MPCA Lab - Week 5

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- Section : D
- SRN : PES2UG20CS237

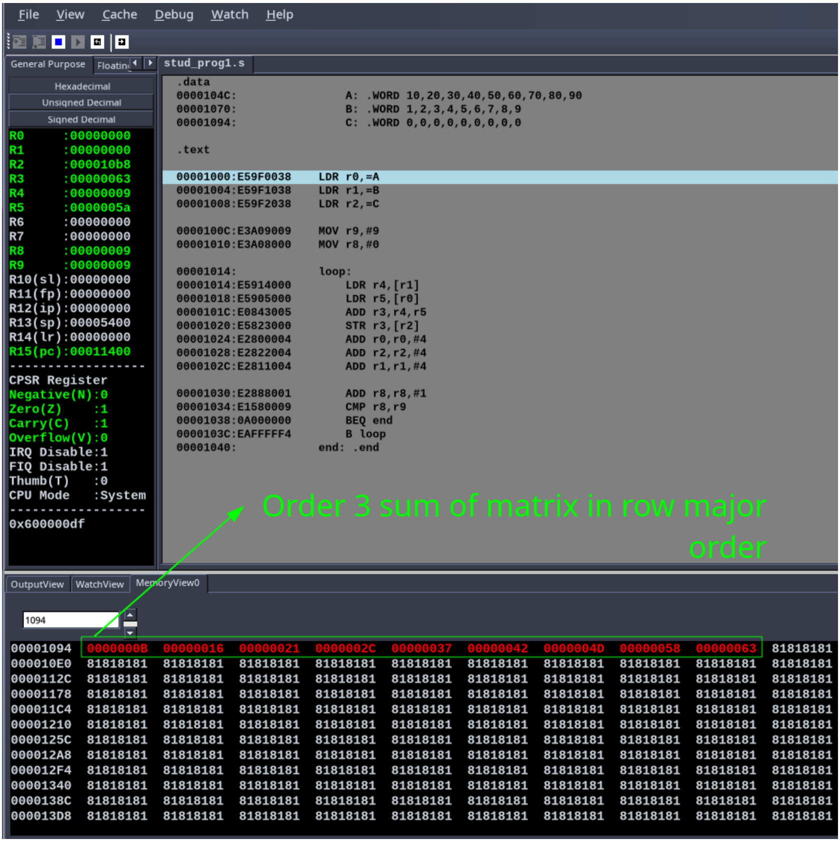
Student programs :

Program 1: Add 2 matrices of order 3, i.e implement c[i][j] = a[i][j]+b[i][j]

Code:

```
.data
    A: .WORD 10,20,30,40,50,60,70,80,90
    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 r9,#9
MOV r8,#0

loop:
    LDR r4,[r1]
    LDR r5,[r0]
    ADD r3,r4,r5
    STR r3,[r2]
    ADD r0,r0,#4
    ADD r2,r2,#4
    ADD r1,r1,#4

    ADD r8,r8,#1
    CMP r8,r9
    BEQ end
    B loop
end: .end
```

Screenshots:



```
R0        :00000000
R1        :00000000
R2        :000010b8
R3        :00000063
R4        :00000009
R5        :0000005a
R6        :00000000
R7        :00000000
R8        :00000009
R9        :00000009
R10(sl):00000000
R11(fp):00000000
R12(ip):00000000
R13(sp):00005400
R14(lr):00000000
R15(pc):00011400
-----------------
CPSR Register
Negative(N):0
Zero(Z)     :1
Carry(C)    :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T)    :0
CPU Mode    :System
-----------------
0x600000df
```

```
.data
0000104C:                A:  .WORD 10,20,30,40,50,60,70,80,90
00001070:                B:  .WORD 1,2,3,4,5,6,7,8,9
00001094:                C:  .WORD 0,0,0,0,0,0,0,0,0

.text

00001000:E59F0038     LDR r0,=A
00001004:E59F1038     LDR r1,=B
00001008:E59F2038     LDR r2,=C

0000100C:E3A09009     MOV r9,#9
00001010:E3A08000     MOV r8,#0

00001014:             loop:
00001014:E5914000         LDR r4,[r1]
00001018:E5905000         LDR r5,[r0]
0000101C:E0843005         ADD r3,r4,r5
00001020:E5823000         STR r3,[r2]
00001024:E2800004         ADD r0,r0,#4
00001028:E2822004         ADD r2,r2,#4
0000102C:E2811004         ADD r1,r1,#4

00001030:E2888001         ADD r8,r8,#1
00001034:E1580009         CMP r8,r9
00001038:0A000000         BEQ end
0000103C:EAFFFFF4         B loop
00001040:             end: .end
```

Order 3 sum of matrix in row major order

```
00001094  0000000B  00000016  00000021  0000002C  00000037  00000042  0000004D  00000058  00000063  81818181
000010E0  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
0000112C  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001178  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000011C4  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001210  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
0000125C  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000012A8  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000012F4  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001340  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
0000138C  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000013D8  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181  81818181
```

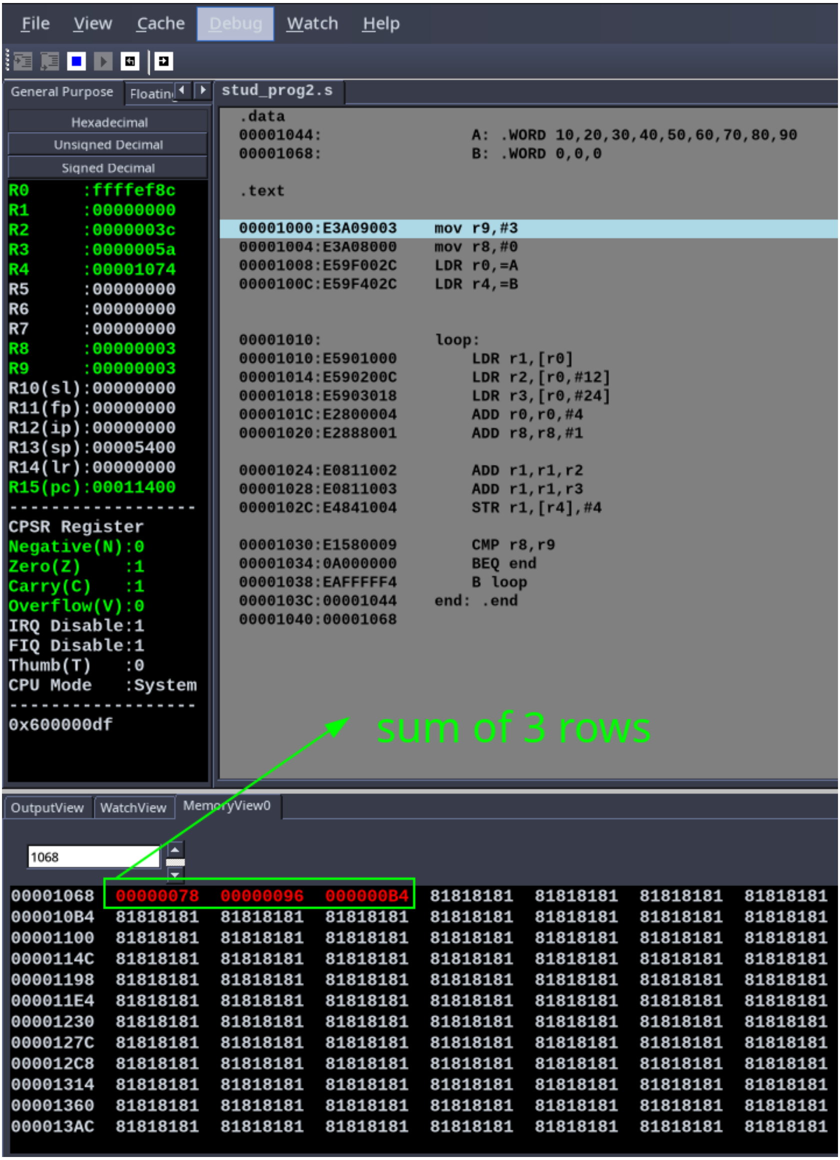
Program 2: Find norm of a 3rd order matrix

Code:

```
.data
    A: .WORD 10,20,30,40,50,60,70,80,90
    B: .WORD 0,0,0
    ANS: .WORD 0

.text
```

```
mov r9,#3
mov r8,#0
LDR r0,=A
LDR r4,=B


loop:
    LDR r1,[r0]
    LDR r2,[r0,#12]
    LDR r3,[r0,#24]
    ADD r0,r0,#4
    ADD r8,r8,#1

    ADD r1,r1,r2
    ADD r1,r1,r3
    STR r1,[r4],#4

    CMP r8,r9
    BEQ end
    B loop
end:
    CMP r1,r2
    BGT R1
    .end
```

Screenshots:



```
R0      :ffffef8c
R1      :00000000
R2      :0000003c
R3      :0000005a
R4      :00001074
R5      :00000000
R6      :00000000
R7      :00000000
R8      :00000003
R9      :00000003
R10(sl):00000000
R11(fp):00000000
R12(ip):00000000
R13(sp):00005400
R14(lr):00000000
R15(pc):00011400
-----------------
CPSR Register
Negative(N):0
Zero(Z)    :1
Carry(C)   :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T)   :0
CPU Mode   :System
-----------------
0x600000df
```

```
 .data
 00001044:                A: .WORD 10,20,30,40,50,60,70,80,90
 00001068:                B: .WORD 0,0,0

 .text

 00001000:E3A09003     mov r9,#3
 00001004:E3A08000     mov r8,#0
 00001008:E59F002C     LDR r0,=A
 0000100C:E59F402C     LDR r4,=B


 00001010:             loop:
 00001010:E5901000         LDR r1,[r0]
 00001014:E590200C         LDR r2,[r0,#12]
 00001018:E5903018         LDR r3,[r0,#24]
 0000101C:E2800004         ADD r0,r0,#4
 00001020:E2888001         ADD r8,r8,#1

 00001024:E0811002         ADD r1,r1,r2
 00001028:E0811003         ADD r1,r1,r3
 0000102C:E4841004         STR r1,[r4],#4

 00001030:E1580009         CMP r8,r9
 00001034:0A000000         BEQ end
 00001038:EAFFFFF4         B loop
 0000103C:00001044     end: .end
 00001040:00001068
```

sum of 3 rows

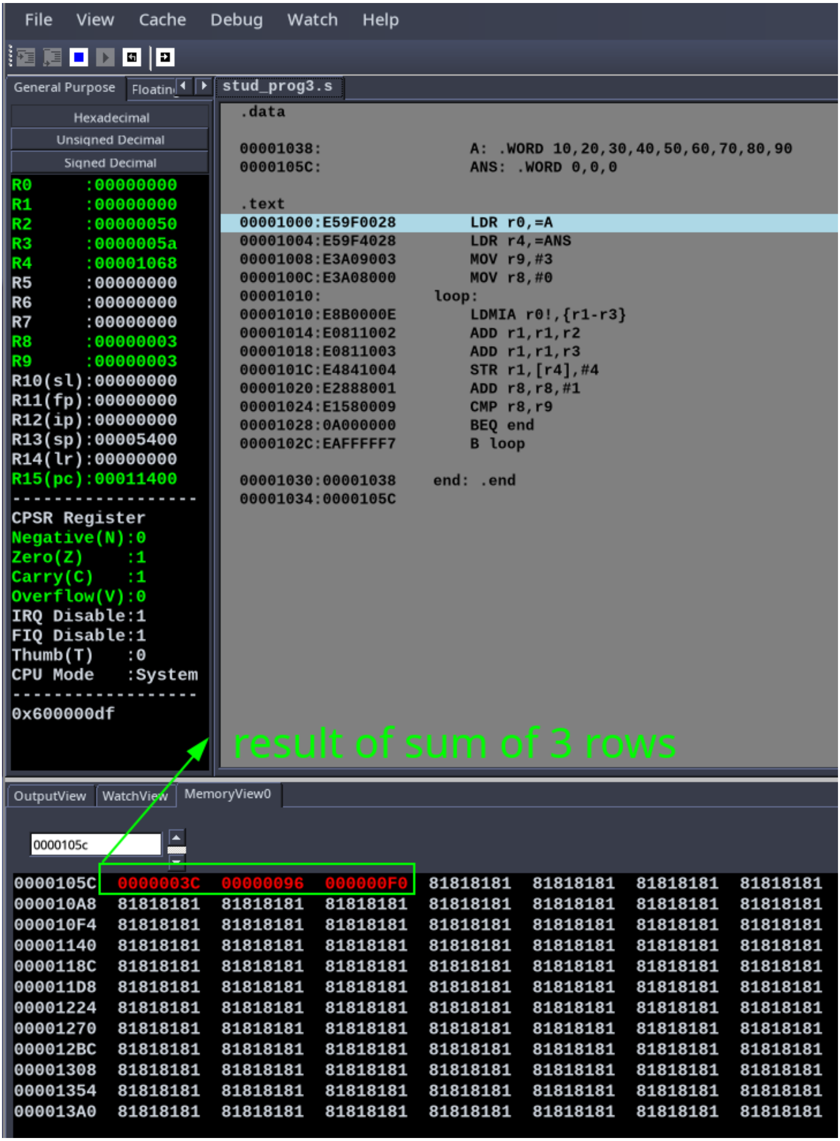
```
00001068 00000078 00000096 000000B4 81818181 81818181 81818181 81818181
000010B4 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001100 81818181 81818181 81818181 81818181 81818181 81818181 81818181
0000114C 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001198 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000011E4 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001230 81818181 81818181 81818181 81818181 81818181 81818181 81818181
0000127C 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000012C8 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001314 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001360 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000013AC 81818181 81818181 81818181 81818181 81818181 81818181 81818181
```

Program 3: Find sum of rows of a 3rd order matrix

Code:

```
.data

    A: .WORD 10,20,30,40,50,60,70,80,90
    ANS: .WORD 0,0,0

.text
    LDR r0,=A
    LDR r4,=ANS
    MOV r9,#3
    MOV r8,#0
loop:
    LDMIA r0!,{r1-r3}
    ADD r1,r1,r2
    ADD r1,r1,r3
    STR r1,[r4],#4
    ADD r8,r8,#1
    CMP r8,r9
    BEQ end
    B loop

end: .end
```

Screenshots:



```
R0         :00000000
R1         :00000000
R2         :00000050
R3         :0000005a
R4         :00001068
R5         :00000000
R6         :00000000
R7         :00000000
R8         :00000003
R9         :00000003
R10(sl):00000000
R11(fp):00000000
R12(ip):00000000
R13(sp):00005400
R14(lr):00000000
R15(pc):00011400
-----------------
CPSR Register
Negative(N):0
Zero(Z)    :1
Carry(C)   :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T)   :0
CPU Mode   :System
-----------------
0x600000df
```

```
.data

00001038:               A: .WORD 10,20,30,40,50,60,70,80,90
0000105C:               ANS: .WORD 0,0,0

.text
00001000:E59F0028       LDR r0,=A
00001004:E59F4028       LDR r4,=ANS
00001008:E3A09003       MOV r9,#3
0000100C:E3A08000       MOV r8,#0
00001010:           loop:
00001010:E8B0000E       LDMIA r0!,{r1-r3}
00001014:E0811002       ADD r1,r1,r2
00001018:E0811003       ADD r1,r1,r3
0000101C:E4841004       STR r1,[r4],#4
00001020:E2888001       ADD r8,r8,#1
00001024:E1580009       CMP r8,r9
00001028:0A000000       BEQ end
0000102C:EAFFFFF7       B loop

00001030:00001038   end: .end
00001034:0000105C
```

result of sum of 3 rows

```
0000105C  0000003C  00000096  000000F0  81818181  81818181  81818181  81818181
000010A8  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000010F4  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001140  81818181  81818181  81818181  81818181  81818181  81818181  81818181
0000118C  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000011D8  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001224  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001270  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000012BC  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001308  81818181  81818181  81818181  81818181  81818181  81818181  81818181
00001354  81818181  81818181  81818181  81818181  81818181  81818181  81818181
000013A0  81818181  81818181  81818181  81818181  81818181  81818181  81818181
```