CNG 491 - Senior Project and Seminar:Design

MIDDLE EAST TECHNICAL UNIVERSITY
NORTHERN CYPRUS CAMPUS

Tests

Project

Smart Home Senior Project

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1. Introduction

In this part of the project we will perform:

- Unit tests
- System and Integration tests
- Alpha/Beta tests

Tests will be performed on our Smart-Home project, we will test separate units, modules, database, web server, applications to define errors or defects before final project will be released.

Unit testing for different functions on R passed successfully. As expected all tests gave right values and we obtained that data computation to our project will be performed without any defects.

System and Integration testing for separate module connections passed successfully. We obtained expected results as interaction between database and computational modules. Also data retrieving from server as expected done without any errors.

2. Test Items(Functions)

2.1. Unit Tests

The Unit Name: R function to sum up all temperature values
Participants: Temirlan Bayeshov
Pass/Fail criteria: testthat library will be used. First our main code will call calTempSum function, to take all temperature values from database and sum them up. After it will call test_Temp function to make unit test for a temperature final value. We will check if value type is data frame or not, because we should make a data frame to take values from database and sum them, and second test will check if there is only single value of temperature sum. In script we used expect_that function from the testthat library.
Results: We obtained success in both tests, because our final temperature value is single and data frame. So, as expected we the R unit test for temperature passed without any failures.

```
1 test_TempSum.R testing calcTempSum function values  2      0   FALSE FALSE       0 0.01   0.01
  real passed
1 0.03      2
```

Figure 1: R calctemp sum

The Unit Name: R function to sum up all humidity values
Participants: Temirlan Bayeshov
Pass/Fail criteria: testthat library will be used. First our main code will call calHumiditySum function, to take all humidity values from database and sum them up. After it will call test_Humidity function to make unit test for a humidity final value. We will check if value type is data frame or not, because we should make a data frame to take values from database and sum them, and second test will check if there is only single value of humidity sum. In script we used expect_that function from the testthat library.
Results: We obtained success in both tests, because our final temperature value is single and data frame. So, as expected we the R unit test for humidity passed without any failures.

```
               file                          context   test nb failed skipped error warning user
1 test_HumiditySum.R testing calcHumiditySum function values  2      0   FALSE FALSE       0 0.01
  system real passed
1      0 0.01      2
```

Figure 2:R calchumidity sum

The Unit Name: Android Credential Control with Non-User Person and Trasition between the pages

Participants: Anıl Peker

Pass/Fail criteria: With espresso framework in the android studio, test tried to connect to the system with non-registrated information. The criteria are, system shouldn't allow to enter the user in the system without non-determined information and the application should inform the user. Also, we tried the trasition between the dashboard and tried to see non-reachable dashboard with wrong path.

Results: The result that we obtain system is not allow to enter the user to the system and it is giving enough information which is comes from the Web service. We could reach to see the dashboards that we gave the wrong path.

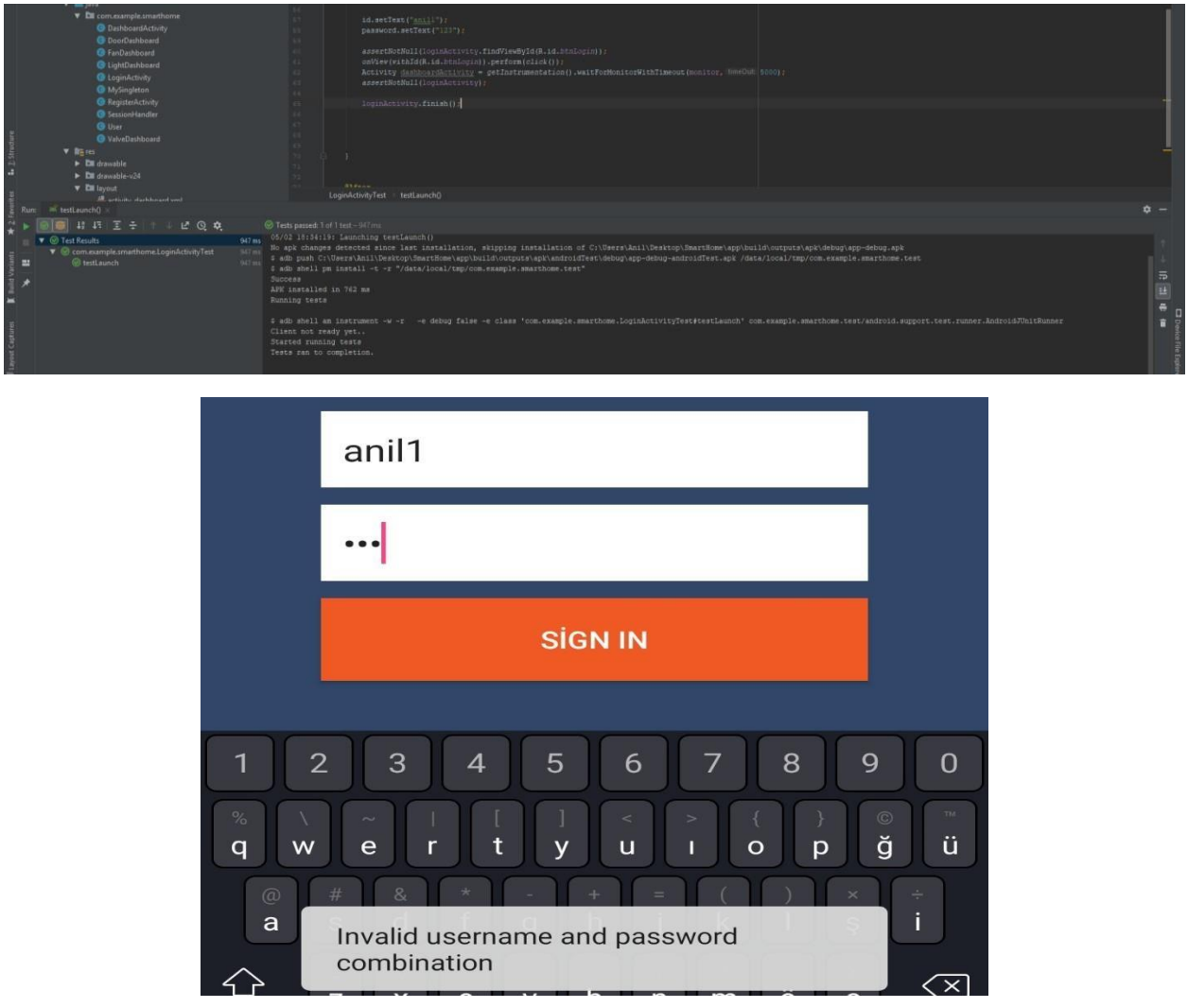

Figure 3: Andriod Credential Control

2.2. System and Integration Testing

The Unit Name: Integration of R and MySql database in server
Participants: Temirlan Bayeshov
Pass/Fail criteria: R scripts will be used to test if we can connect to MySql and retrieve data from tables which stored in our server. Firstly we will create connectionResult function for connection to database and test it if our two modules connected successfully. We will use two methods for integration testing: isIdcurrent and dbIsValid. First method will show use if currently we connected to database while second one will show if our database valid. If both of the methods return TRUE than test successfully passed, otherwise in case of FALSE test will be failed. We expect that methods will return TRUE for both methods. After passing this criteria we will check if our data retrieved successfully.

Results: We obtained pass for integration test. Both of methods which checks connection to database throw R code showed successful results. We obtained that we can connect to our MySql database on our server, so now we will be able to retrieve data from server.

```
connectionResult<-function()
{
  con<-dbConnect(MySQL(),host="localhost",dbname="anildata",user="root",password="")

  return (con)
}
```

```
> test.connectionResult<-function()
+ {
+   dbIsValid(con)
+   isIdCurrent(con)
+   return(print(isIdCurrent(con)))
+
+ }

> con=connectionResult()

> conStatus=test.connectionResult()
[1] TRUE
```

```
> dbIsValid(con)
[1] TRUE
```

Figure 4: R connection test

The Unit Name: System testing retrieving of data from server
Participants: Temirlan Bayeshov
Pass/Fail criteria: R scripts will be used for testing if our data will be successfully retrieved from database. After successful integration test of connection to database, we are able to test if we can take data sets from it. We will use test.dataRetrieveResult function to test if we can access to temperature/humidity, etc. values. If we will obtain values we will be able to see them in print method as a table. Otherwise, in case of fail, we will get an error message.

Results: After first passed integration test which are connection to database module, we tested if we can retrieve data sets from MySql database. Our test passed successfully without any error messages. Now we able to connect and take a data for next steps of statistical performance.

```
> test.dataRetrieveResult<-function()
+ {
+   result=dbSendQuery (con,"select * from temphum")
+   data=fetch(result,n=-1)
+   temperature=subset(data,select=c(temperature))
+
+   return (temperature)
+ }
>
> temp=test.dataRetrieveResult()
> print(temp)
  temperature
1          24
2         123
3          26
4          40
>
```

	temperature
1	24
2	123
3	26
4	40

Figure 5:R Data retrieving test

2.3. Alpha/Beta tests

The Unit Name: Project Survey
Participants: Anıl Peker
Process: We ask questions about controlling of automated home via mobile application to find pros and cons and what should be added or removed from the project. In addition, we observed the most favorable function of the survey participants.
Pass/Fail criteria: Pass criteria is useful functions for customers that they choose most suitable for them. Fail criteria is non- useful functions for customers that they choose most non-suitable for them.
Results: In our survey, we found 10 participants for participating.

- ➔ 1 out of 10 participants didn't agree of session handler because user don't want to enter his/her credential in every 24 hours.
- ➔ 1 out of 10 participants suggested to create a secondary application for children with restricted operation on home.
- ➔ 3 out of 10 participants wanted to get more required information about the application interfaces and operations.
- ➔ 1 out of 10 participants gave idea about water pumping system in the garden should be automated in Arduino according to soil moisture.
- ➔ For the security part, 2 out of 10 participants desired to have a camera to feel more secured.
- ➔ In the interface part, only 1 participant out of 10 didn't like the graphical user interface of the application.
- ➔ 3 out of 10 participants completely agreed with our application.

3. Summary of the Tests Passed

3.1. Unit tests for R calculating functions

Test: Unit test
Library:testthat
Scripts: R language
Functions: calcTempSum, calcHumiditySum,test_TempSum,test_TempHumidity

- R function to sum up all temperature values passed. As we expected we made our values from INT type to Data Frame type. After getting all values from database we summed the up and we get only single value at the result. Both unit tests passed successfully.
- R function to sum up all humidity values passed. As we expected we made our values from INT type to Data Frame type. After getting all values from database we summed the up and we get only single value at the result. Both unit tests passed successfully.

3.2. Unit tests for Android Credential Control with Non-User Person

Test: Unit test
Library: Junit
Scripts: Java
Functions: Login interface and login php function

- The function that the interface does for login system tested for non-user registration information. We tried give dummy and non-correct information to login the system and we observed the required warning and the application continue to work properly.
- The user cannot reach every dashboard with the wrong paths information.

3.3. System and Integration Tests for connection of R and Database

Test: System and Integration test
Methods: dbIsValid, isIdcurrent
Scripts: R language
Functions: connectionResult, test.connectionResult, test.DataRetrieveResult

- Integration test passed as expected, both of methods return TRUE boolean values for connection from R to our MySql database in server. We used bottom up method, starting with unit tests, than we tested connection first before retrieving data sets.
- Test for retrieving data successfully passed, now we able to access tables and values inside of them for future statistical computations.

4. Summary of the Tests Failed

Test: Alpha/Beta Testing
Methods: Surveying
Functions: Mobile Application and Functionality

- 7 out of 10 participants didn't like some parts of application and its functionality fully.
- Some of the participants suggested new operations about session handler, security deficiency, GUI design and notifications.

5. References

1. Testhat library, https://www.utest.com/tools/testhat
2. R test, https://www.r-bloggers.com/unit-testing-with-r/
3. NeoLoad, https://www.neotys.com/
4. Junit, https://junit.org/junit5/