Microprocessor and Computer Architecture (MPCA) Laboratory
UE20CS252 4th Semester,
Academic Year 2021-22

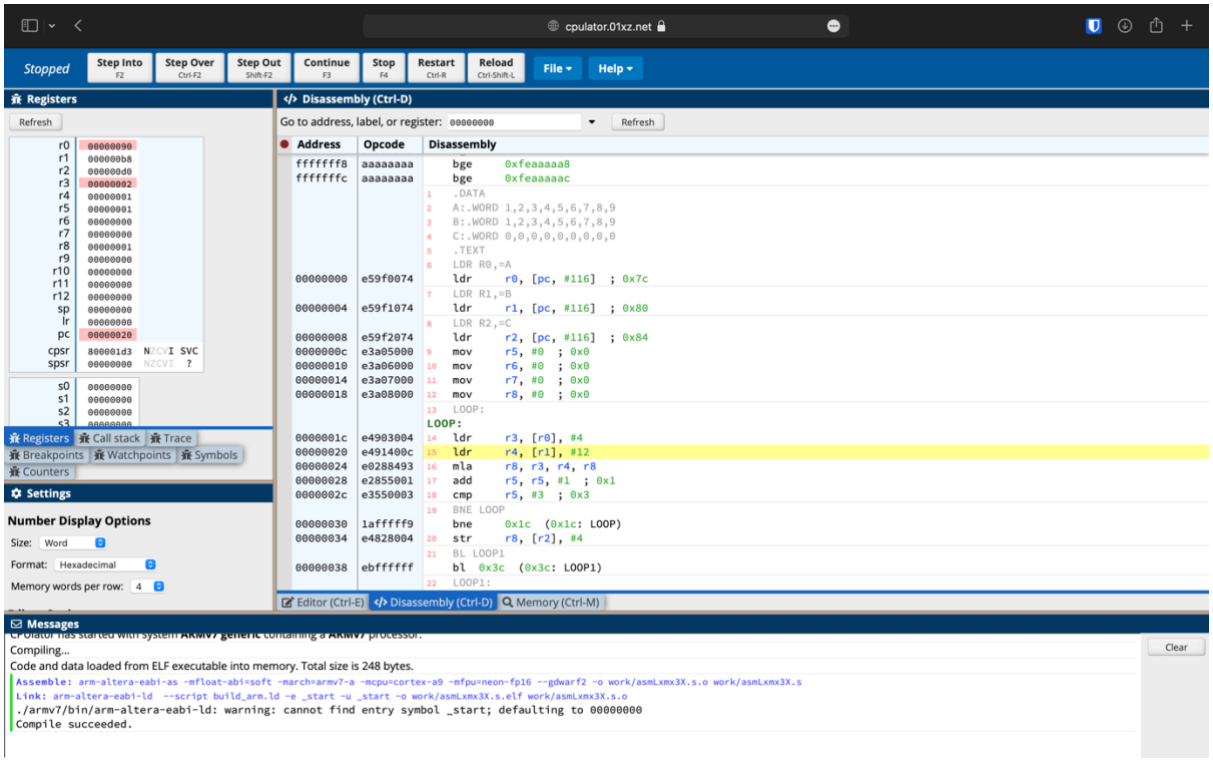
Week 5

Vanshika Goel	PES1UG20CS484	H Section

1. Write a program in ARM7TDMI-ISA to multiply 2 matrices of order3.
i.e., implement c[i][j]=c[i][j] + a[i][j] x b[i][j].
a. Use MLA instruction
b. Use MUL instruction

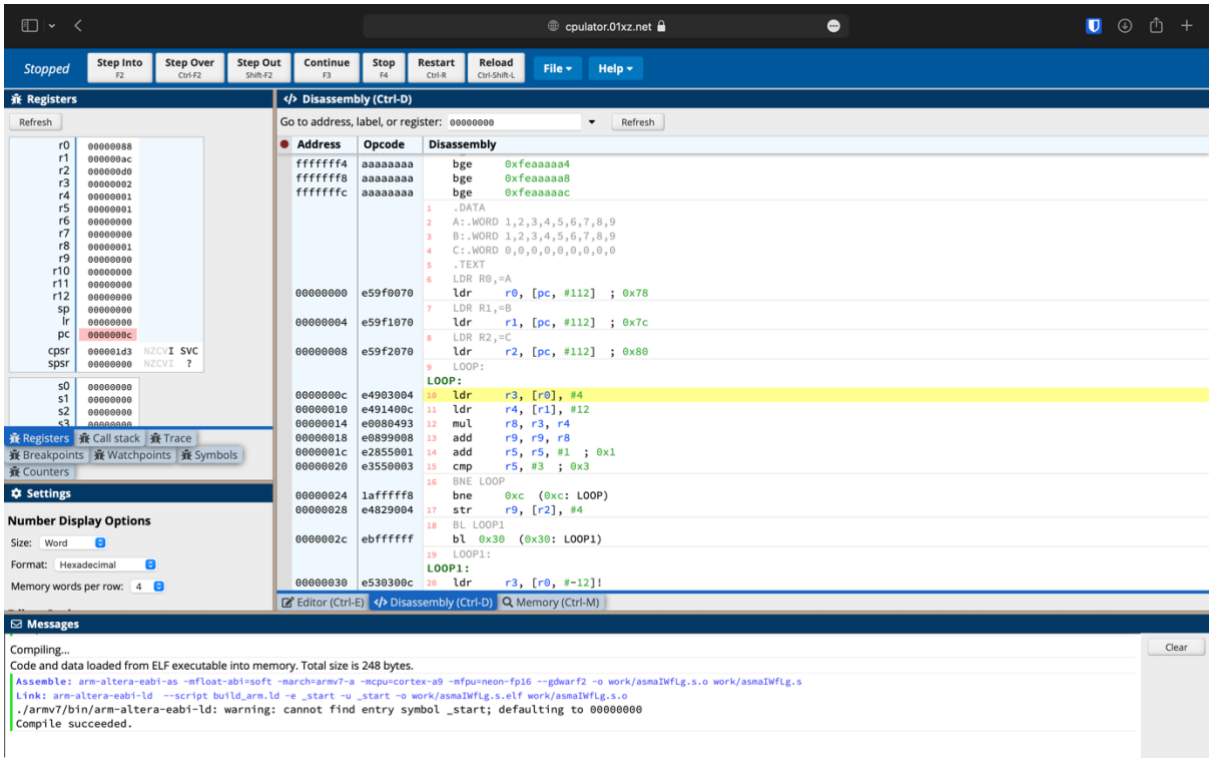
```
.DATA
A:.WORD 1,2,3,4,5,6,7,8,9
B:.WORD 1,2,3,4,5,6,7,8,9
C:.WORD 0,0,0,0,0,0,0,0,0
.TEXT
        LDR R0,=A
        LDR R1,=B
        LDR R2,=C
        MOV R5,#0
        MOV R6,#0
        MOV R7,#0
        MOV R8,#0
LOOP:
        LDR R3,[R0],#4
        LDR R4,[R1],#12
        MLA R8,R3,R4,R8
        ADD R5,R5,#1
        CMP R5,#3
        BNE LOOP
        STR R8,[R2],#4
        BL LOOP1
LOOP1:
        LDR R3,[R0,#-12]!
        LDR R4,[R1,#-32]!
        MOV R8,#0
        MOV R5,#0
        ADD R6,R6,#1
        CMP R6,#3
        BLT LOOP
LOOP2:
        LDR R3,[R0,#12]!
        LDR R4,[R1,#-12]!
        MOV R8,#0
```

```
        MOV R5,#0
        MOV R6,#0
        ADD R7,R7,#1
        CMP R7,#3
        BNE LOOP
SWI 0X011
```



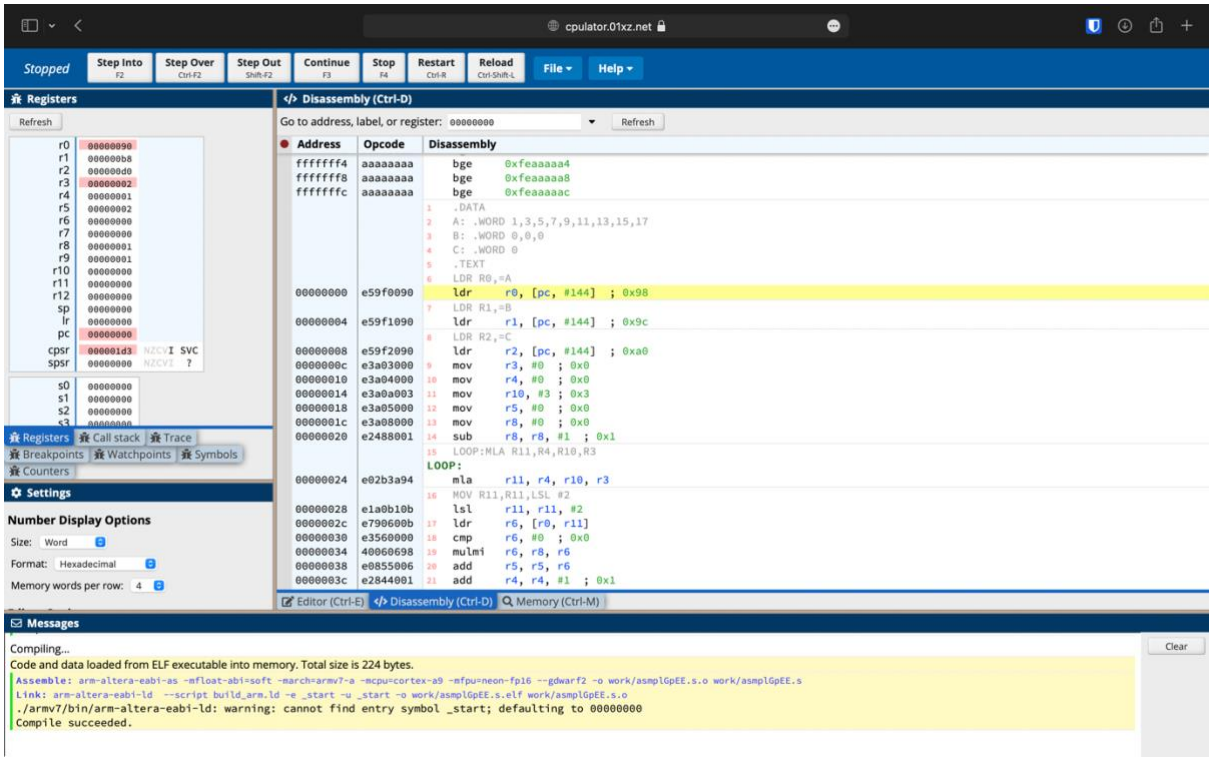

```
.DATA
A:.WORD 1,2,3,4,5,6,7,8,9
B:.WORD 1,2,3,4,5,6,7,8,9
C:.WORD 0,0,0,0,0,0,0,0,0
.TEXT
        LDR R0,=A
        LDR R1,=B
        LDR R2,=C
LOOP:
        LDR R3,[R0],#4
        LDR R4,[R1],#12
        MUL R8,R3,R4
        ADD R9,R9,R8
        ADD R5,R5,#1
        CMP R5,#3
BNE LOOP
        STR R9,[R2],#4
        BL LOOP1
```

```
LOOP1:
        LDR R3,[R0,#-12]!
        LDR R4,[R1,#-32]!
        MOV R8,#0
        MOV R9,#0
        MOV R5,#0
        ADD R6,R6,#1
        CMP R6,#3
        BLT LOOP
LOOP2:
        LDR R3,[R0,#12]!
        LDR R4,[R1,#-12]!
        MOV R8,#0
        MOV R9,#0
        MOV R5,#0
        MOV R6,#0
        ADD R7,R7,#1
        CMP R7,#3
BNE LOOP
SWI 0X001
```



2. Write a program in ARM7TDMI-ISA to find the NORM of a square matrix of order n.

```
.DATA
A: .WORD 1,3,5,7,9,11,13,15,17
B: .WORD 0,0,0
C: .WORD 0
.TEXT
LDR R0,=A
LDR R1,=B
LDR R2,=C
MOV R3,#0
MOV R4,#0
MOV R10,#3
MOV R5,#0
MOV R8,#0
SUB R8,R8,#1
LOOP:MLA R11,R4,R10,R3
MOV R11,R11,LSL #2
LDR R6,[R0,R11]
CMP R6,#0
MULMI R6,R8,R6
ADD R5,R5,R6
ADD R4,R4,#1
CMP R4,#3
BNE LOOP
MOV R7,R3,LSL #2
STR R5,[R1,R7]
MOV R4,#0
ADD R3,R3,#1
MOV R5,#0
CMP R3,#3
BNE LOOP
MOV R3,#0
MOV R4,#0
MOV R5,#0
LDR R3,[R1,R4]
MAX:ADD R4,R4,#4
LDR R6,[R1,R4]
CMP R3,R6
MOVLT R3,R6
ADD R5,R5,#1
CMP R5,#2
BNE MAX
STR R3,[R2]
SWI 0X011
.END
```



3. Write a program in ARM7TDMI-ISA to find the ROWSUM of a matrix.

```
.DATA
A:.WORD 1,2,3,4,5,6,7,8,9 ;MATRIX 1ST ELEMENT OFFSET 0 THEN 4, 8, 12 ETC
C:.WORD 0,0,0
.TEXT
        LDR R0,=A
        LDR R2,=C

        MOV R3,#0
        MOV R4,#0
        MOV R10,#3
        MOV R7,#0
LOOP1:

        MLA R11,R3,R10,R4
        MOV R11, R11, LSL #2

        LDR R5,[R0,R11]

        ADD R7, R7, R5

        ADD R4, R4,#1
        CMP R4, #3
BNE LOOP1

        MOV R4,#0
        MLA R11,R3,R10,R4
```

MOV R11, R11, LSL #2
STR R7,[R2,R11]
MOV R7,#0
ADD R3, R3, #1
CMP R3, #3

BNE LOOP1

SWI 0x011