Canadian University of Bangladesh
Department of Computer Science and Engineering (CSE)

MICROPROCESSOR LAB PROJECT
SUMMER 2024

Course Title: **Microprocessor and Interfacing Sessional**

Course Code: **CSE-2302 (2)**

Assignment No: 01 (LAB FINAL)

Assignment Name: Basic Calculator in EMU8086 Assembly Language

Submitted To:

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Dept. Of CSE

Submitted By:

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ID : 23305017

Batch: 23-FALL-CSE-DIPLOMA

Semester: Summer-24-T

Date Of Submission: 28-09-2024

Basic Calculator in EMU8086 Assembly Language

Developed by MEHEDI HASSAH (ID: 23305017)

Microprocessor Lab | Canadian University of Bangladesh

Instructor: Rajesh Majumdar

GitHub Source Code Link: [Basic_Calculator_By_Mehedi]

Introduction:

Welcome to the Basic Calculator program, a simple yet powerful tool designed using 8086 assembly language. This project demonstrates fundamental concepts of low-level programming, including arithmetic operations like addition, subtraction, multiplication, and division, all executed within the 8086 microprocessor environment.

Key highlights of this program include:

- Interactive User Interface: Seamless input for selecting operations and entering digits (0-9).
- Auto-processing: User inputs are automatically processed without the need to press 'Enter Key'.
- Clear Result Display: Results are shown clearly, even for multi-digit numbers, also included a thank-you message with my details.

This project serves as a perfect introduction to the world of assembly language programming, where the beauty lies in controlling the hardware at a granular level, efficiently using processor instructions.

Program Overview:

1. **Select Operation:** The user is prompted to select from four available operations:
    - 1: Addition
    - 2: Subtraction
    - 3: Multiplication
    - 4: Division
2. **Input Numbers:** The program accepts two digits for the operation, ensuring correct numeric input for precision.
3. **Error Handling:** Division by zero is gracefully handled, notifying the user of invalid inputs.
4. **Final Output:** The program outputs the result of the chosen operation with a personalized message and detailed author information.

Explanation:

Overview of Logic and Libraries Used:

Built-in Libraries: In the assembly language program, the DOS interrupt 21H is used for input/output operations.Part of the larger infrastructure of the library that DDS Int21H consists of Interrupt 21H is a TDOS service that allows for such things as the keyboard input, string display, etc, which is much needed for the user to be able to input this assembly language project through this program.

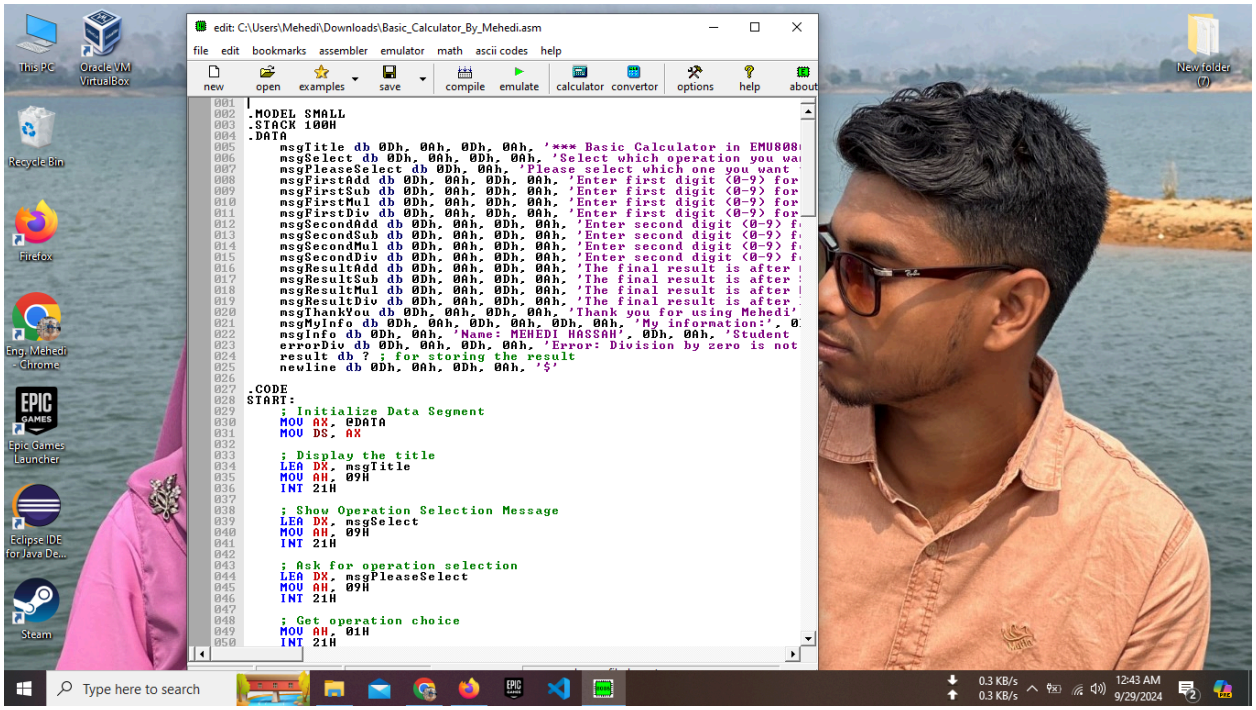
Key Logic Implemented:

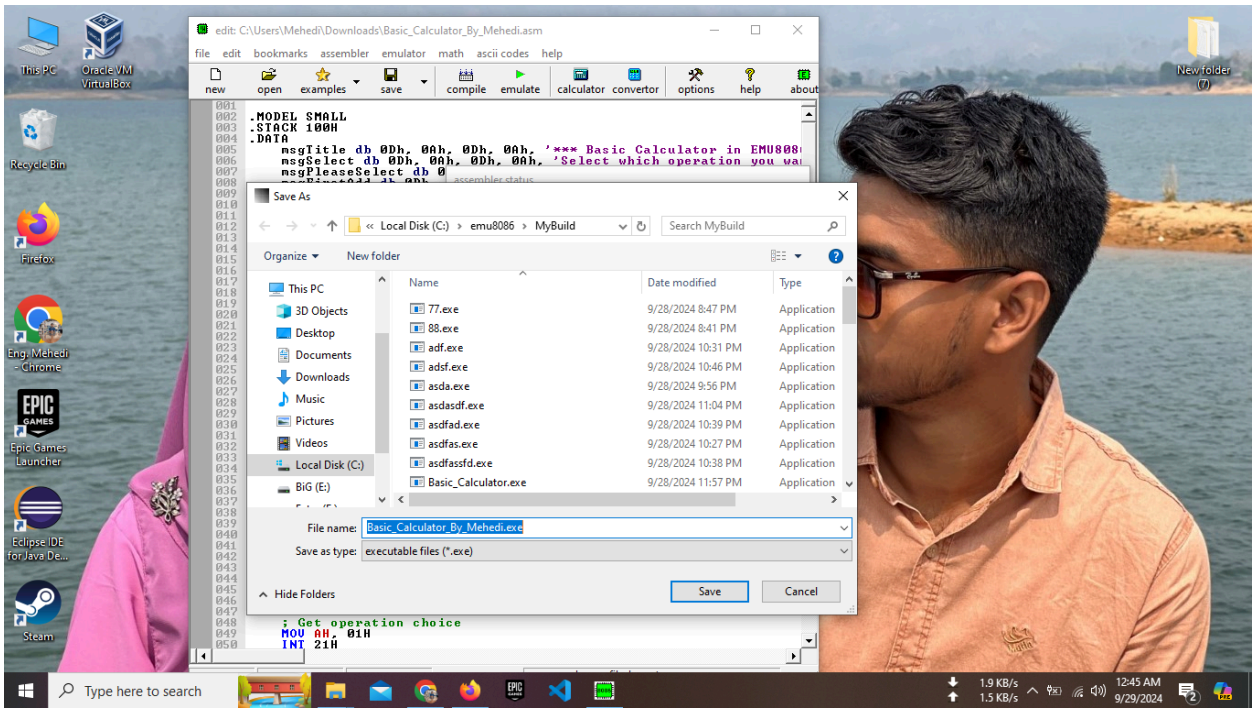
The program lets the users avail of the operation of their choosing wherein they will be asked to supply two numbers.
It uses conditional jumps as a decision-making tool that will force the CPU to either add, subtract, multiply, or divide the input given by the user.
For each operation(addition, subtraction, multiplication, division), the program carries out the computation and gives the reward.
The division operation automatically checks for division by zero and corrects this mistake.

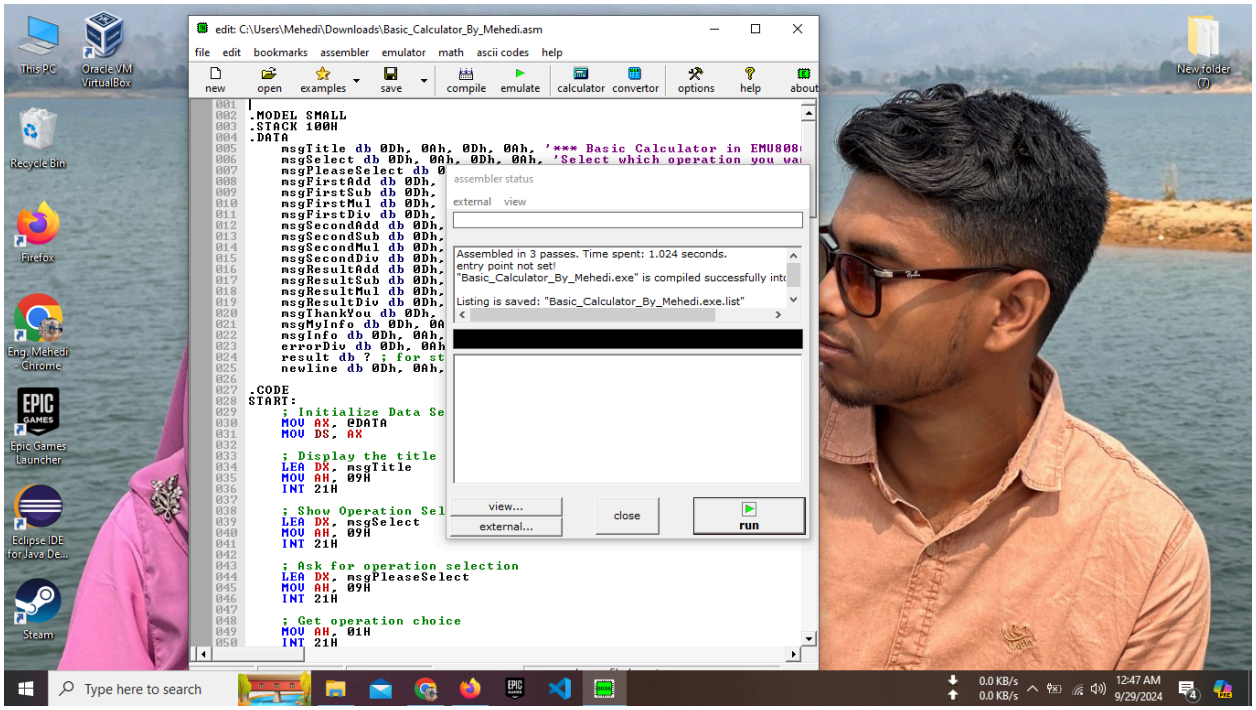
Why the Chosen Logic:

The use of direct I/O operations with DOS interrupts is what makes the program efficient and responsive to the user's inputs.
The conditional branching factor allows for the setting of different clear paths for each arithmetic operation which makes the program easier to understand as well as modify in the future.

SCREENSHOTS OF RUNTIME


edit: C:\Users\Mehedi\Downloads\Basic_Calculator_By_Mehedi.asm
file edit bookmarks assembler emulator math ascii codes help
new open examples save compile emulate calculator convertor options help about
.MODEL SMALL
.STACK 100H
.DATA
msgTitle db 0Dh, 0Ah, 0Dh, 0Ah, '*** Basic Calculator in EMU808
msgSelect db 0Dh, 0Ah, 0Dh, 0Ah, 'Select which operation you wa
msgPleaseSelect db 0Dh, 0Ah, 'Please select which one you want
msgFirstAdd db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter first digit (0-9) for
msgFirstSub db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter first digit (0-9) for
msgFirstMul db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter first digit (0-9) for
msgFirstDiv db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter first digit (0-9) for
msgSecondAdd db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter second digit (0-9) f
msgSecondSub db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter second digit (0-9) f
msgSecondMul db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter second digit (0-9) f
msgSecondDiv db 0Dh, 0Ah, 0Dh, 0Ah, 'Enter second digit (0-9) f
msgResultAdd db 0Dh, 0Ah, 0Dh, 0Ah, 'The final result is after
msgResultSub db 0Dh, 0Ah, 0Dh, 0Ah, 'The final result is after
msgResultMul db 0Dh, 0Ah, 0Dh, 0Ah, 'The final result is after
msgResultDiv db 0Dh, 0Ah, 0Dh, 0Ah, 'The final result is after
msgThankYou db 0Dh, 0Ah, 0Dh, 0Ah, 'Thank you for using Mehedi'
msgMyInfo db 0Dh, 0Ah, 0Dh, 0Ah, 'My information:', 0
msgInfo db 0Dh, 0Ah, 'Name: MEHEDI HASSAH', 0Dh, 0Ah, 'Student
errorDiv db 0Dh, 0Ah, 0Dh, 0Ah, 'Error: Division by zero is not
result db ? ; for storing the result
newline db 0Dh, 0Ah, 0Dh, 0Ah, '$'
.CODE
START:
; Initialize Data Segment
MOV AX, @DATA
MOV DS, AX
; Display the title
LEA DX, msgTitle
MOV AH, 09H
INT 21H
; Show Operation Selection Message
LEA DX, msgSelect
MOV AH, 09H
INT 21H
; Ask for operation selection
LEA DX, msgPleaseSelect
MOV AH, 09H
INT 21H
; Get operation choice
MOV AH, 01H
INT 21H
Type here to search
0.3 KB/s
0.3 KB/s
12:43 AM
9/29/2024


edit: C:\Users\Mehedi\Downloads\Basic_Calculator_By_Mehedi.asm
Save As
« Local Disk (C:) › emu8086 › MyBuild
Search MyBuild
Organize New folder
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
BiG (E:)
Name
Date modified
Type
77.exe 9/28/2024 8:47 PM Application
88.exe 9/28/2024 8:41 PM Application
adf.exe 9/28/2024 10:31 PM Application
adsf.exe 9/28/2024 10:46 PM Application
asda.exe 9/28/2024 9:56 PM Application
asdasdf.exe 9/28/2024 11:04 PM Application
asdfad.exe 9/28/2024 10:39 PM Application
asdfas.exe 9/28/2024 10:27 PM Application
asdfassfd.exe 9/28/2024 10:38 PM Application
Basic_Calculator.exe 9/28/2024 11:57 PM Application
File name: Basic_Calculator_By_Mehedi.exe
Save as type: executable files (*.exe)
Hide Folders
Save
Cancel
; Get operation choice
MOV AH, 01H
INT 21H
Type here to search
1.9 KB/s
1.5 KB/s
12:45 AM
9/29/2024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file edit bookmarks assembler emulator math ascii codes help
new open examples save compile emulate calculator convertor options help about
.MODEL SMALL
.STACK 100H
.DATA
msgTitle db 0Dh, 0Ah, 0Dh, 0Ah, '*** Basic Calculator in EMU808
msgSelect db 0Dh, 0Ah, 0Dh, 0Ah, 'Select which operation you wa
msgPleaseSelect db 0
msgFirstAdd db 0Dh,
msgFirstSub db 0Dh,
msgFirstMul db 0Dh,
msgFirstDiv db 0Dh,
msgSecondAdd db 0Dh,
msgSecondSub db 0Dh,
msgSecondMul db 0Dh,
msgSecondDiv db 0Dh,
msgResultAdd db 0Dh,
msgResultSub db 0Dh,
msgResultMul db 0Dh,
msgResultDiv db 0Dh,
msgThankYou db 0Dh,
msgMyInfo db 0Dh, 0A
msgInfo db 0Dh, 0Ah,
errorDiv db 0Dh, 0Ah
result db ? ; for st
newline db 0Dh, 0Ah,
.CODE
START:
; Initialize Data Se
MOV AX, @DATA
MOV DS, AX
; Display the title
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INT 21H
; Show Operation Sel
LEA DX, msgSelect
MOV AH, 09H
INT 21H
; Ask for operation selection
LEA DX, msgPleaseSelect
MOV AH, 09H
INT 21H
; Get operation choice
MOV AH, 01H
INT 21H
assembler status
external view
Assembled in 3 passes. Time spent: 1.024 seconds.
entry point not set!
"Basic_Calculator_By_Mehedi.exe" is compiled successfully int
Listing is saved: "Basic_Calculator_By_Mehedi.exe.list"
view...
external...
close
run
Type here to search
0.0 KB/s
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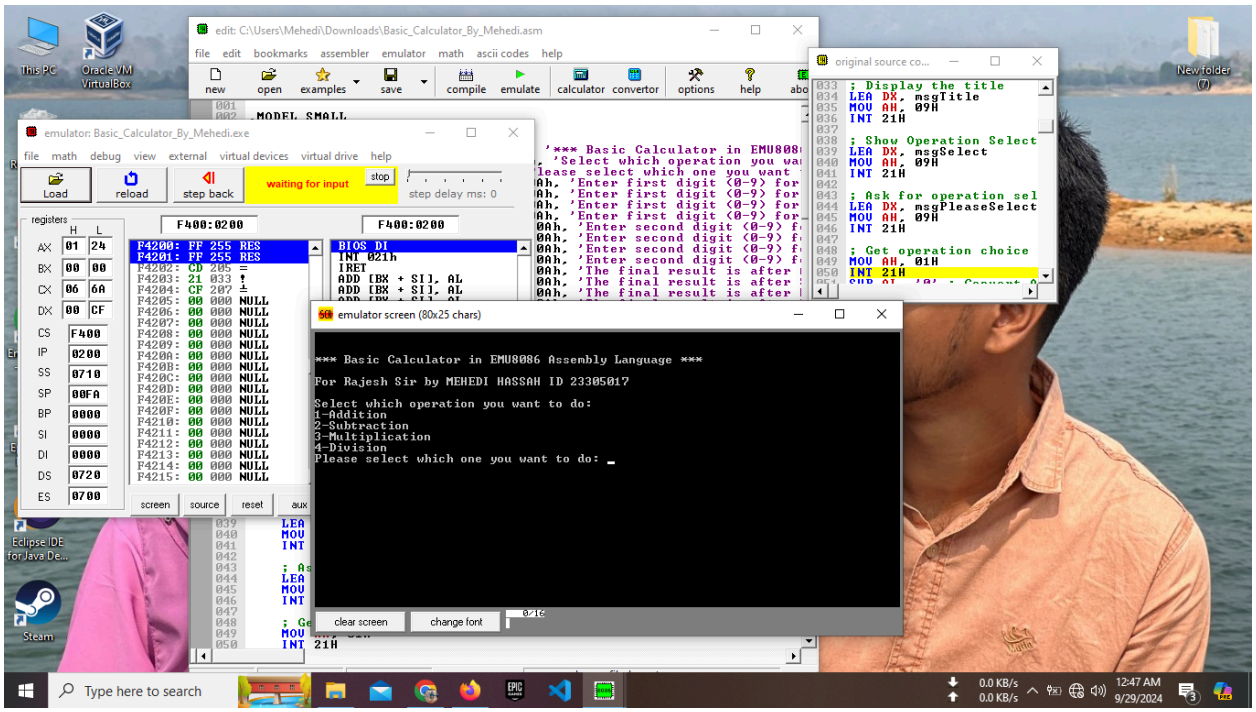
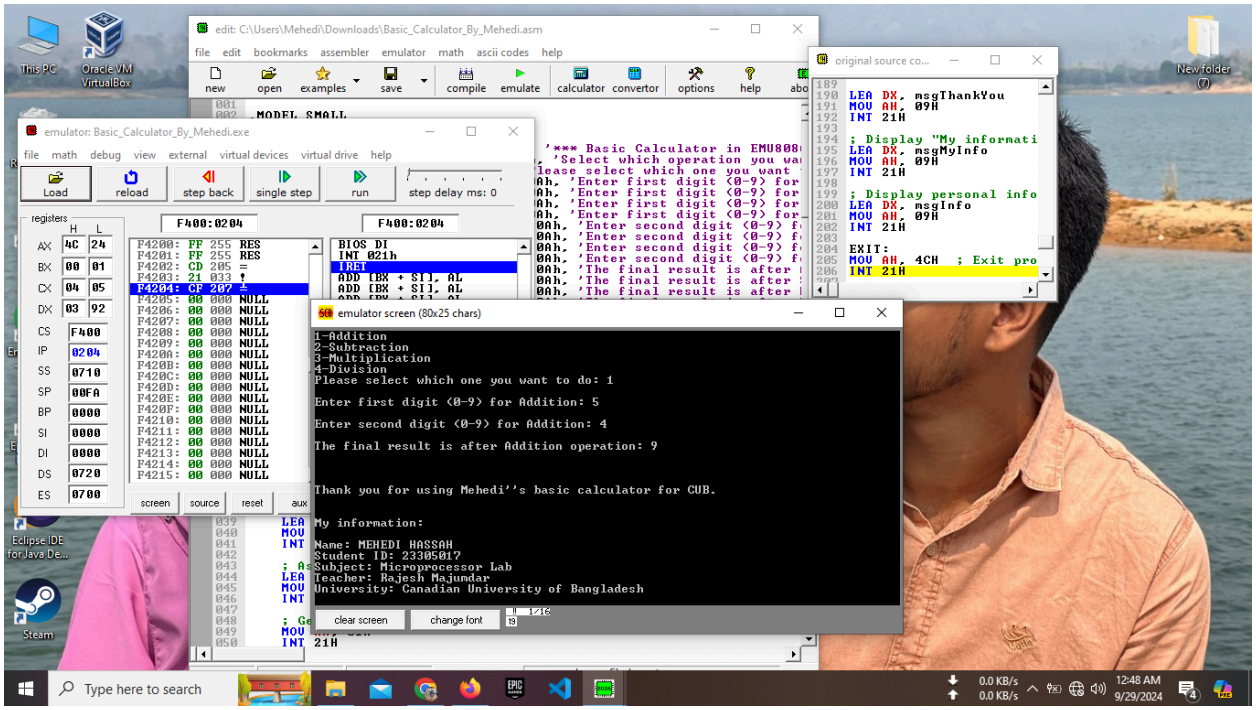
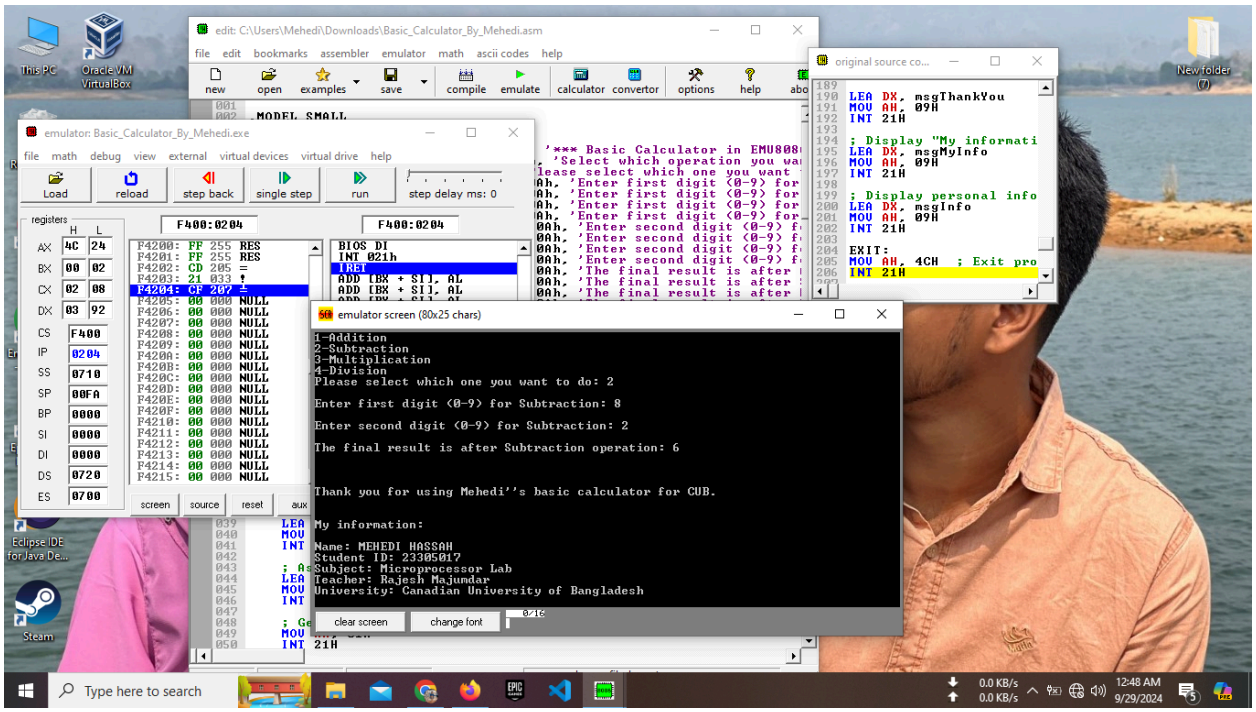
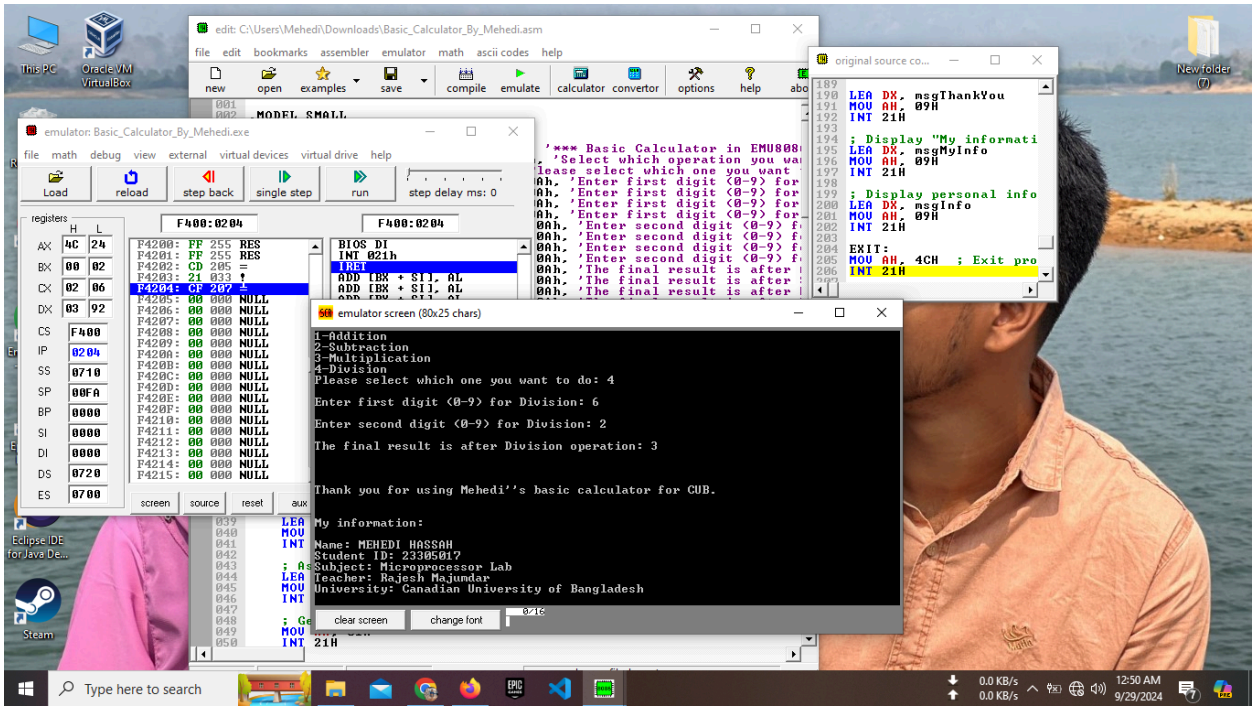
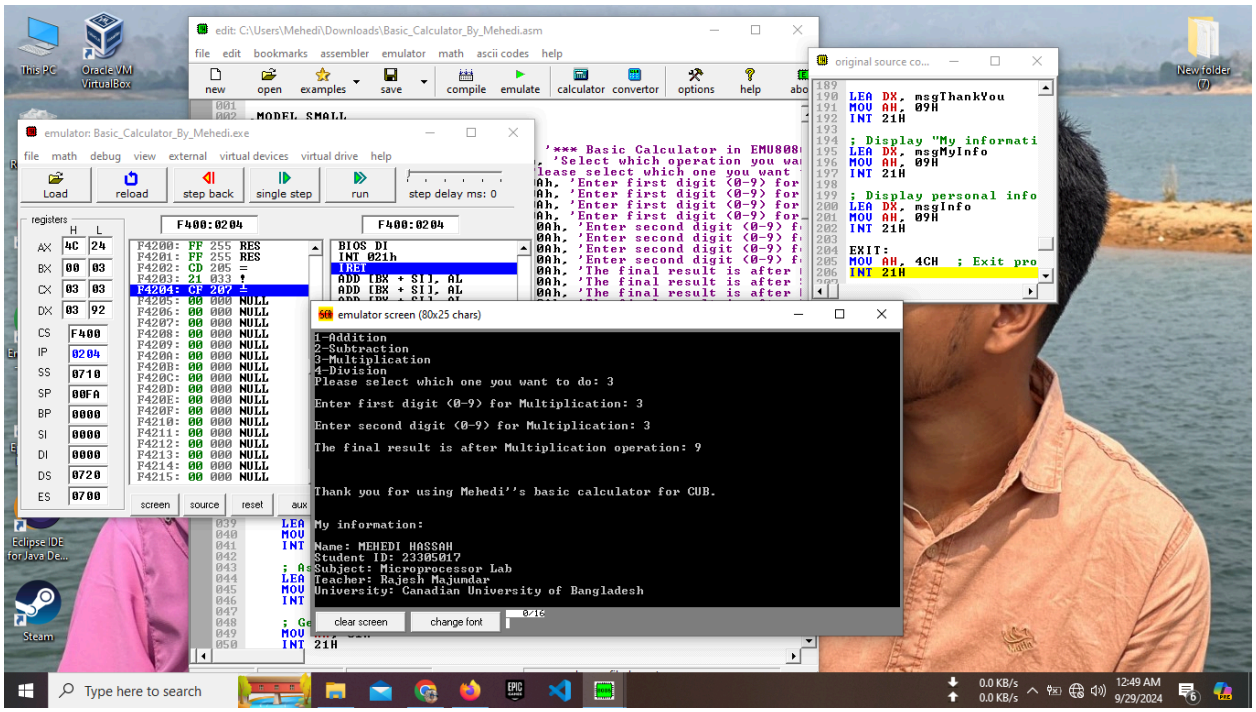
9/29/2024

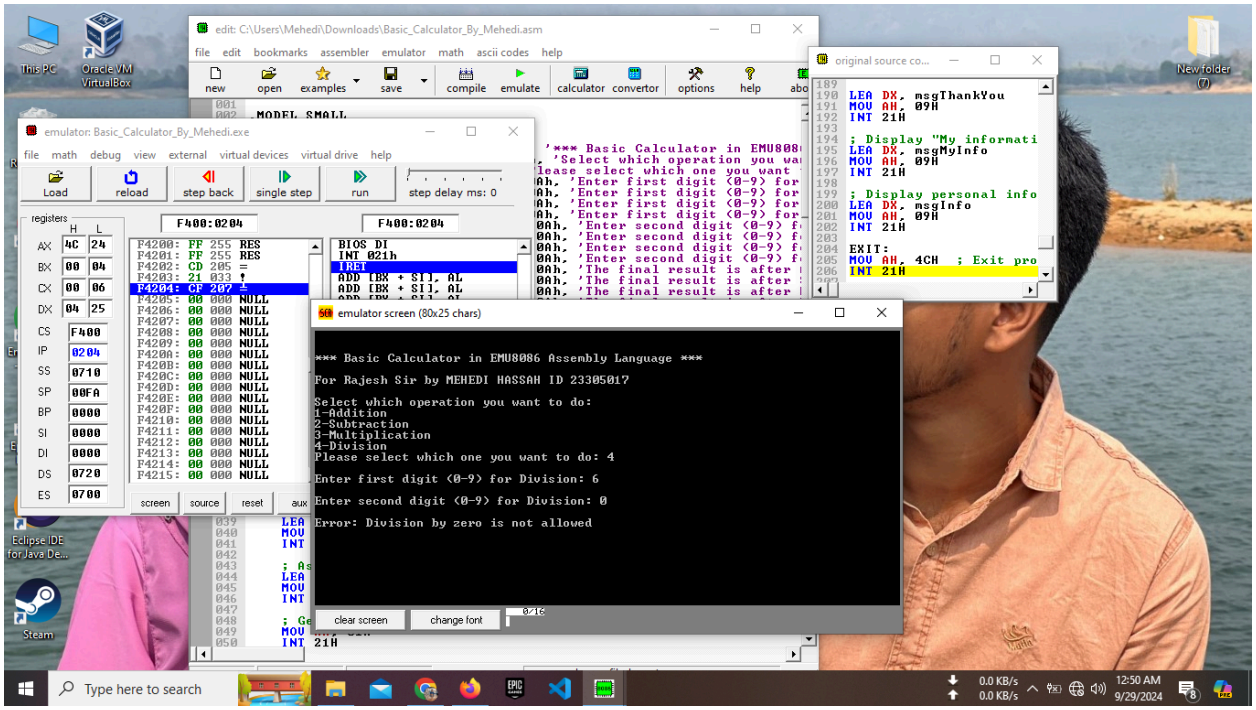

edit: C:\Users\Mehedi\Downloads\Basic_Calculator_By_Mehedi.asm
original source co...
emulator: Basic_Calculator_By_Mehedi.exe
file math debug view external virtual devices virtual drive help
Load reload step back waiting for input stop step delay ms: 0
registers
AX 01 24
BX 00 00
CX 06 6A
DX 00 CF
CS F400
IP 0200
SS 0710
SP 00FA
BP 0000
SI 0000
DI 0000
DS 0720
ES 0700
F400:0200
F4200: FF 255 RES
F4201: FF 255 RES
F4202: CD 205 =
F4203: 21 033 !
F4204: CF 207 ±
BIOS DI
INT 021h
IRET
ADD [BX + SI], AL
screen source reset aux
emulator screen (80x25 chars)
*** Basic Calculator in EMU8086 Assembly Language ***
For Rajesh Sir by MEHEDI HASSAN ID 23305017
Select which operation you want to do:
1-Addition
2-Subtraction
3-Multiplication
4-Division
Please select which one you want to do:
clear screen
change font
; Display the title
LEA DX, msgTitle
MOV AH, 09H
INT 21H
; Show Operation Select
LEA DX, msgSelect
MOV AH, 09H
INT 21H
; Ask for operation sel
LEA DX, msgPleaseSelect
MOV AH, 09H
INT 21H
; Get operation choice
MOV AH, 01H
INT 21H
Type here to search
0.0 KB/s
0.0 KB/s
12:47 AM
9/29/2024


emulator screen (80x25 chars)
1-Addition
2-Subtraction
3-Multiplication
4-Division
Please select which one you want to do: 1
Enter first digit (0-9) for Addition: 5
Enter second digit (0-9) for Addition: 4
The final result is after Addition operation: 9
Thank you for using Mehedi''s basic calculator for CUB.
My information:
Name: MEHEDI HASSAN
Student ID: 23305017
Subject: Microprocessor Lab
Teacher: Rajesh Majumdar
University: Canadian University of Bangladesh
clear screen
change font


emulator screen (80x25 chars)
1-Addition
2-Subtraction
3-Multiplication
4-Division
Please select which one you want to do: 2
Enter first digit (0-9) for Subtraction: 8
Enter second digit (0-9) for Subtraction: 2
The final result is after Subtraction operation: 6
Thank you for using Mehedi''s basic calculator for CUB.
My information:
Name: MEHEDI HASSAN
Student ID: 23305017
Subject: Microprocessor Lab
Teacher: Rajesh Majumdar
University: Canadian University of Bangladesh
clear screen
change font


emulator screen (80x25 chars)
1-Addition
2-Subtraction
3-Multiplication
4-Division
Please select which one you want to do: 4
Enter first digit (0-9) for Division: 6
Enter second digit (0-9) for Division: 2
The final result is after Division operation: 3
Thank you for using Mehedi''s basic calculator for CUB.
My information:
Name: MEHEDI HASSAN
Student ID: 23305017
Subject: Microprocessor Lab
Teacher: Rajesh Majumdar
University: Canadian University of Bangladesh
clear screen
change font


emulator screen (80x25 chars)
1-Addition
2-Subtraction
3-Multiplication
4-Division
Please select which one you want to do: 3
Enter first digit (0-9) for Multiplication: 3
Enter second digit (0-9) for Multiplication: 3
The final result is after Multiplication operation: 9
Thank you for using Mehedi''s basic calculator for CUB.
My information:
Name: MEHEDI HASSAN
Student ID: 23305017
Subject: Microprocessor Lab
Teacher: Rajesh Majumdar
University: Canadian University of Bangladesh
clear screen
change font



Final Conclusion:

This assembly language program is a prime example of how to develop a calculator that can perform basic arithmetic operations correctly. It acts as a means of using assembly language for practical applications, introducing the main concepts to users such as user input handling, conditional logic, and arithmetic operations.

----THANK YOU----