Matrix Calculator

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CERTIFICATE

This is to certify that the report entitled "**Matrix Calculator**" is a bonafied work carried out by **Milan A. Sonagra (15IT133)** and **Abhishek P. Soni (15IT134)** under the guidance and supervision of **Mr. Pritesh N. Prajapati** for the subject **Software Group Project-II (IT215)** of **4th** Semester of Bachelor of Technology in **Information Technology** at Faculty of Technology & Engineering – CHARUSAT, Gujarat.

To the best of my knowledge and belief, this work embodies the work of candidates themselves, have duly been completed, and fulfills the requirement of the ordinance relating to the B.Tech. Degree of the University and is up to the standard in respect of content, presentation and language for being referred to the examiner.

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- Abhishek Soni (15IT134)

ABSTRACT

At the time of studying Engineering Mathematics - I and II, and specially the portion of matrix, students like us may face the problem to find the correct answer of matrix summation and other operations. Therefore, we decided to develop an application as our project, which will help in overcoming the problem by getting the work done using a computer. The project can perform various operations on matrix like addition, subtraction, multiplication, transpose, inverse, adjoint, determinant etc. for m×n matrix. Matrix is also useful for IT field. It is used in Image processing, Networking, etc. And we think, we can better understand all of this thinks if we create a project on this. Mostly the matrix calculator is useful for 1^{st} and 2^{nd} year students who studies matrix. There are another software, named MATLAB, is also available which performs this kind of operations, but this calculator is useful for them who initially start the study of matrix.

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Chapter 1: Introduction

1.1 Project Overview

Matrix calculator is perform all the operations like addition, subtraction, multiplication, inverse, determinant etc. We make it in the Java Programming language. We use the swing to develop this calculator.

1.2 Scope

Scope of this matrix calculator is that it might be useful in the Mathematics Department. Another thing is that it is useful for 11th-12th or 1st year engineering students who are might be not aware about the MATLAB. In our Information Technology field matrix play the very much important role like in Cryptography, Image Processing etc.

1.3 Objective

In this calculator, we provide the best comfortability to the user. Using our calculator user can easily calculate the any operations on the matrix. There are also matrix calculator available on the internet but it can perform only n x n order operations while our calculator can perform any operations on the m x n order matrix. Our objective to make this calculator is who are currently studying in the 11th -12th or in the 1st year of Engineering who may face the the problem to get the correct result of matrix operations to help them.

Chapter 2: System Requirements Study

2.11 User Characteristics

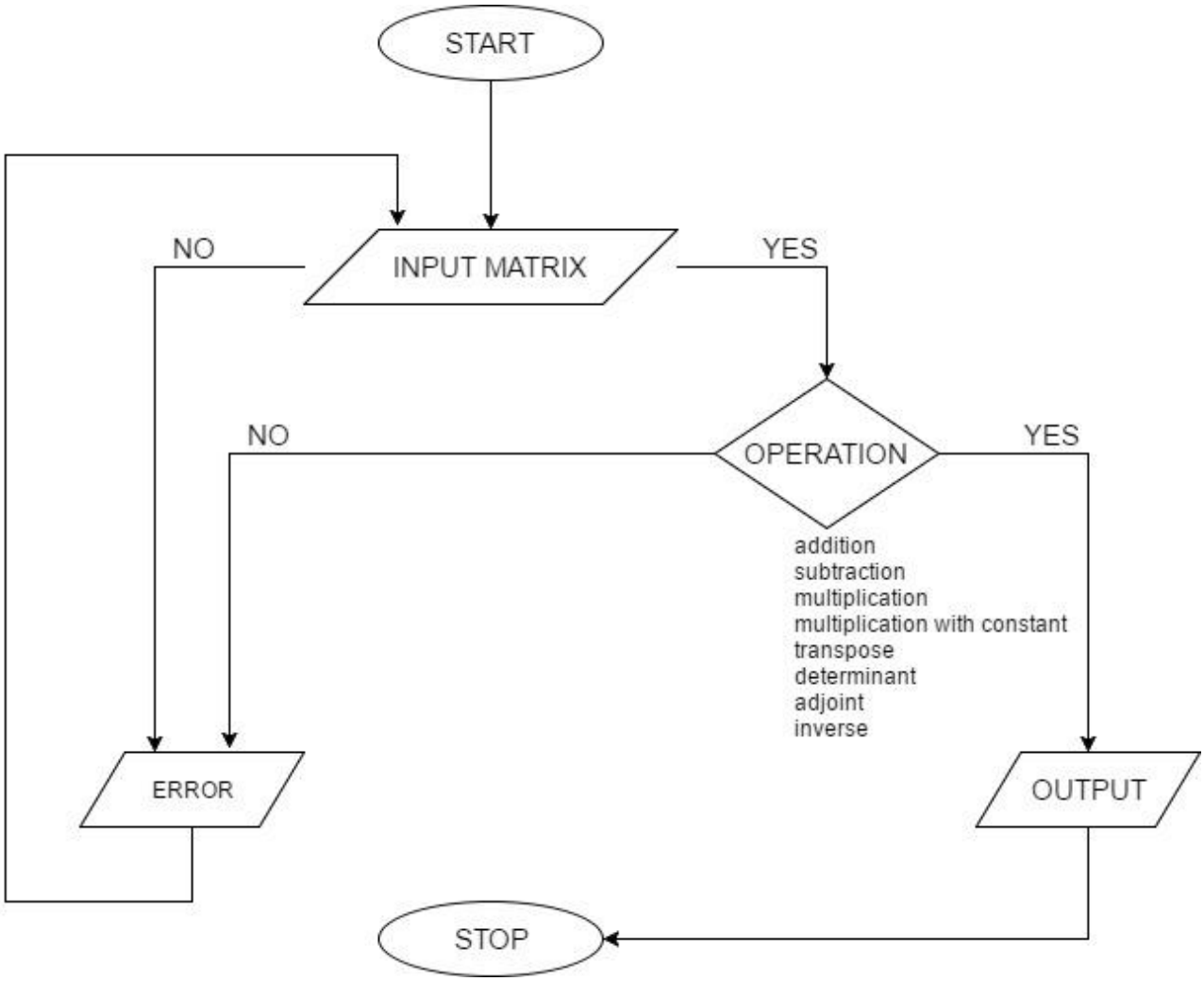
We design our calculator such as anyone can easily access it. It is very similar to this calculator which is in our Personal Computers or laptops. Users need not any special requirement to access this calculator.

2.12 Tools & Technology Used

To develop our project we used the Netbeans IDE (8.2) because it is easy and better platform to develop any java language code at student level. It is true that there are also other platforms to develop our project like Eclipse etc. but Netbeans is more comfortable for us. We use the Java Development Kit 8.2(JDK) to support java code. To run our calculator user require only Java Runtime Environment (JRE) and Java Development Kit (JDK) with version 7.0 or latest version.

Chapter 3: System Design

3.1 Project Flow



3.2 Major Functionality:

- It can perform any operations on the order of m x n.
- Platform independent
- It will warn if user enter the any wrong or in-correct input.
- Perform Operations like,
  - Addition, Subtraction,
  - Multiplication, square
  - Multiplication with constant
  - Transpose
  - Determinant

- Adjoint
- Inverse

➢ User can insert decimal point only once for each element.

➢ User can see the operation's information, he/she perfumes last.

E.g. if it is addition of Matrix-A and Matrix-B; stores answer in Matrix-C,

The **Info** button show the information on screen as,

Matrix-A

+

Matrix-B

=

Matrix-C

➢ It is user friendly By GUI.

3.3 GUI snapshots

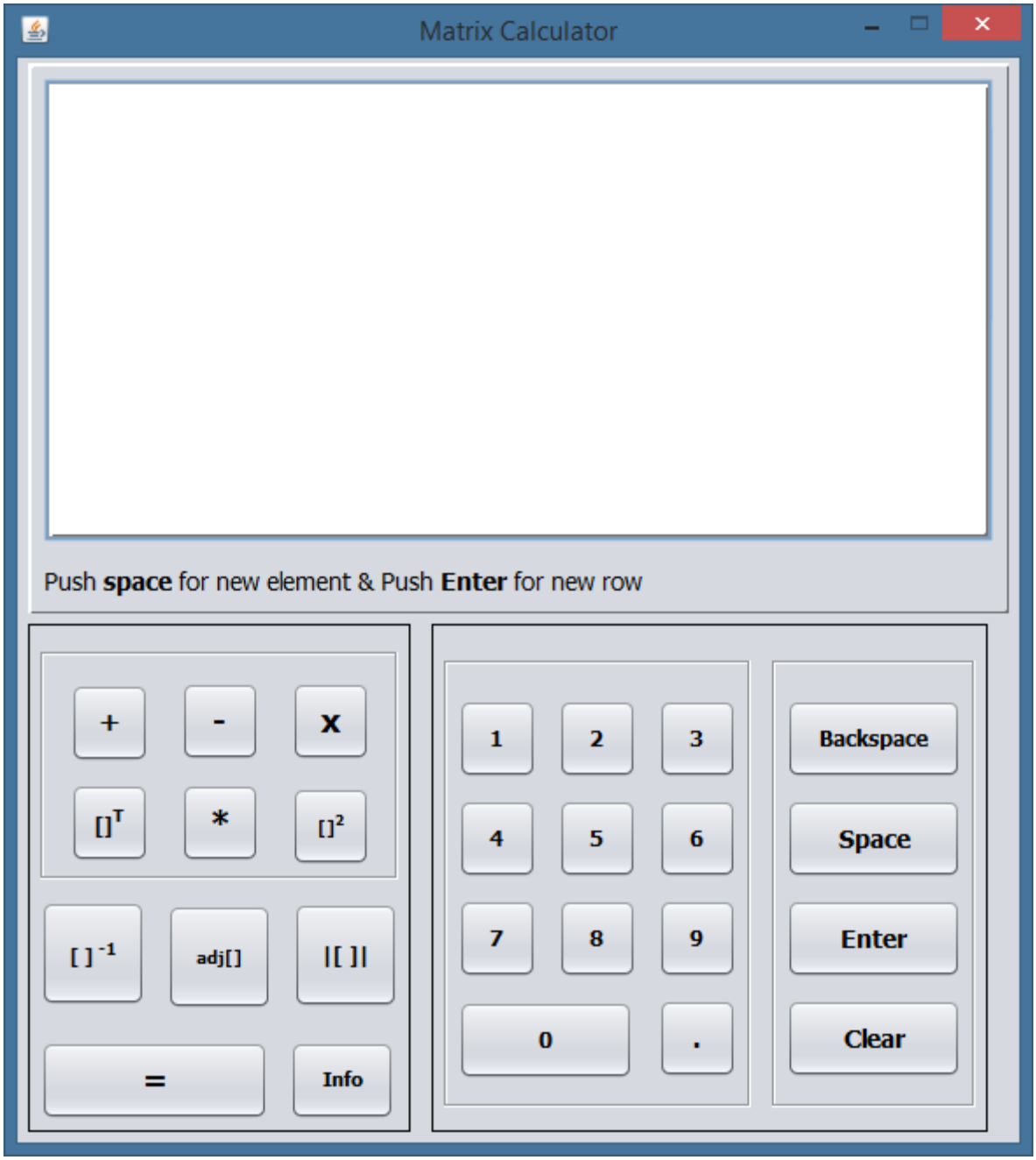


Fig 3.1 Main Window

Chapter 4: Implementation Planning

4.1 Implementation Environment

We implement the project in Windows 8.2 and Windows 10 using Netbeans IDE (8.2) and jdk 8.2. Netbeans is one of the best tool for beginners of starting java. It is provide drag & drop feature for swing programming.

4.2 Program / Modules Specification

In our calculator, we all are know user must provide the input of a matrix. In this input section if user provide the in-correct input like number of row/column is zero then it will display the message like invalid input. Another section like Determinant, in this section we know that determinant is only possible if order is n x n otherwise not. If these conditions are satisfy than it will give the correct answer. Another section Multiplication, we know that matrix multiplication is only possible if number of 1st matrix's column and 2nd matrix's row is equal. If these conditions are satisfy than it will give the correct answer.

4.3 Coding Standards

We implement the code as like that anyone can easily understand that. All the name of methods and variables are in camel-case. And we add comment each and every ware.

This is a demo of pseudo code of a method named addition

```
public Matrix addition(Matrix Mat2)
{
	Matrix Ans = new Matrix(this.r , this.c);		/*TEMP. STORE ANSWER*/
	for(int i=0 ; i<=r ; i++)
	{
		for(int j=0 ; j<=c ; j++)
		{
			Ans.M[i][j] = this.M[i][j] + Mat2.M[i][j] ; /*ADD ELEMENT*/
		}
	}
	Return Ans;
}
```

4.4 Snapshots of project

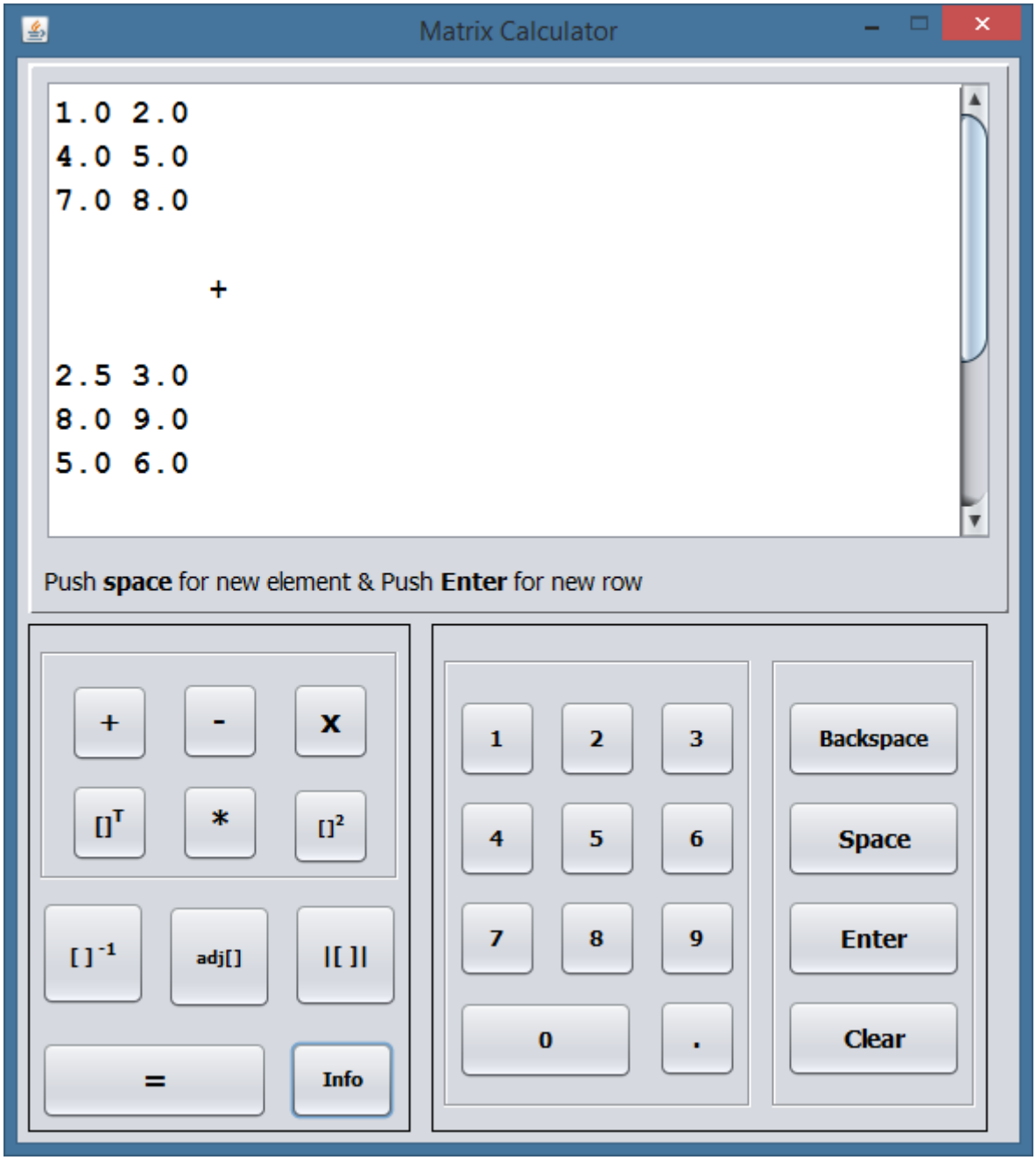


Fig 4.1 Main Window (with addition)

Fig. 4.2 Error popup for invalid input

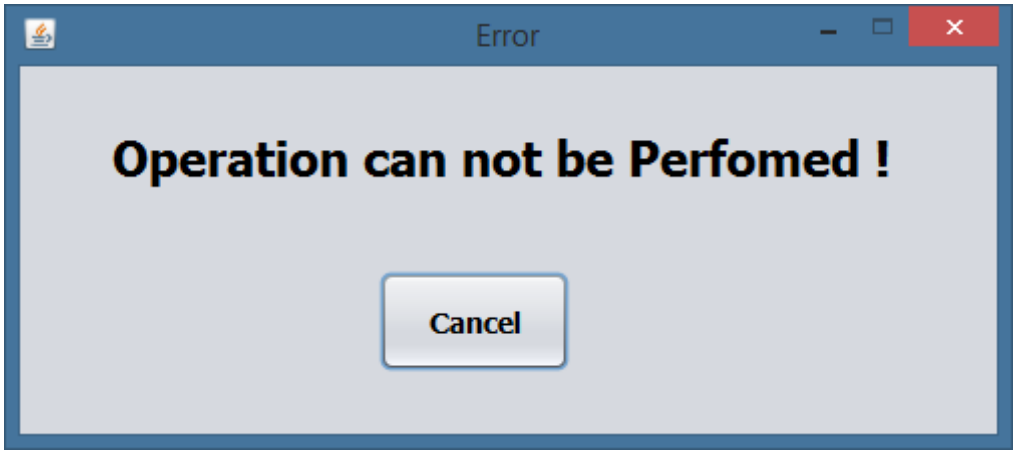


Fig. 4.3 Error popup for operation not preformed

Chapter 5: Constraints and Future Enhancement

❖ Limitations:

There are also some limitations of our calculator like,

- It will not perform the operations like,
  - Row/ column operations
  - Rank/ Nullity
  - Row Echelon Form
- User can not enter the value using key-board because using this user can enter alphabets which is not correct input.
- Inverse is possible only for 2 x 2 matrix.
- There are also some bugs like,
  - User cannot enter decimal point after removed once.
  - It will generate more then one popup box for one wrong input.

❖ Future Enhancement:

- Anyone try to add more useful operations of matrix like,
  - Row/ column operation
  - Rank/ Nullity
  - Modulo with constant
  - Row Echelon Form
  - Eigan value & Eigan vactor
  - Power ‘n’
- Try fix the bugs.
- Input using keyboard.

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Chapter 6 : Conclusion

Matrix calculator can perform the the perform the bsic operayions of matrix like addition, subtraction, multiplication, determinant, adjoint, inverse, transpose etc. with all the validation like display the in-correct or error mesaages.

After completion of our project we learnt Java Programming language very well, In this we learnt some concepts of Object Oriented Programming languages are useful real life application. Also, we learnt how to do project in group. During project which difficulties arises and how to solve it. Another thing we learnt that how to complete the tasks in specific time period. At the end we learnt lots of things during project.

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