INFO 1105 Assignment 1 Report
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Assignment Objective :

Make a Appointment calendar system where the operation (insert, search and remove) should be available and all the method must have a sub-linear runtime overall and must allow user to search specific appointment accurately and react when the user enter an invalid input or missing input.

Assignment Functionality :

The Programme allow user to add appointment by using location, time and description. Also, allow user to delete the appointment by referring to a specific or group of event. Moreover, allow user to see upcoming event by either using time or both time and location.

Data Structure Used : Array List

Reason : During the planning stage of this assignment, I found out the assignment will be using a lot of searching, getting and insert and remove operation. Hence, I am looking for structure that has an less than O(n) Runtime. I expect usual usage of get method and insert method, and arraylist's get method has a O(1) constant runtime which is really faster and its insert is around O(1) most of the time in an unsorted list. So I figure if I am using arraylist I will be able to maintain the overall runtime to be less than O(N).

Used For : I used this data structure for Making the calendar to store all the appointment field. And all the method is either accessing the element in the array list or manipulating the elements in the arrayList for example addAppointment and remove appointment.

Runtime Analysis :

```
public List<Appointment> getAppointments(String location);
```

The Runtime for this method : O(n)

Calculation : Getter method **[O(1)] + add [O(n)] = O(n)** (Overall runtime)

Explanation : Since we are only adding one element to an unsorted list in which specifying insertion position have to copy all array elements to the right from insertion point by System.arraycopy call. Resulting in **an O(n)** runtime complexity. In which we get the overall runtime for this method as (**O(n)).**

```
public Appointment getNextAppointment(Date when);
```

The Runtime for this method : O(n)

Calculation : CompareTo()[O(n)] + get()[O(1)] + indexOf() [O(n)] = [O(n)]

Explanation : With **compare to** method, as they are comparing each character of the 2 string ,it will take O(n) to finish comparing both string character by character, where n is the length of both string together. That's why we get O(n) in this method. For **get** , the computer will do the calculation (**offset + (size of variable)*n)** in the processor without accessing the memory locations back and forth, which is why it is O(1). For **indexOf(),** since it will find the string u want from the string u are currently in ,its runtime will time O(n).

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```
public Appointment getNextAppointment(Date when, String location);
```

The Runtime for this method: O(n)

Calculation: getStartTime **(O(1))** + CompareTO**[O(n)]** + equals **[O(n)]** + indexOF **[O(n)] = O(n)**

Explanation: adding all the runtime of the above method we get **3O(n)+O(1)** which **= O(n).**

```
public void add(String description, Date when, String location);
```

The Runtime for this method : O(n)

Explanation : Since in this method, I only use add to add all the things into list, the run time will be the runtime of add which is **O(n)** as for add operation the run time is equals to adding n elements, O(n). Hence the overall runtime for this method is **O(n).**

```
public void remove(Appointment appointment);
```

The Runtime for this method: O(n)

Explanation: Since I am using remove(object) it will cost**(O(n)).** Therefore the overall time complexity is **O(n).**

TESTING CODE

How Do I test the code:

I first write down all the possible test case I can think of then picking the most useful one out of the list. The criteria is I want to find the one which has high chance of user to make that particular mistake such as null input or invalid input. Then I code the Junit Test Case. By running the test, I will fix my code until all test case passed.

For testing the code I have the following testing method:

```
testGetAppointments_Correct()
```

This method test if the get method returns all the appointment of a specific location.

```
testGetNextAppointment_Correct()
```

This method test if the getNextAppointment method return all the appointment after a certain date and time.Also, test for input of non-exciting time to see if an exception is thrown or not.

```
testRemoveAppointment_Correct()
```

This method test if the remove appointment method can remove certain appointment by using its time and location.

```
testRemoveAppointment_Missing()
```

This method test if the remove appointment method will throw an exception if a null input is detected.

```
testRemoveAppointment_invalid()
```

This method test if the remove appointment will thrown exception if invalid input is detected.

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`testAddAppointment_Correct()`

This method test if the add method can add an appointment to the list.

`testAddAppointment_Missing()`

This method test if the add method will throw exception if an null input is detected.

`testAddAppointment_invalid()`

This method test for invalid input such as invalid data format etc.

`TestOperation()`

This method simulate when a user enter,delete and enquire about appointment. In the method, we first delete appointment after a certain date and time then add a new appointment. At last, check if the calendar content is correct or not.

`TestRemoveAll()`

This method test to see if by using getNextAppointment and remove can remove all content in the calendar.