User Manual

MIPS CALCULATOR – CS 402 PROJECT

RUSSI SINHA
A20411286

CONTENTS

1. INTRODUCTION

This project consists of a calculator which has few of the basic arithmetic operations and numeric conversions. It is coded using MIPS assembly language and is executable using SPIM (MIPS simulator).
The program consists of few of the basic arithmetic operations like 'Addition', 'Subtraction', 'Multiplication', and 'Division'.
It also consists of a list of conversion options to convert input values between hexadecimal, decimal, and binary.
The calculator is easy to use since the User Interface is very simple to understand and provides all details required for the user to understand without any hassles.
prompts are provided at every step for inputs required from the user, whether it be an option from the menu list or an input for conversion or performing some arithmetic operation.

2. GETTING STARTED

The program is coded using MIPS assembly language. A MIPS simulator (eg. SPIM) is required to execute the program. The program is to be loaded on to the simulator and just hit 'Run'. The program will automatically start running from its main function.

3. CALCULATOR MENU

This is simple calculator with some basic arithmetic operations.
When the program starts, the first menu is displayed as below:

```
MIPS Calculator Menu
====================
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Conversions
6. Exit

Enter your choice:
```

It asks the user to provide the option number corresponding to which operation the user would like to perform (1 - 4).
If the user desires to perform addition, the input provided by the user should be 1.
After the selection the user needs to provide two operands when the message is displayed as below:

```
First operand:
```
----- for first operand

```
Second operand:
```
----- for second operand

After the user has provided the two operands the program performs the specified operation (operation specified by user in previous step) and displays the result as below:

```
Result: ##
```
----- display result value instead of '##'

After the result has been displayed, the program starts over and goes back to the main menu for the user to perform another arithmetic operation.
The various arithmetic operations and their corresponding input codes required by user to perform the operation are mentioned below:

Arithmetic operation	User input code
Addition	1
Subtraction	2
Multiplication	3
Division	4
Conversions	5
Exit	6

For conversion menu, go to section 4.
The main menu is displayed every time after each operation is completed and the result is displayed. This continues until the user wants to quit the program (section 5).

If the user tries to provide an input option which is not in the menu, it will display an error message as below:

```
Invalid input. Please try again!
```

The menu options will be displayed again and ask the user for a valid input.

4. CONVERSION MENU

Option 5 of the main menu is the conversion operation. Selecting this option will display another menu with a list of options as below:

```
MIPS Conversions Menu
=====================
1. Decimal to Binary
2. Decimal to Hexa
3. Binary to Decimal
4. Binary to Hexa
5. Hexa to Decimal
6. Hexa to Binary
7. Back to Main Menu
8. Exit

Enter your choice:
```

At this step the user needs to provide the option number corresponding to which conversion the user wants to perform.
If the user desires to perform “Decimal to binary” conversion, the input provided by the user should be 1.
After the selection the user needs to provide decimal value which the user wants to convert to binary when the message is displayed as below:

```
Provide decimal value:
```
----- provide decimal input

After the user has provided the decimal input the program performs the specified conversion (specified by user in previous step) and displays the converted result as below:

```
Result: ##
```
----- display converted result instead of '##'

After the converted value has been displayed, the program starts over and goes back to the main menu for the user to select another operation to perform.
The various conversion operations and their corresponding input codes required by user to perform the conversion are mentioned below:

Arithmetic operation	User input code
Decimal to binary	1
Decimal to hexa	2
Binary to decimal	3
Binary to hexa	4
Hexa to decimal	5
Hexa to binary	6
Back to main menu	7
Exit	8

The user can go back to previous menu (calculator menu) by the selecting the appropriate option (input 7). See section 3 for more details.
The main menu is displayed every time after each operation is completed and the result is displayed. This continues until the user wants to quit the program (section 5).

If the user tries to provide an input option which is not in the menu, it will display an error message as below:

```
Invalid input. Please try again!
```

The main menu options will be displayed again and ask the user for a valid input.

5. QUIT PROGRAM

The user can quit the program from either of the menus (calculator menu or conversion menu) by select the appropriate option

i. In calculator menu, user input ‘6’
ii. In conversion menu, user input ‘8’

When the user selects the quit option, the following message is displayed:

```
Goodbye!
```

And the program stops executing.

6. SELF EVALUATION

The feature that does not currently exist in the MIPS calculator is the validation of input characters. The input validation currently only exists in the menu option selection (calculator menu and the conversion menu). It has not been implemented during input of operand values and input of conversion values.