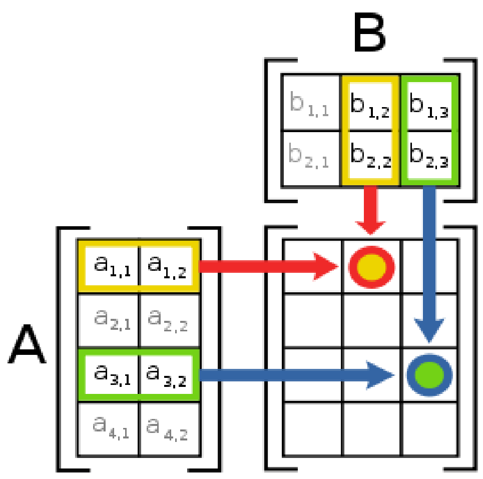
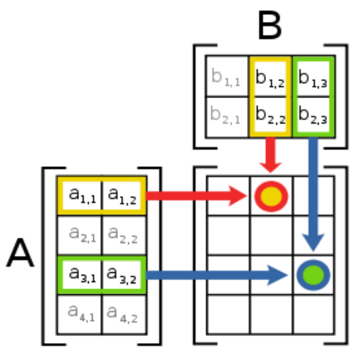


Matrix Calculator Model-based Testings Documentation

Ka Son Chan

Table of Contents



Matrix Calculator User Guide

Ka Son Chan

Prerequisites and steps for functional tests

- You have installed Eclipse, the Android SDK, and ADT.
- You have been able to deploy a Java application to an Android device (physical or virtual).

Step 1: Install Scala-IDE

- You have installed the Scala-IDE that matches your version of Eclipse.
- Scala IDE Lithium works with Eclipse 4.2 and 4.3 (Juno and Kepler). http://download.scala-ide.org/nightly-scala-ide-4.0.x-210x

Step 2: Install AndroidProguardScala

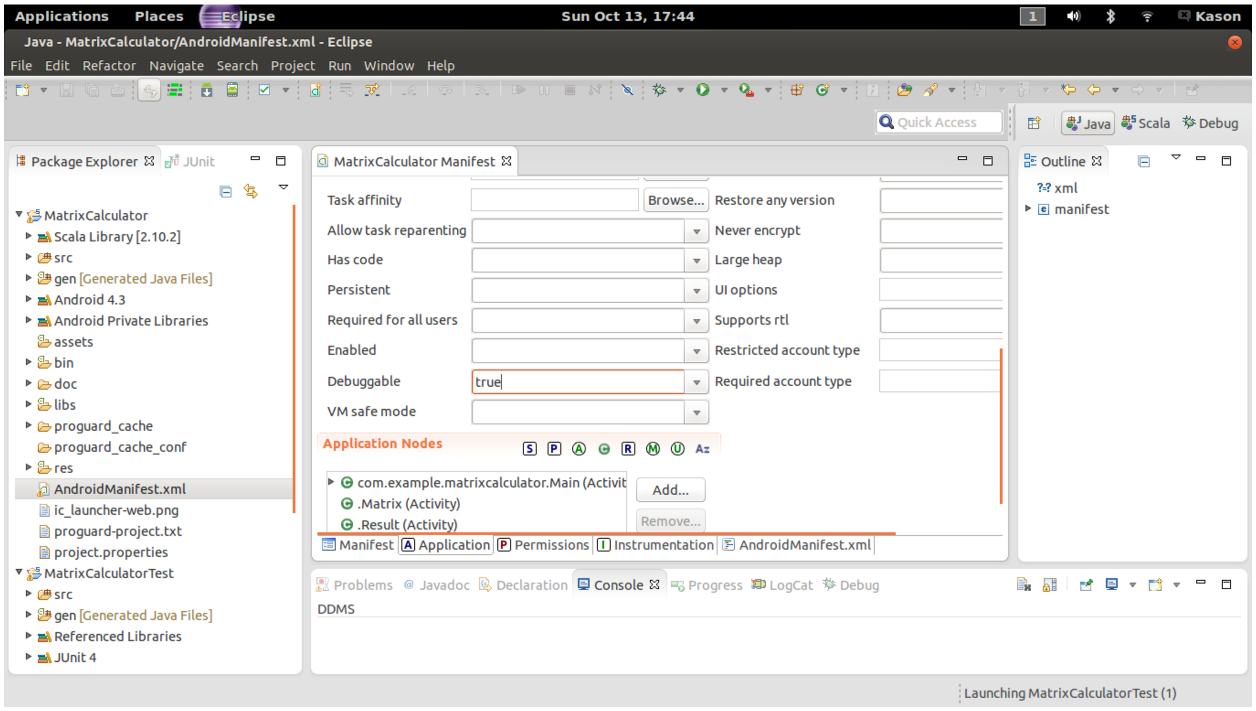
- Point Eclipse to the update site at https://androidproguardscala.s3.amazonaws.com/UpdateSiteForAndroidProguardScala and install.

Step 3: Download the zip files MatrixCalculator and MatrixCalculatorTest

- Unzip both MatrixCalculator and MatrixCalculatorTest files.
- Import them into Eclipse environment.

Step 4: Check MatrixCalculator Manifest

- As shown in Figure U1 below, Debuggable should equals to true in MatrixCalculator AndroidManifest.xml file.



Applications Places Eclipse
Sun Oct 13, 17:44
Kason
Java - MatrixCalculator/AndroidManifest.xml - Eclipse
File Edit Refactor Navigate Search Project Run Window Help
Quick Access
Java Scala Debug
Package Explorer
JUnit
MatrixCalculator
Scala Library [2.10.2]
src
gen [Generated Java Files]
Android 4.3
Android Private Libraries
assets
bin
doc
libs
proguard_cache
proguard_cache_conf
res
AndroidManifest.xml
ic_launcher-web.png
proguard-project.txt
project.properties
MatrixCalculatorTest
src
gen [Generated Java Files]
Referenced Libraries
JUnit 4
MatrixCalculator Manifest
Browse...
Application Nodes
Add...
Remove...
Manifest Application Permissions Instrumentation AndroidManifest.xml
Outline
xml
manifest
Problems Javadoc Declaration Console Progress LogCat Debug
DDMS
Launching MatrixCalculatorTest (1)

Task affinity
Allow task reparenting
Has code
Persistent
Required for all users
Enabled
Debuggable: true
VM safe mode
Restore any version
Never encrypt
Large heap
UI options
Supports rtl
Restricted account type
Required account type

com.example.matrixcalculator.Main (Activit
.Matrix (Activity)
.Result (Activity)

Figure U1

Step 5: Check MatrixCalculatorTest Build Path

- Remove All Android libraries if you see them in MatrixCalculatorTest Build Path.
- As shown in Figure U2 below, MatrixCalculatorTest Build Path should contain only Robotium and JUnit4 libraries.

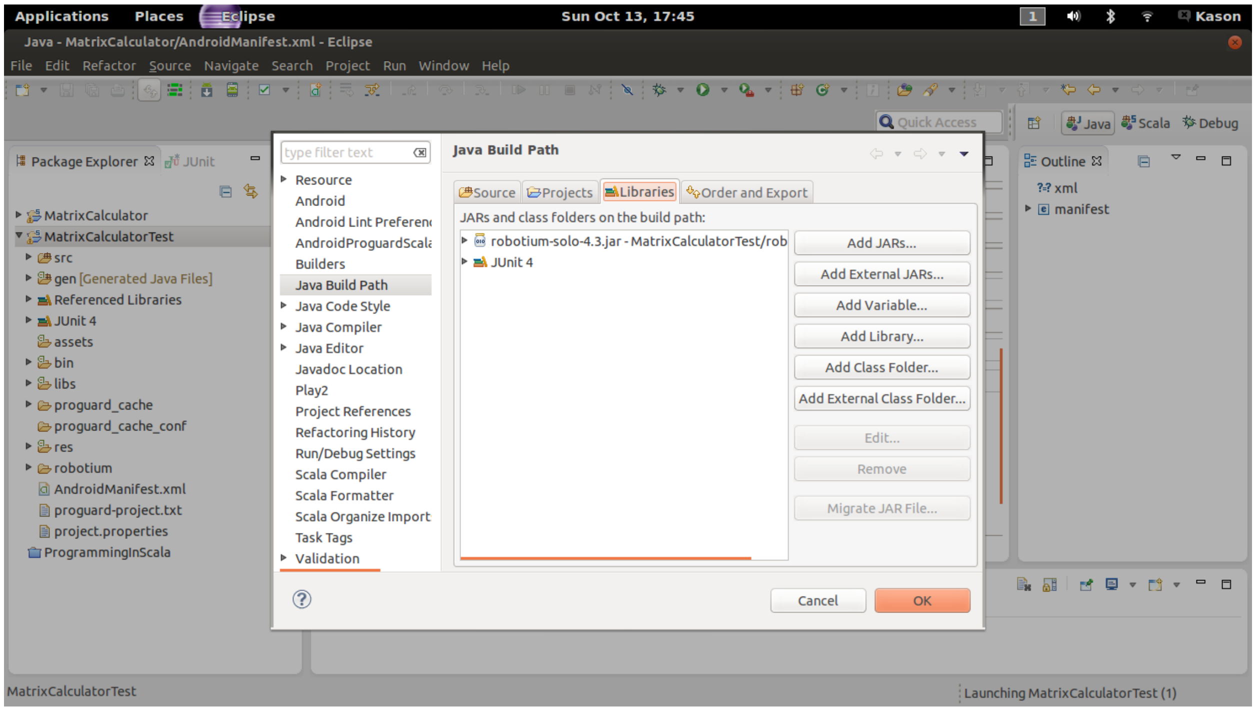


Figure U2

After installing all the prerequisites, Scala, AndroidProguardScala, you can import the source codes folder to Eclipse, compile and execute.

Steps to execute the functional tests:

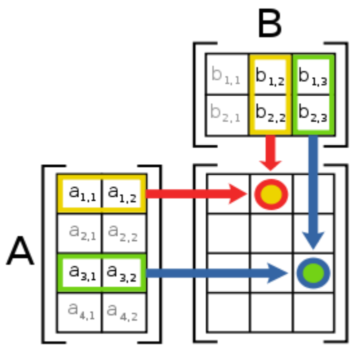
Step 1: Right click on the MatrixCalculatorTest folder in the Package Explorer.
Step 2: Choose Run as Android JUnit Test.

Notes:

- There are equivalent test cases listed below to the implementation in the MatrixCalculatorTest zip file. The implementations of each test case name starts with **test**. I.e. Activity Diagram Test Case (ADTC) number one is **testADTC01** and so forth.
- For easy reading, there are comma (,) and space between each test input written in the table below.
- There are two different status reports attached to the submission – **log.txt** and **MatrixCalculatorTest 20131028-195311.xml**

References:

- http://scala-ide.org/docs/tutorials/androiddevelopment/index.html
- https://code.google.com/p/robotium/
- http://www.youtube.com/watch?v=T_8euppCz3k



Matrix Calculator Requirements and Use Cases Specifications

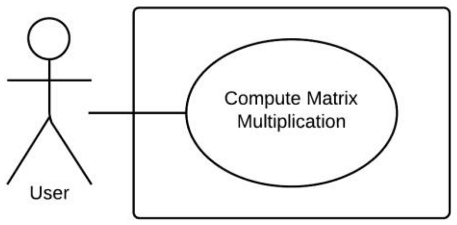
Ka Son Chan

This Matrix Calculator Multi-threaded Android Application allows the user to enter 2 matrices row and column sizes, the number data and performs matrix operation – Multiplication. This application is utilizing multi-threads in the operation, which enhance the speed of the application comparing to single thread app.

Below are the requirement specifications of the Matrix Calculator:

1. The application allows the user to enter two matrices row size values and two column size values that are to be numeric integer (1, 2, 3, 4, or 5).
2. The application allows the user to enter each matrices row and column size values that are to be one character in length.
3. The column size value of matrix 1 need to be equal to the row size value of matrix 2.
4. The application generates two empty matrices according to the user valid entries of row and column size values.
5. The application allows the user to enter positive or negative integers including numeric characters (0, 1, 2, 3, 4, 5, 6, 7, 8, and 9) and negative character (-) in the matrices values to the empty matrices values.
6. The application shows the correct result of positive or negative integers after the user entering valid matrices values and application operation.

Use Case Model



Use Case (UC):

- Compute Matrix Multiplication

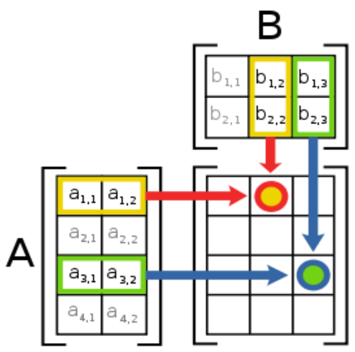
Use Case Name: Compute Matrix Multiplication
Summary: The user enters two matrices row and column size values, matrices values and get the result.
Actor: User
Precondition: The Matrix Calculator application system is launched.
Description:

1. The user enters two matrices row size values and two column size values.
2. The user selects the Generate button.
3. The system checks the user input sizes values.
4. If the user input sizes values are valid, the system generates and displays the empty matrices.
5. The user enters the matrices values.
6. The user selects the Compute button.
7. The system checks the user input matrices values.
8. If the user input matrices values are valid, the system computes the matrix multiplication.
9. The system displays the result matrix.

Alternatives:

- If the user selects the Generate button after leaving the matrices sizes value(s) empty, the system prints error message “Empty matrix row or column size. Enter size range between 1 and 5.”
- If the user selects the Generate button, after inputting size value(s) that is/are not between 1 and 5, the system prints error message “Empty matrix row or column size. Enter size range between 1 and 5.”
- If the user selects the Back button, the application prints the matrices sizes entry page.
- If the user input column size value of matrix 1 is not equal to the row size value of matrix 2, the system prints error message “Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.”
- If the user select the Compute button after leaving the matrices value(s) empty, the system display error message “Empty matrix.”
- If the user inputs “-” only, the system displays error message "Invalid matrix data "-"."
- If the user input(s) is/are invalid, the system displays error message "Invalid matrix data."
- If the user selects the Back button, the application prints the matrices values entry page.

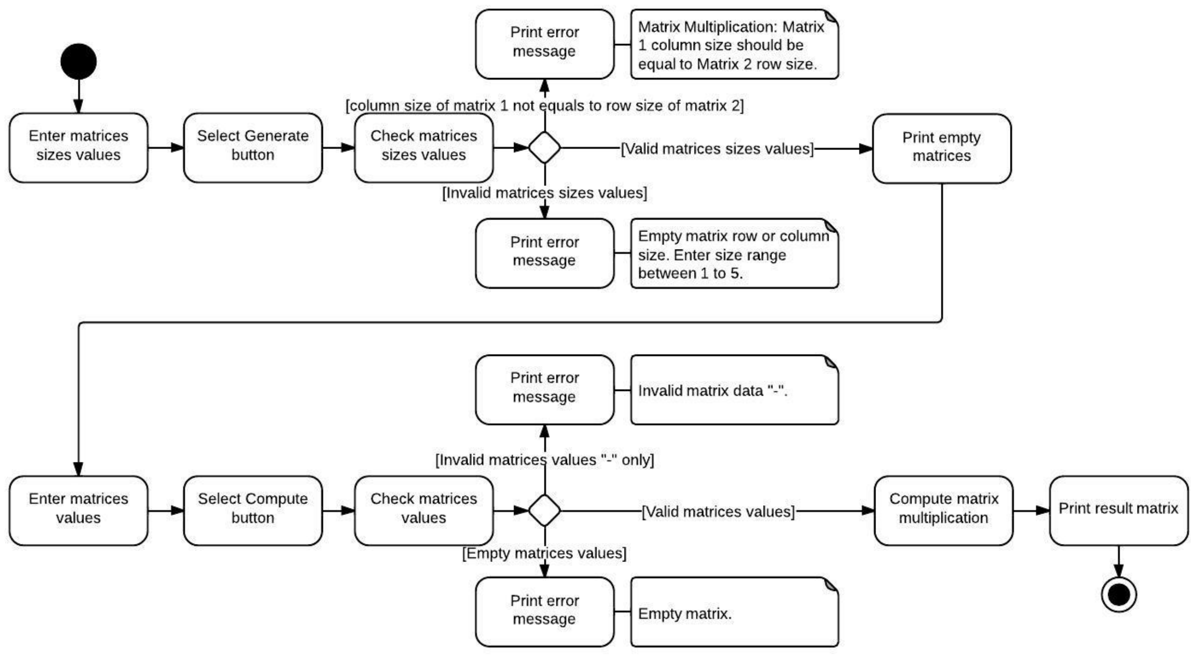
Postcondition: The result matrix is displayed.



Matrix Calculator Activity Diagrams and Test Cases

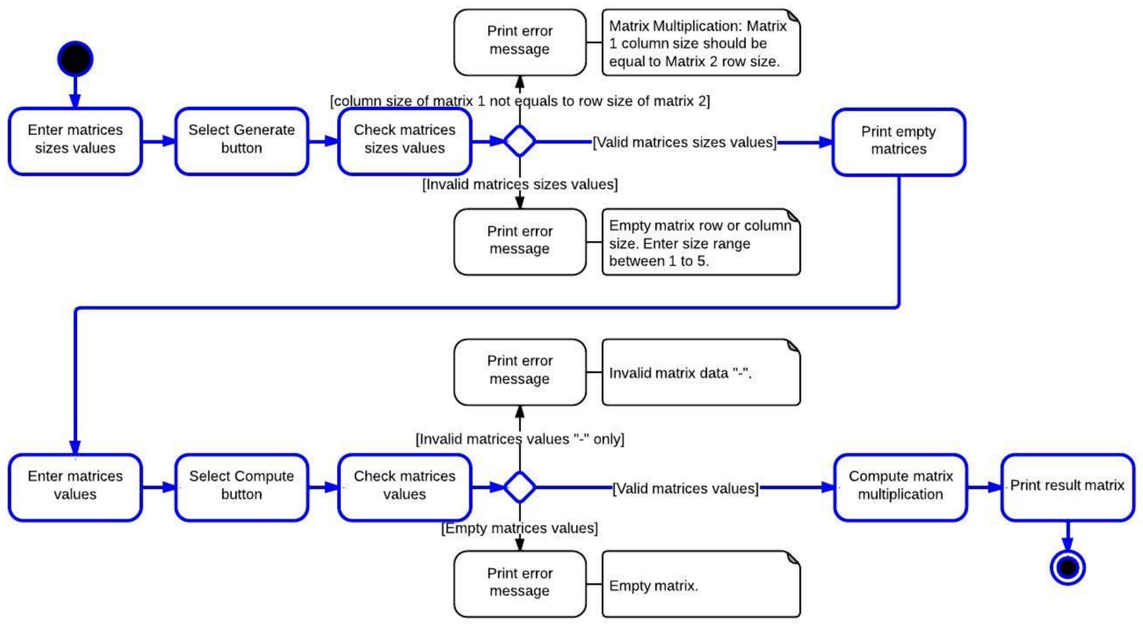
Ka Son Chan

Activity Diagram (AD)

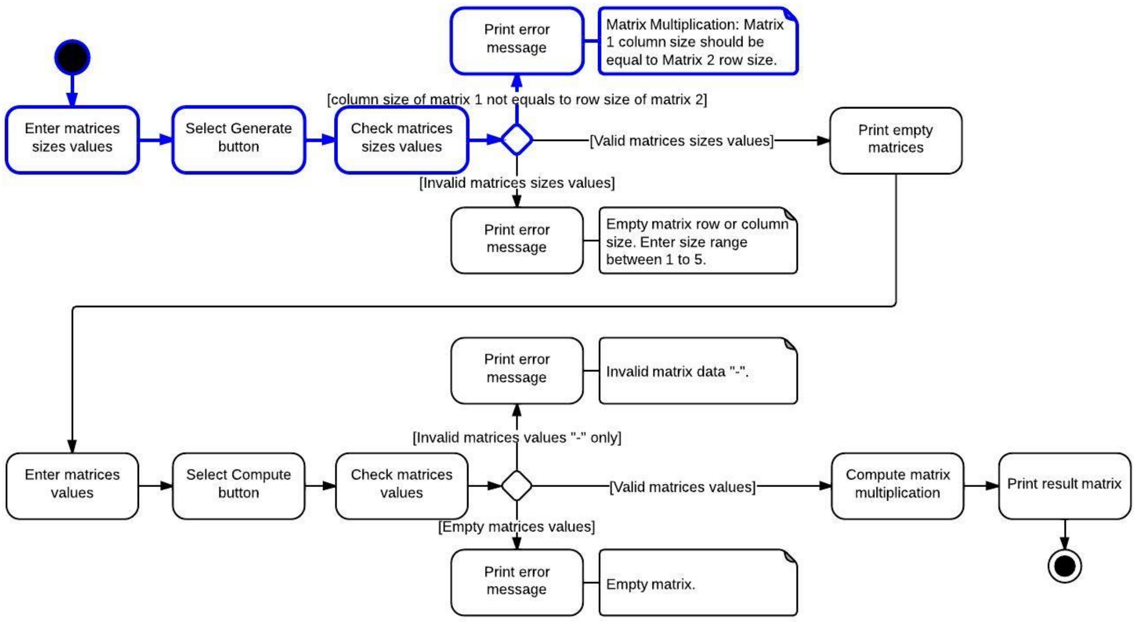

Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[column size of matrix 1 not equals to row size of matrix 2]
Enter matrices sizes values
Select Generate button
Check matrices sizes values
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.

Activity Diagram Test Cases (ADTC)

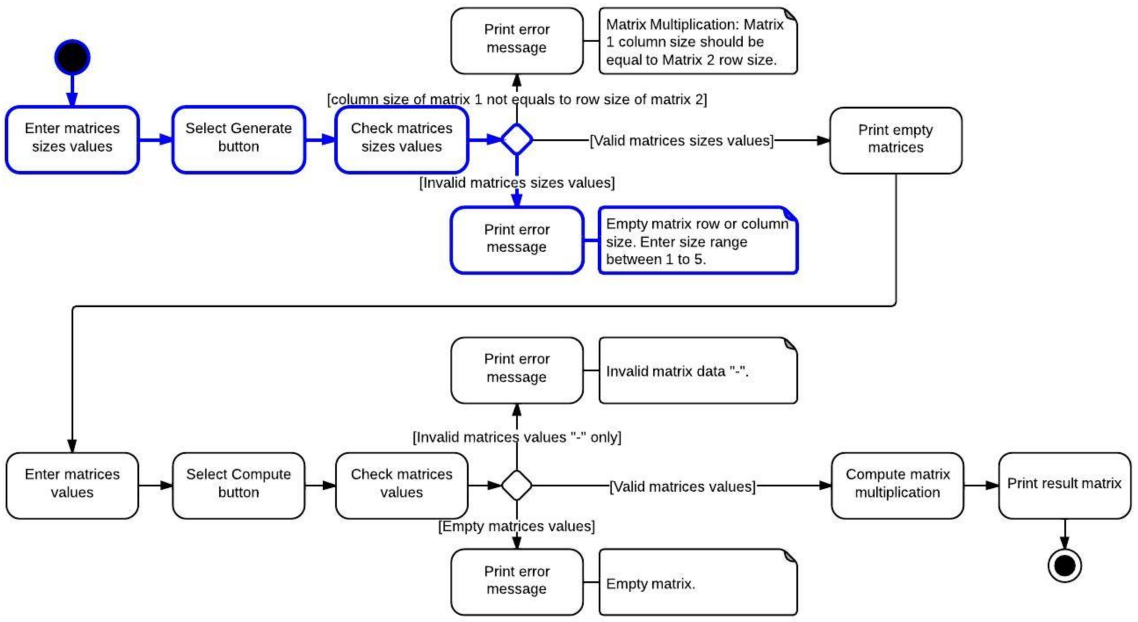
Test Case #	Test Input	Expected Output	Comments	Pass/Fail
ADTC01	1, 1, 1, 1 1, 2	2		Pass


Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[column size of matrix 1 not equals to row size of matrix 2]
Enter matrices sizes values
Select Generate button
Check matrices sizes values
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.

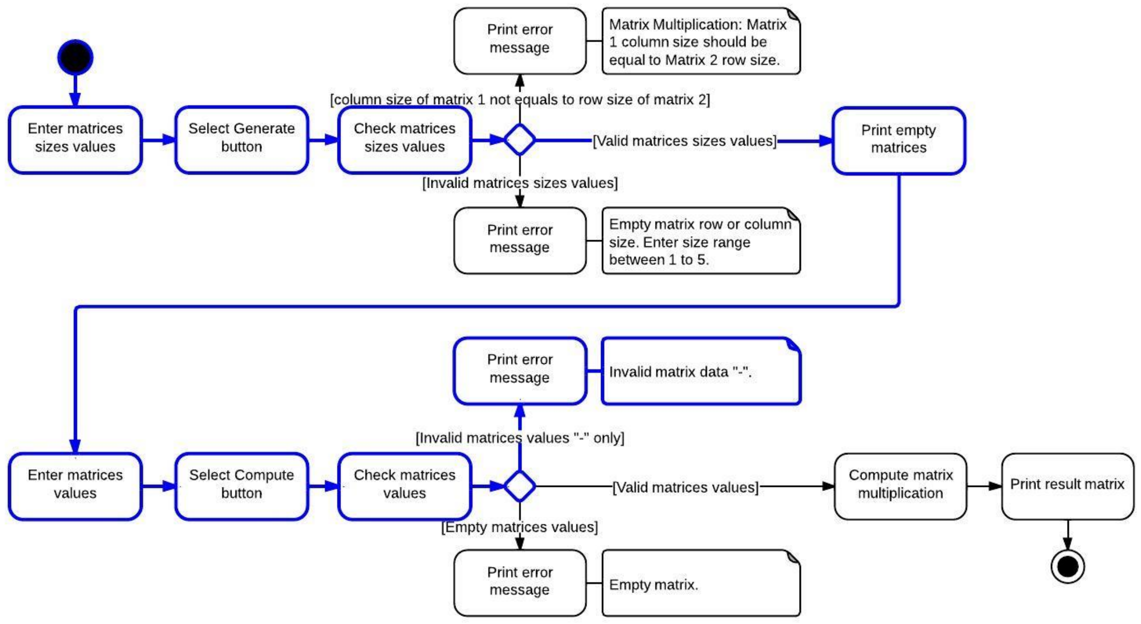
Test Case #	Test Input	Expected Output	Comments	Pass/Fail
ADTC02	1, 1, 2, 1	Error message		Pass


Enter matrices sizes values
Select Generate button
Check matrices sizes values
[column size of matrix 1 not equals to row size of matrix 2]
Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.

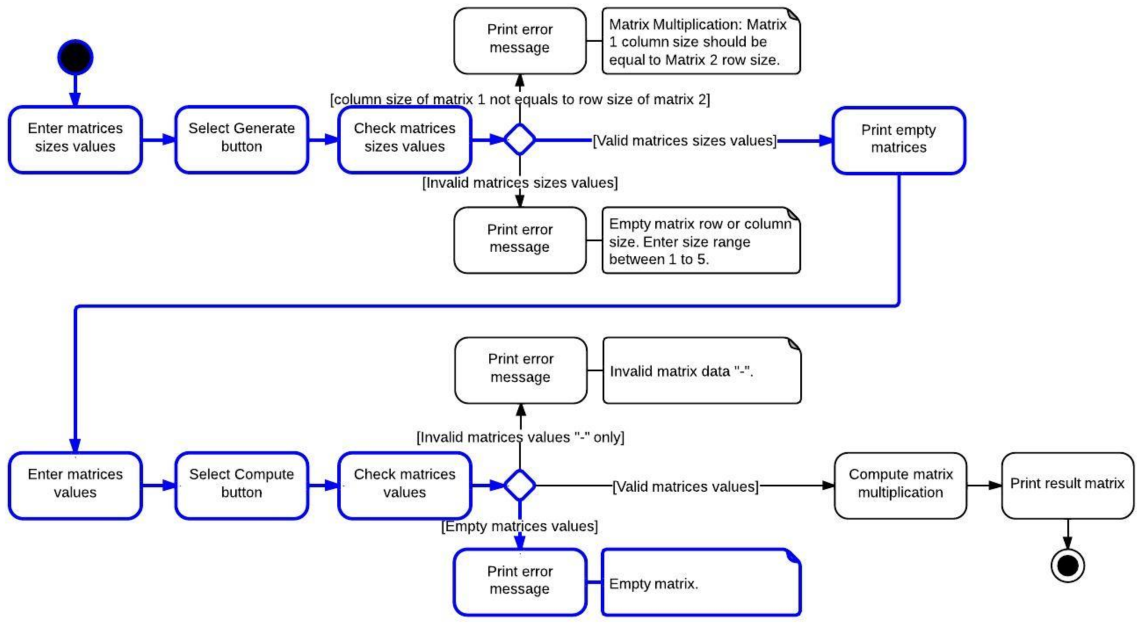
Test Case #	Test Input	Expected Output	Comments	Pass/Fail
ADTC03	1, 1, 1, 0	Error message		Pass

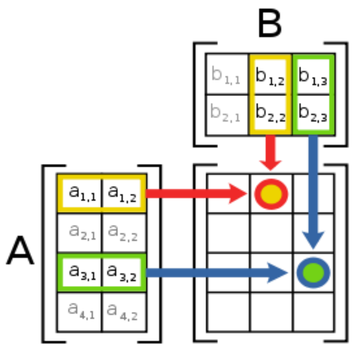

Enter matrices sizes values
Select Generate button
Check matrices sizes values
[column size of matrix 1 not equals to row size of matrix 2]
Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.

Test Case #	Test Input	Expected Output	Comments	Pass/Fail
ADTC04	1, 1, 1, 1 1, -	Error message		Pass


Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[column size of matrix 1 not equals to row size of matrix 2]
Enter matrices sizes values
Select Generate button
Check matrices sizes values
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.

Test Case #	Test Input	Expected Output	Comments	Pass/Fail
ADTC05	1, 1, 1, 1 1,	Error message		Pass

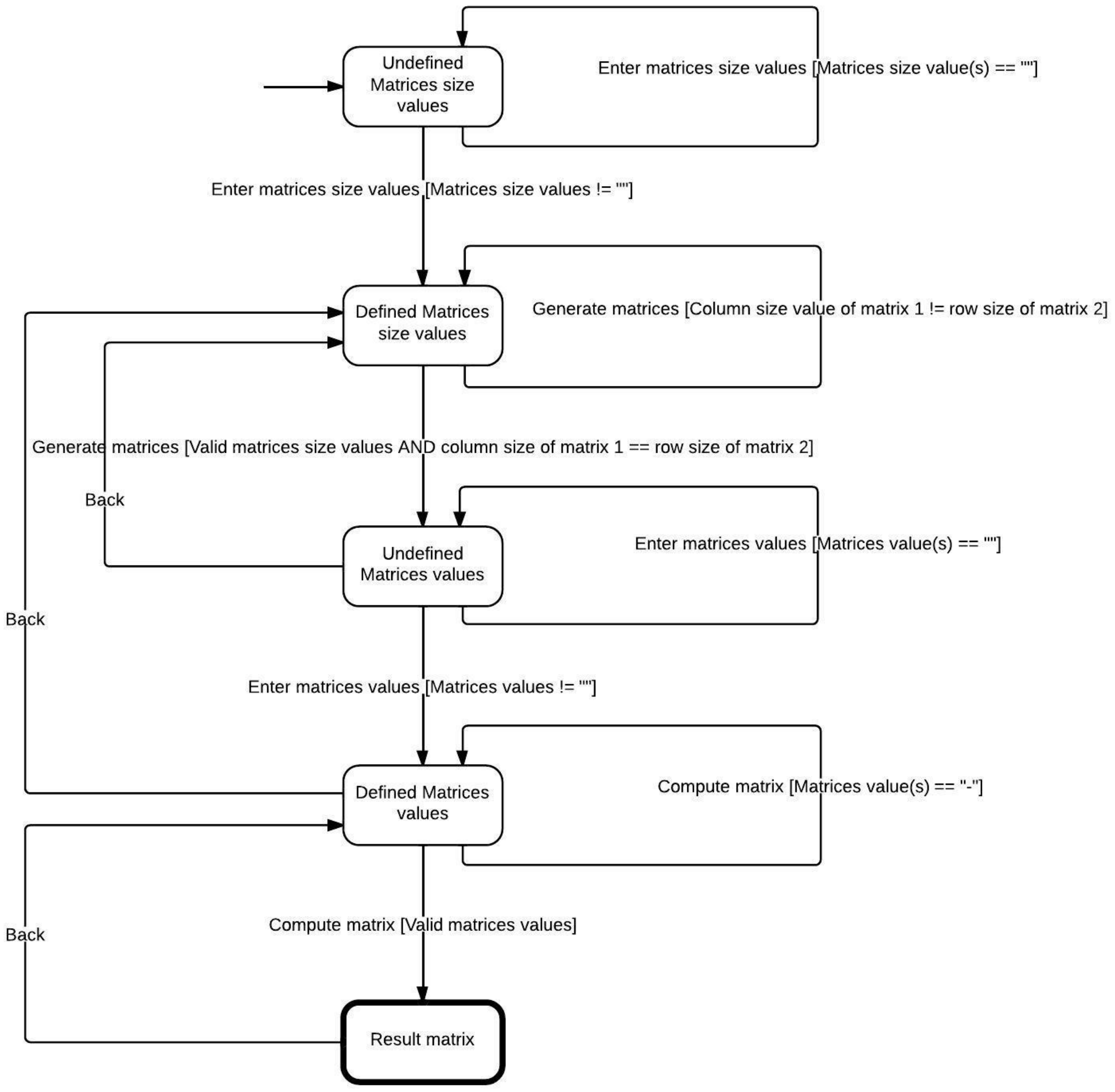

Print error message
Matrix Multiplication: Matrix 1 column size should be equal to Matrix 2 row size.
[column size of matrix 1 not equals to row size of matrix 2]
Enter matrices sizes values
Select Generate button
Check matrices sizes values
[Valid matrices sizes values]
Print empty matrices
[Invalid matrices sizes values]
Print error message
Empty matrix row or column size. Enter size range between 1 to 5.
Print error message
Invalid matrix data "-".
[Invalid matrices values "-" only]
Enter matrices values
Select Compute button
Check matrices values
[Valid matrices values]
Compute matrix multiplication
Print result matrix
[Empty matrices values]
Print error message
Empty matrix.



Matrix Calculator Finite State Machines and Test Cases

Ka Son Chan

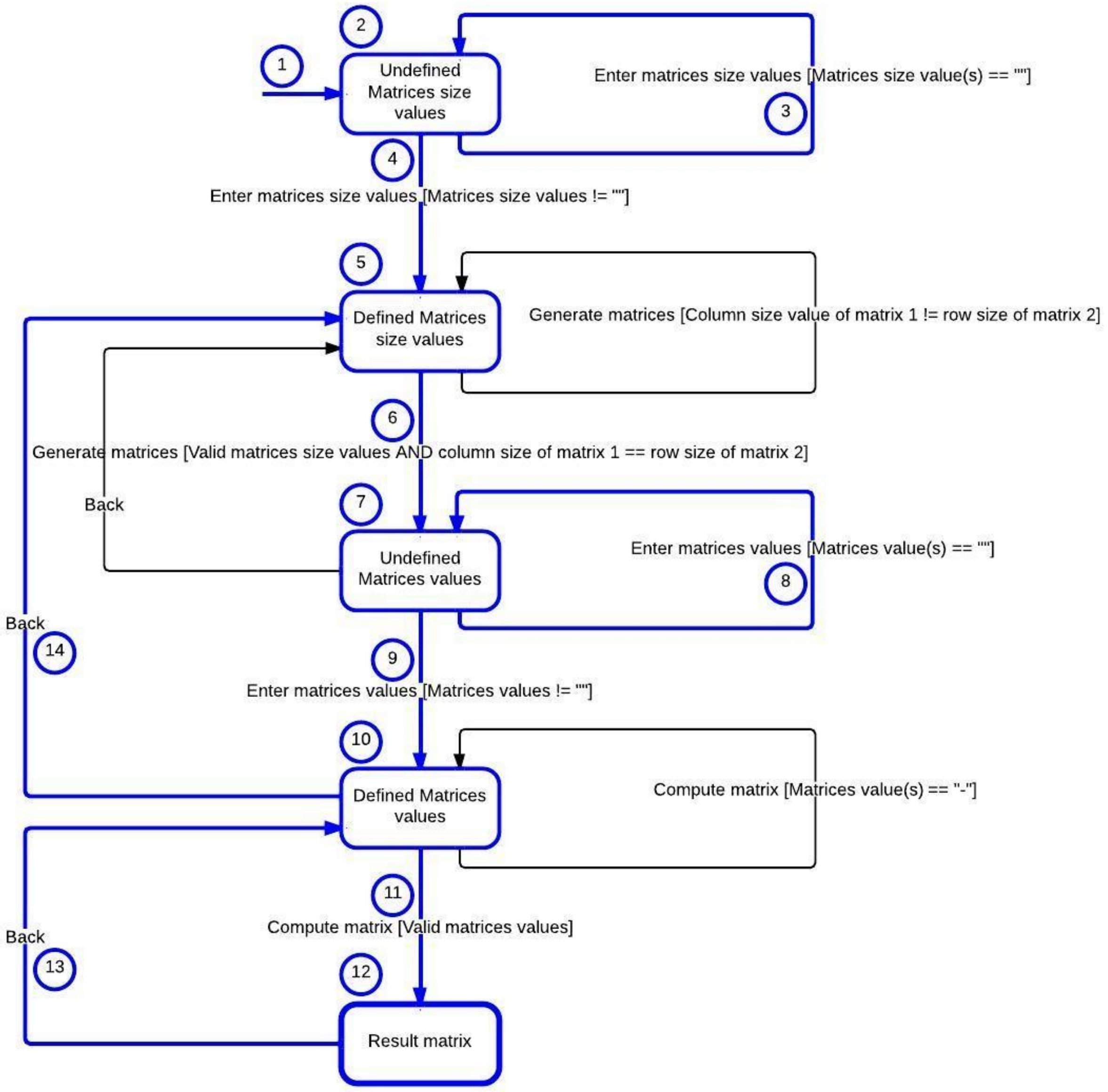
Finite State Machines (FSM)



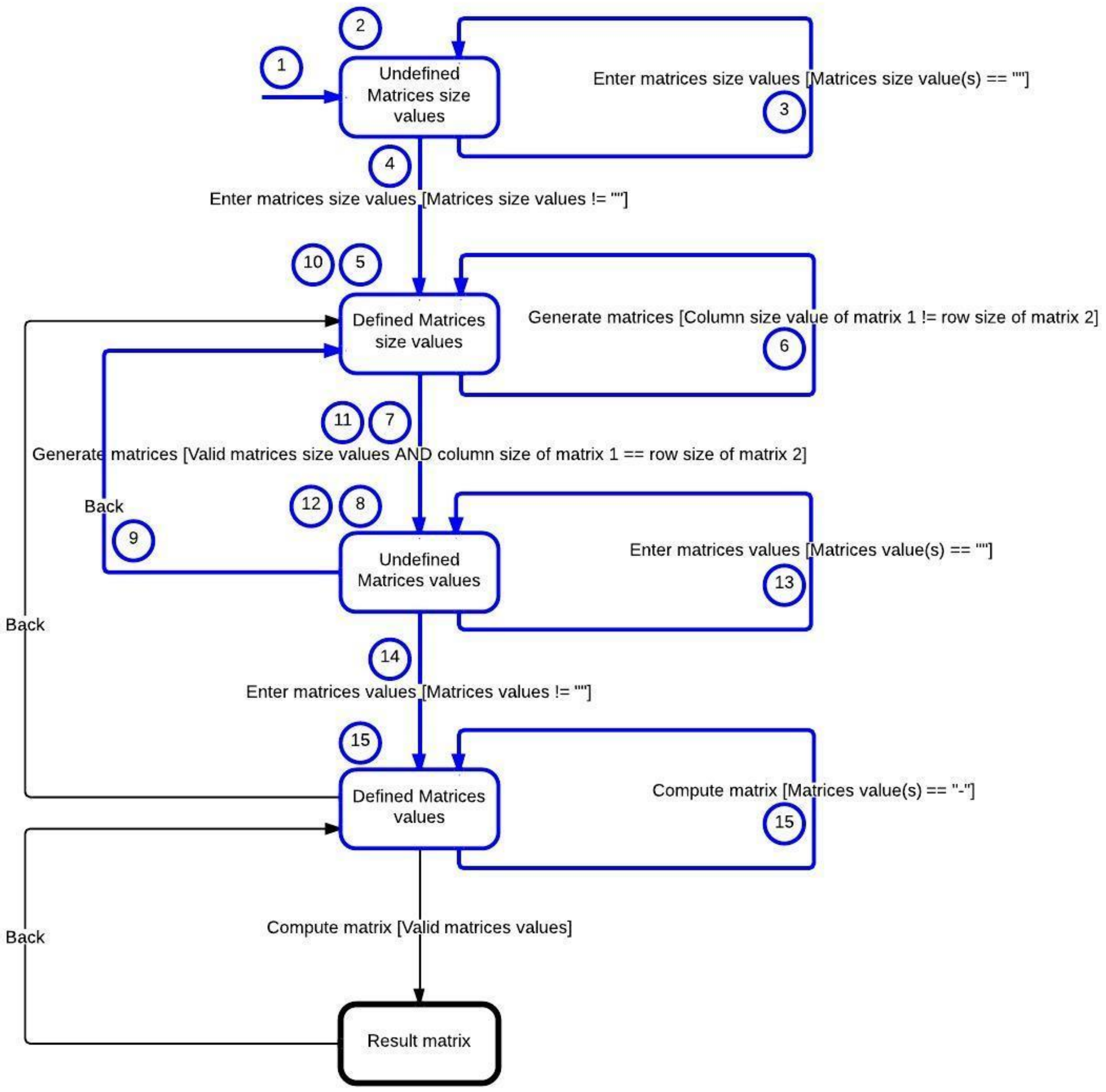
Undefined Matrices size values
Enter matrices size values [Matrices size value(s) == ""]
Enter matrices size values [Matrices size values != ""]
Defined Matrices size values
Generate matrices [Column size value of matrix 1 != row size of matrix 2]
Generate matrices [Valid matrices size values AND column size of matrix 1 == row size of matrix 2]
Back
Undefined Matrices values
Enter matrices values [Matrices value(s) == ""]
Back
Enter matrices values [Matrices values != ""]
Defined Matrices values
Compute matrix [Matrices value(s) == "-"]
Back
Compute matrix [Valid matrices values]
Result matrix

Finite State Machines Test Cases (FSMTC)

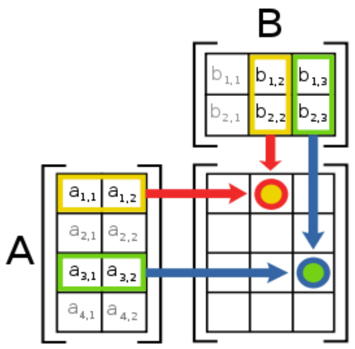
Test Case #	Test Input	Expected Output	Comments	Pass/Fail
FSMTC01	1, 1, 1, 1 3, 4	12		Pass


1
2
Undefined Matrices size values
Enter matrices size values [Matrices size value(s) == ""]
3
4
Enter matrices size values [Matrices size values != ""]
5
Defined Matrices size values
Generate matrices [Column size value of matrix 1 != row size of matrix 2]
6
Generate matrices [Valid matrices size values AND column size of matrix 1 == row size of matrix 2]
Back
7
Undefined Matrices values
Enter matrices values [Matrices value(s) == ""]
8
Back
14
9
Enter matrices values [Matrices values != ""]
10
Defined Matrices values
Compute matrix [Matrices value(s) == "-"]
11
Compute matrix [Valid matrices values]
Back
13
12
Result matrix

Test Case #	Test Input	Expected Output	Comments	Pass/Fail
FSMTC02	1, 1, 2, 1 1, 1, 1, 1 3, -	Error message		Pass



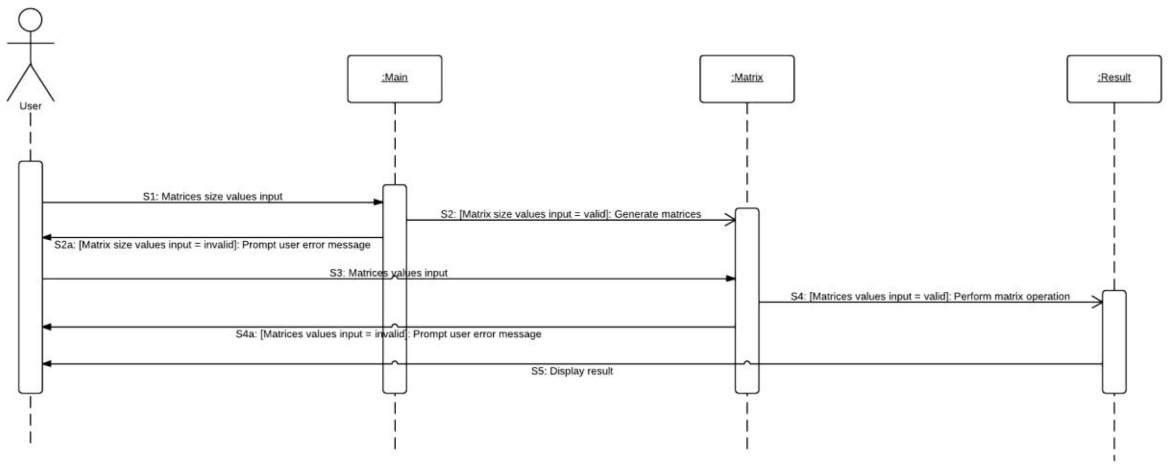
1
2
Undefined Matrices size values
Enter matrices size values [Matrices size value(s) == ""]
3
4
Enter matrices size values [Matrices size values != ""]
10
5
Defined Matrices size values
Generate matrices [Column size value of matrix 1 != row size of matrix 2]
6
11
7
Generate matrices [Valid matrices size values AND column size of matrix 1 == row size of matrix 2]
Back
9
12
8
Undefined Matrices values
Enter matrices values [Matrices value(s) == ""]
13
Back
14
Enter matrices values [Matrices values != ""]
15
Defined Matrices values
Compute matrix [Matrices value(s) == "-"]
15
Back
Compute matrix [Valid matrices values]
Result matrix



Matrix Calculator Sequence Diagrams and Test Cases

Ka Son Chan

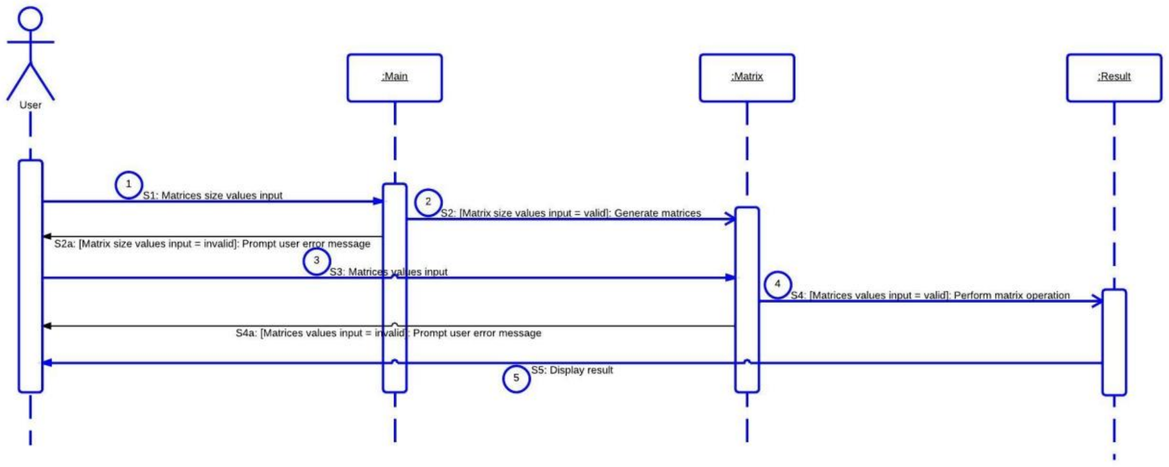
Sequence Diagram (SD)



User
:Main
:Matrix
:Result
S1: Matrices size values input
S2: [Matrix size values input = valid]: Generate matrices
S2a: [Matrix size values input = invalid]: Prompt user error message
S3: Matrices values input
S4: [Matrices values input = valid]: Perform matrix operation
S4a: [Matrices values input = invalid]: Prompt user error message
S5: Display result

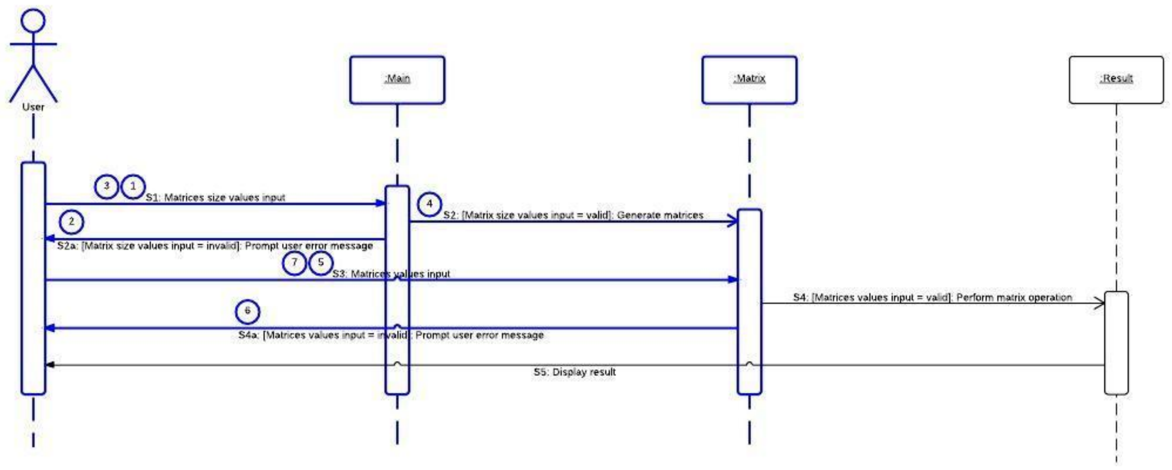
Sequence Diagram Test Cases (SDTC)

Test Case #	Test Input	Expected Output	Comments	Pass/Fail
SDTC01	1, 1, 1, 1 3, 4	12		Pass



User
:Main
:Matrix
:Result
1
S1: Matrices size values input
2
S2: [Matrix size values input = valid]: Generate matrices
S2a: [Matrix size values input = invalid]: Prompt user error message
3
S3: Matrices values input
4
S4: [Matrices values input = valid]: Perform matrix operation
S4a: [Matrices values input = invalid]: Prompt user error message
5
S5: Display result

Test Case #	Test Input	Expected Output	Comments	Pass/Fail
SDTC02	1, 2, 1, 1 1, 1, 1, 1 3, -	Error message		Pass


User
:Main
:Matrix
:Result
3
1
S1: Matrices size values input
4
S2: [Matrix size values input = valid]: Generate matrices
2
S2a: [Matrix size values input = invalid]: Prompt user error message
7
5
S3: Matrices values input
S4: [Matrices values input = valid]: Perform matrix operation
6
S4a: [Matrices values input = invalid]: Prompt user error message
S5: Display result