Project Design Document

Project: Tip Calculator

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Detailed Feature Descriptions

Percentage Calculation

The basic function of the calculator, this function will take any given number, and multiply it by any user given percentage. This percentage will be given as a whole number to facilitate calculation through basic multiplication of two numbers.

Stack

This data structure will store the given values inputted by the user and will be critical in error detection. To pop off the stack is to remove a value from the stack to be used in calculations.

ASCII Character Handling

We need the computer to understand the user input, so we will need to convert the characters that are input into binary to avoid miscalculations. These will then be put into the stack to store until it is time to perform the operation of multiplying, or the output of an error message if input incorrectly. At the end if no errors are detected, the output will be converted to decimal in order to be readable to the user.

Data Architecture

We will be using two's complement integers to perform the necessary calculations. In decimal these will be within a range of 0 to 328, as that is the highest number that can be used in a calculation of 16 bits finding up to 100% of the value.

User Interface

ASCII Characters

Not all ASCII characters fit within the parameters of a tip calculator, so only relevant characters will be recorded in the stack, and any others will result in an error message. The user will not be required to input operators, only numbers and if necessary, a decimal point.

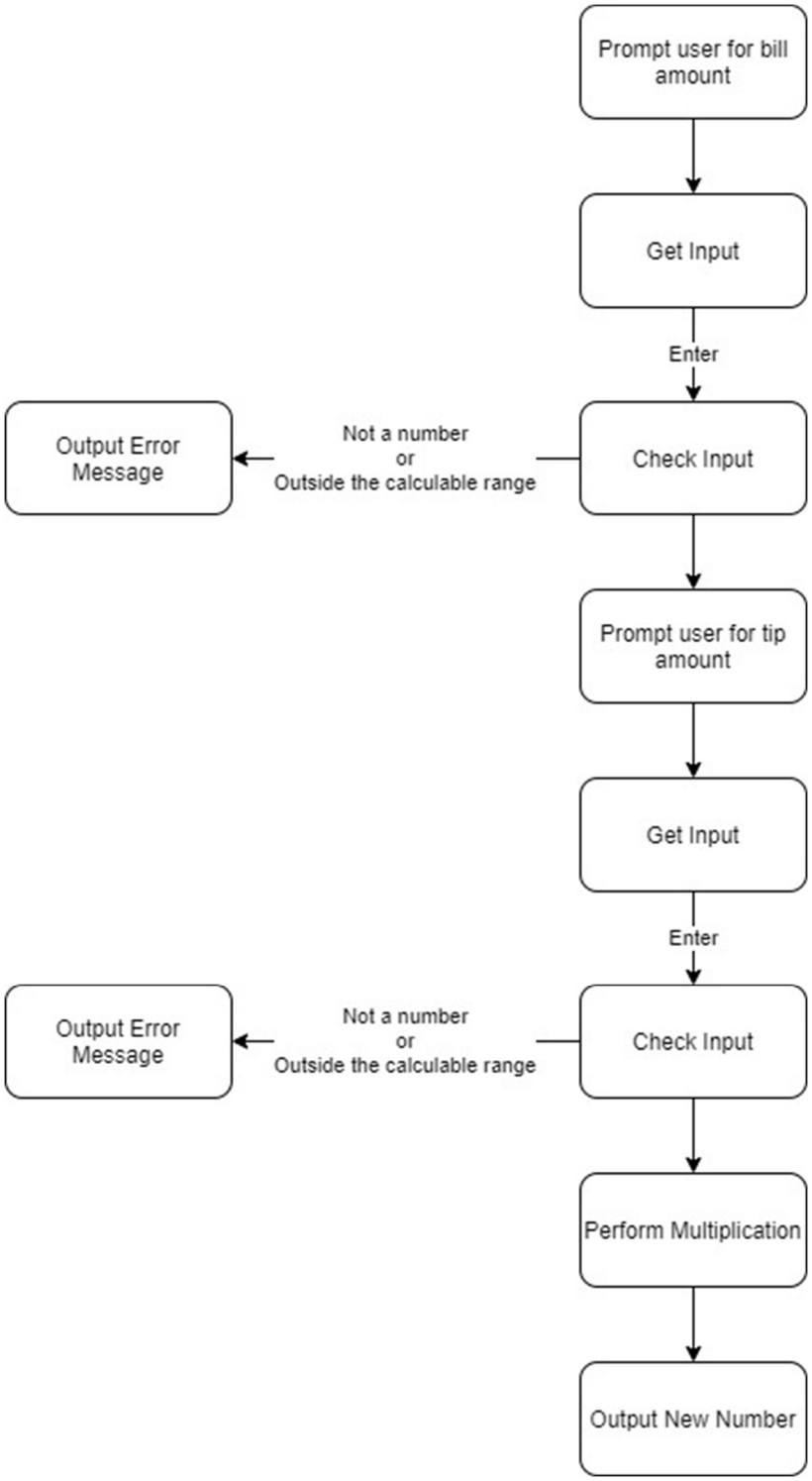
Errors

When errors are found, such as a mistaken input, outside the range, or otherwise, a message will be displayed for the user, ending the program, and explaining what went wrong.

Input String

The user will only be required to enter integers and a decimal point where necessary, hitting enter after entering their input.

Flow Chart


Prompt user for bill amount
Get Input
Enter
Check Input
Not a number
or
Outside the calculable range
Output Error Message
Prompt user for tip amount
Get Input
Enter
Check Input
Not a number
or
Outside the calculable range
Output Error Message
Perform Multiplication
Output New Number

Procedural Design

Main Routine

- Prompt user input for bill amount
- Allow user input
- Run the Number Verification Routine
    - If no errors continue to Calculation Routine, otherwise output error message and end program
- Prompt user input for tip
- Run the Number Verification Routine
    - If no errors continue to Calculation Routine, otherwise output error message and end program

Number Verification Routine

- Use basic sums of the input with positive and negative hexadecimal numbers to verify that input is within the calculable 16 bit range.
    - 0-328 for Bill Amount
    - 0-100 for Tip Amount

Calculation Routine

- Using basic addition of hexadecimal characters repeated in loops, multiplication will be performed.
- The last two digits will be separated to form the decimal value saved a whole number.

Final Output Routine

- Output message that “Tip = $”
- Output whole number calculation
- Output a decimal (“.”)
- Output decimal value
- End Program