java naming convention. This expectation will be graded as “coding standards”.
- You should give your detailed design in solution (with UML class diagram) in the report.pdf.
- You can ask your questions through course’s piazza group and you are supposed to be aware of everything discussed in the piazza group. General discussion of the problem is allowed, but DO NOT SHARE answers, algorithms, source codes and reports.
- All assignments must be original, individual work. Duplicate or very similar assignments are both going to be considered as cheating.

References

- [1] PopCap Games, <http://www.popcap.com>
- [2] <https://docs.oracle.com/javase/7/docs/api/java/lang/Comparable.html>
- [3] <https://docs.oracle.com/javase/7/docs/api/java/util/Collections.html>
- [4] <https://docs.oracle.com/javase/7/docs/api/java/util/Arrays.html>