# *Programming III (420-G30-HR)*

# *Assignment 2 – Hangman Using Linked Lists*

Date assigned: Friday, October 9

Frame design, class diagram due: Friday, Oct. 9, in lab

Test cases scenarios due: Wed, Oct. 21 (@2350)

Code and junit tests due: Friday, Oct. 29 (@2350)

***Objectives:***

After completing this assignment, the student should be able to:

1. Draw a class diagram.
2. Design junit test cases for a linked list.
3. Use a singly linked list.
4. Use a doubly linked list.
5. Write a serialized object.
6. Read a serialized object.
7. Override the **toString()** and **equals()** method of the **Object** class.

***Problem Specifications:***

Develop a program to play the game Hangman. You must read a list of words (or word phrases) from the file **dictionary.txt**. A sample of this file is provided on Moodle; its format is a single word sequence per line. The Hangman program should **randomly** select a word to use; this is the word that the player is trying to guess. The game displays the number of letters in the word. The player then guesses one letter at a time. If the letter is in the word, then **all** occurrences of that letter should be displayed to the player. If the letter is not in the word, then the letter should be added to the list of guessed letters for the user to see, and a mistake is recorded. If the player guesses the word before six mistakes are made, they win. If they don’t then they lose and the answer should be displayed to the player.

The program should ask for the player name at the start of a game. Past player names should be available in a **drop down list** to select from. The program keeps track of the number of games each player has played. At any time, the player can view the scoreboard, which shows the name of each player, in alphabetical order, and the number of times each player has played the game and the number of wins each player has had.

The player has the option of asking for a hint. This should show a random letter in the word to the player. (Note – if the letter ‘a’ is given as the hint, and there are three letter ‘a’’s in the word, then all 3 occurrences of the letter ‘a’ or ‘A’ should be shown.

Once a word has been used in a game, it must not be used again. This does not mean that the word should be deleted from the **dictionary.txt** file; this file must never be modified. The word should be deleted from the internally stored list.

A game can be exited at any time, and when the program is restarted, you must continue from where the game left off. (This means that you only read the **dictionary.txt** file the very first time you start a game; all subsequent times the state will be saved). You should preserve the player scoreboard and the current game across a program exit. **Serialization** must be used to accomplish this save of state.

In addition to the notes provided, here are two good references for learning about serialization:

<http://www.tutorialspoint.com/java/java_serialization.htm>

<https://www.geeksforgeeks.org/serialization-in-java/>

The user should be able to perform the following functionality at any time, from a **drop down menu**:

1. Start a new game, even if a game is in progress
2. View the scoreboard, without affecting the current game in progress
3. Get a hint. This should show a random letter in the word.
4. Quit the program, even if a game is in progress
5. Learn about the rules of the game

Your design must use the following:

* 1. Your frame design is up to you. There are 10 marks allocated for the frame design. A basic frame that does not have any colour or creativity will receive a mark of 5/10.
  2. For singly linked lists, use the provided **SLNode** and **SinglyLinkedList** code. For doubly linked list, use the provided **DLNode** and **DoublyLinkedList** code.
  3. A singly linked list must be used to store the words read in from the dictionary.txt file. When a word has been used, it must be deleted from this linked list.
  4. A singly linked list must be used to store the letters of the word to be guessed. You cannot use string processing – you must use a singly linked list of characters.
  5. A singly linked list must be used to store the guessed letters.
  6. A doubly linked list must be used to store the scoreboard. The scoreboard must be kept in alphabetical order.
  7. Serialization must be used for the file reading and writing of the program state.
  8. Make sure that you keep your frame logic separate from the program logic.
  9. Junit test cases must be written for all player and scoreboard functionality.

***To Do:***

***Phase 1:***

1. Sketch a frame design for the program. This can be hand drawn, and either scanned or a legible photo of it can be submitted.
2. Draw a class diagram for the program.
3. Draft a list of black box test case scenarios to test the program.

***Phase 2:***

1. Code the program, testing as you go.
2. Code the junit tests for the scoreboard functionality. A list of these tests will be discussed together in class on Oct 22.
3. Thoroughly test your program against your test cases.

***Marking Scheme:***

|  |  |  |
| --- | --- | --- |
|  | **Mark** | **Out of** |
| Frame sketch |  | 7 |
| Class Diagram |  | 8 |
| Black box test case design (rules,equivalency partitions, sample value mapping) |  | 15 |
| Black box test case scenarios |  | 10 |
| Basic Frame code – functionality matches requirements; |  | 15 |
| Frame code innovation – use of colour, creativity |  | 10 |
| Basic Game logic code – dictionary file processing, correct list types used for word and guessed letters; |  | 35 |
| Hint functionality – frame and logic |  | 10 |
| Scoreboard functionality – frame and logic – doubly linked list used; kept in alphabetical order |  | 15 |
| Game state saved using serialization |  | 15 |
| Junit test case code – Scoreboard |  | 20 |
| Correct Program Execution |  | 10 |
| Organization |  | 5 |
| **Total** |  | **175** |

***Organization Marks:***

Marks will be given for organization. This includes:

* naming files and folders according to the department standards
* giving meaningful names to variables, classes, objects and methods
* formatting and indenting Java classes using the Eclipse format tool
* submitting the assignment in correctly on **Moodle**
* including all required files in the submitted assignment folder

***To be handed in:***

The following files should be included in a ***username*\_G30\_A02\_Linked\_Lists** folder and uploaded to **Moodle**:

1. The test cases.
2. The class diagram for the assignment.
3. The frame design.
4. The java project for the assignment. The project name should be ***username*\_G30\_A02\_Linked\_Lists** .

# *Appendix A - Hints – Hangman Using Linked Lists JUnit Tests*

\*Note that theses are an example of the things that you should test for your Junit tests. You may have done your Scoreboard class differently, which is completely fine, but you need to have Junit tests to thoroughly test that class. It’s hard to imagine your Player class being much different from this example though.

Player Class

* name: String
* numberGamesPlayed: Integer
* numberGamesWon: Integer
* default constructor
* constructor with Name
* accessors and mutators for each of the 3 instance vars

Scoreboard Class

* doublyLinkedList of Players (kept sorted by name)
* numPlayers: Integer
* default constructor
* addPlayer(name)
* gamePlayed(name, winOrLose:Boolean)
* Player getNextPlayer(index) (for displaying in Frame)

Junit Player tests

1. Test constructor ; create Player and make sure each instance var is set to defaults for numGamesPlayed and numGamesWon, and that name is set.
2. Test sets – increment gamesPlayed and gamesWon and make sure they return the right value

Junit Scoreboard Class

1. Test default constructor – no players added, numPlayers = 0
2. Test addPlayer – create 1 and make sure you get it back. (boundary test)
3. Test addPlayer, more than 1 player in list and make sure you get it back (boundary test)
4. Test gamePlayed with a win, and with a loss
5. Test gamePlayed with a player that is not found
6. Test getNextPlayer with an empty list
7. Test getNextPlayer with a list of 1
8. Test getNextPlayer with a list of 3