

**Gebze Technical University
Computer Engineering**

CSE 222 – 2019 Spring

HOMEWORK 2 REPORT

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1 INTRODUCTION

1.1 Problem Definition

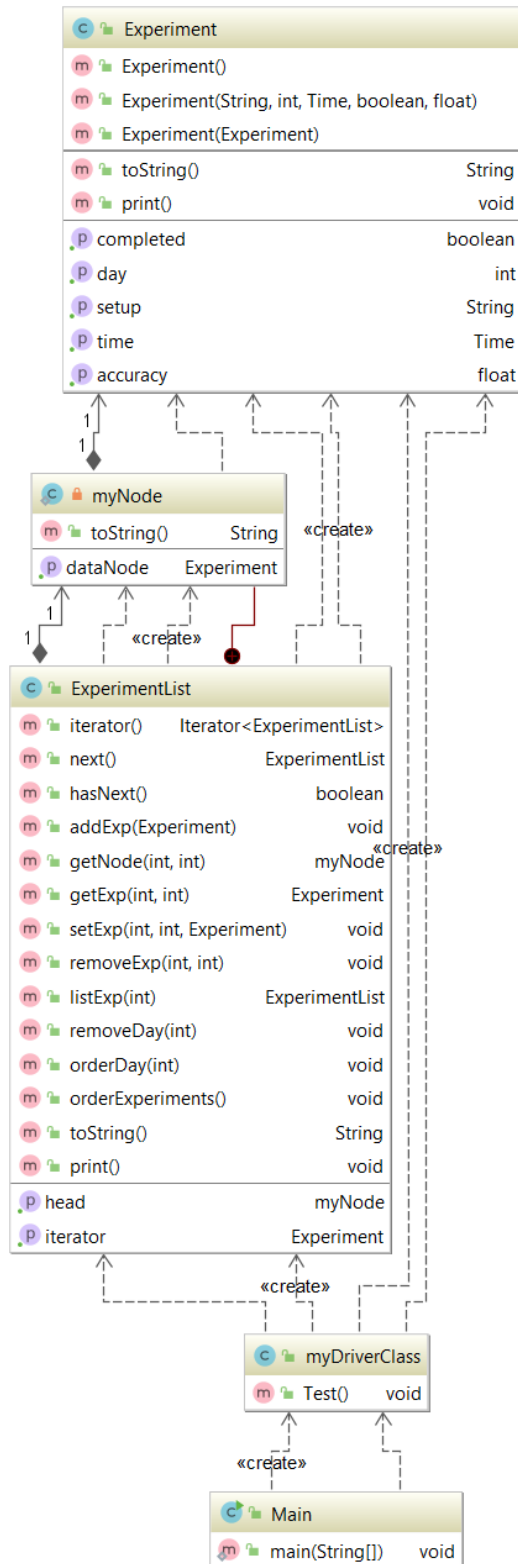
In this homework, we have to connect the experiments with using single linked list which depends on days and added experiment. While we adding an experiment, we should look experiment's day and put it next to the last element. If we want to add new experiment which we do not have this experiment's day in our linked list, we should make a new day node and adding it our linked list.

1.2 System Requirements

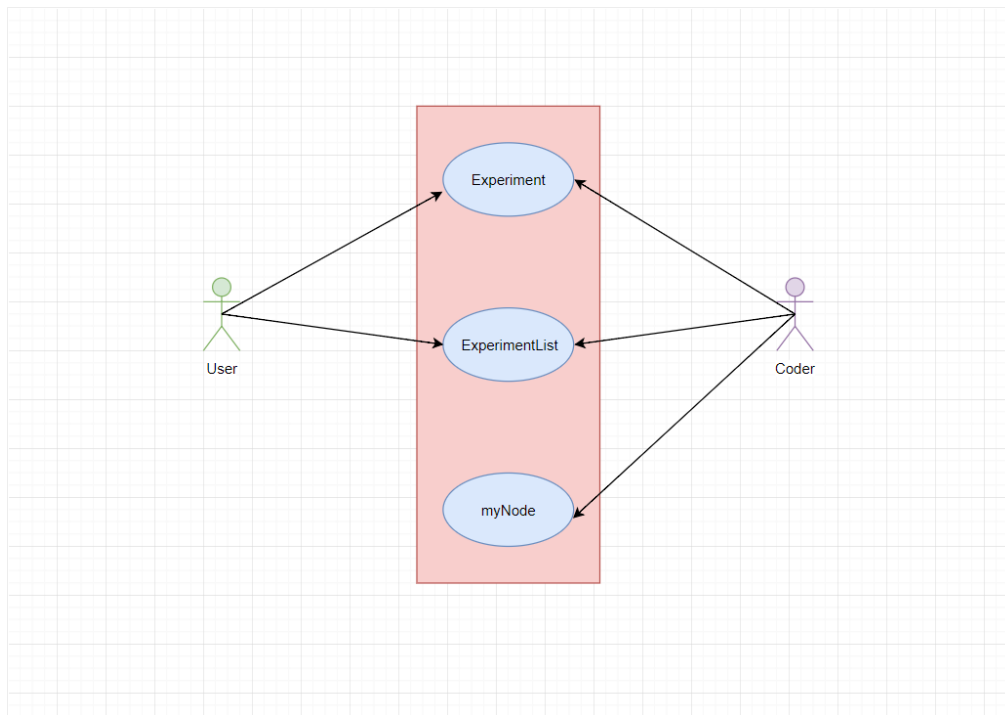
While we solving this problem, we should have Experiment, ExperimentList and myNode classes, Experiment class will keep the informations of our experiments, ExperimentList should keep our experiments with using linked-list. To do this, we have to use myNode class which has a experiment variable and two myNode variable (one of them will keep the all experiments, another node will only keep the first experiment of the days). When we make these classes like that we can solve this problem easily and understandable. And also we should make iterable our ExperimentList class and we have to override the methods.

2 METHOD

2.1 Class Diagrams



2.2 Use Case Diagrams



2.3 Problem Solution Approach

2.3.1 Experiment Class

In this class, we have our experiment informations. Our variables are setup, day, time, completed, accuracy. We should keep this values to do our methods which are in ExperimentList class and thus we solve our problems easily with this way. We have getter methods, overrided toString method and constructors.

2.3.2 myNode Class

In this class, we have an experiment class variable and two myNode class variables. One of the myNode variable will keep a linked-list which is taking all experiments, and another myNode variable will keep linked-list which is taking the first experiments of every day. With this way, we can reach the experiments easily and faster. Also, myNode is a private static class which is inner class of ExperimentList. Thus, the user can not use myNode class in its driver or main class.

2.3.2 ExperimentList Class

In this class, as a variable it only has a myNode variable which is using for pointing the head. With pointing the head of linked-list, we can reach all the experiments easily. In ExperimentList class, we have 8 method to use our linked-list. Adding, getting, setting, removing and ordering. Adding method is taking so many conditions to add experiment to our linked-list. Because we have to keep our experiments sorted. For our remove method (removeDay), we have to look if the day the user wants to delete, is on our list or not. If our list have this day so we can remove it from the list and we can connect our new nodes instead of removed experiments. For ordering, we have two ordering methods. For these methods, we should look our experiments' accuracy which are in our linked-list, and we should sort them. To sort them easily, I used our getter and setter methods. And also we have to override iterator methods to make our ExperimentList class iterable.

ExperimentList class implements iterator and iterable interfaces.

3 RESULT

3.1 Test Cases

For testing, I make my test class and tried all methods given in homework. My Experiment's days in my ExperimentList are:

```
Experiment Exp1 = (new Experiment( setupInput: "Experiment1", dayInput: 1,new Time( hour: 1, minute: 2, second: 3), completedInput: false, accuracyInput: 0));
Experiment Exp2 = (new Experiment( setupInput: "Experiment2", dayInput: 1,new Time( hour: 1, minute: 40, second: 3), completedInput: true, accuracyInput: 7));
Experiment Exp3 = (new Experiment( setupInput: "Experiment3", dayInput: 1,new Time( hour: 7, minute: 50, second: 3), completedInput: true, accuracyInput: 5));
Experiment Exp4 = (new Experiment( setupInput: "Experiment2", dayInput: 3,new Time( hour: 3, minute: 12, second: 3), completedInput: true, accuracyInput: 9));
Experiment Exp5 = (new Experiment( setupInput: "Experiment3", dayInput: 3,new Time( hour: 2, minute: 15, second: 3), completedInput: true, accuracyInput: 12));
Experiment Exp6 = (new Experiment( setupInput: "Experiment5", dayInput: 3,new Time( hour: 1, minute: 21, second: 3), completedInput: true, accuracyInput: 11));
Experiment Exp7 = (new Experiment( setupInput: "Experiment6", dayInput: 2,new Time( hour: 1, minute: 31, second: 3), completedInput: true, accuracyInput: 13));
Experiment Exp8 = (new Experiment( setupInput: "Experiment2", dayInput: 2,new Time( hour: 5, minute: 1, second: 3), completedInput: false, accuracyInput: 0));
Experiment Exp9 = (new Experiment( setupInput: "Experiment3", dayInput: 5,new Time( hour: 6, minute: 1, second: 3), completedInput: true, accuracyInput: 11));
Experiment Exp10 = (new Experiment( setupInput: "Experiment4", dayInput: 5,new Time( hour: 16, minute: 1, second: 3), completedInput: false, accuracyInput: 0));

ExperimentList TestList = new ExperimentList();

TestList.addExp(Exp1);
TestList.addExp(Exp2);
TestList.addExp(Exp3);
TestList.addExp(Exp4);
TestList.addExp(Exp5);
TestList.addExp(Exp6);
TestList.addExp(Exp7);
TestList.addExp(Exp8);
TestList.addExp(Exp9);
TestList.addExp(Exp10);
```

3.2 Running Results

```
-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-Our Test List-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-
```

ExperimentList:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

```

Day nodes:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0

```

getExp Method Test

```
Day 1 Index 1 --> setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
```

```
Day 2 Index 2 --> null (Day 2 has 2 Experiment...)
```

```
Day 3 Index 0 --> setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
```

```
Day 5 Index 1 --> setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0
```

setExp Method Test

```
Day 1 Index 1 before the setExp --> setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
```

```
Day 1 Index 1 after the setExp --> setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
```

listExp Method Test

listExp method for Day 3

Listed ExperimentList Class:

ExperimentList:

```
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
```

Day nodes:

```
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
```

-o-

removeDay Method Test

-Before the removeDay method (Removing Day 3)-

ExperimentList:

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

Day nodes:

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0

-After the removeDay method-

ExperimentList:

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

Day nodes:

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0

```
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                                orderDay Method Test
```

orderDay Method Test

Before the orderDay method:

ExperimentList:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

```

Day nodes:

```
setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
```

After the `orderDay` method for day 1 and day 3 :

ExperimentList:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

```

Day nodes:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0

```

```
-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-  
                                orderExperiments Method Test
```

orderExperiments Method Test

ExperimentList:

```

setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0
setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0
setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0
setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0
setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0
setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0
setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0

```

Day nodes:

```
setup : Experiment1, day : 1, time : 01:02:03, completed : false, accuracy : 0.0
```

```

-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-
ExperimentList Iterable Test

setup : Experiment3, day : 1, time : 07:50:03, completed : true, accuracy : 5.0

setup : Experiment2, day : 1, time : 01:40:03, completed : true, accuracy : 7.0

setup : Experiment6, day : 2, time : 01:31:03, completed : true, accuracy : 13.0

setup : Experiment2, day : 2, time : 05:01:03, completed : false, accuracy : 0.0

setup : Experiment2, day : 3, time : 03:12:03, completed : true, accuracy : 9.0

setup : Experiment5, day : 3, time : 01:21:03, completed : true, accuracy : 11.0

setup : Experiment3, day : 3, time : 02:15:03, completed : true, accuracy : 12.0

setup : Experiment3, day : 5, time : 06:01:03, completed : true, accuracy : 11.0

setup : Experiment4, day : 5, time : 16:01:03, completed : false, accuracy : 0.0

-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-

```

3.3 Time Complexity

Experiment Class Time Complexity

My all methods of Experiment Class are $O(1)$ because i did not use any loops.

myNode Class Time Complexity

My all methods of myNode Class are $O(1)$ because i did not use any loops.

ExperimentList Class Time Complexity

Function Name	iterator	next	hasNext	addExp	getNode	getExp	setExp	removeExp
Time Complexity	$O(1)$	$O(1)$	$O(1)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$
Function Name	listExp	removeDay		orderDay	orderExperiments	getHead		
Time Complexity	$O(n)$	$O(n)$		$O(n^2)$	$O(n^2)$	$O(1)$		