

MPCA Assignment : Unit-2

- Name : P K Navin Shrinivas
- Section : D
- SRN : PES2UG20CS237

Question 1: Binary Search in ARM7RDMI Assembly

Code:

```
.data
    ARR: .WORD 2,4,7,9,10,14,15
    KEY: .WORD 14
    SIZE: .WORD 7
    OUTPUT1: .ASCIZ "Successful Search"
    OUTPUT2: .ASCIZ "Unsuccessful Search"
.text

LDR r11,=SIZE
LDR r0,[r11]
LDR r1,=ARR
ADD r2,r1,r0,LSL #2
LDR r11,=KEY
LDR r3,[r11]

initloop:
    SUB r6,r2,r1
    CMP r6,#4
    BEQ failed
```

```
SUB r4,r2,r1
MOV r4,r4,LSR #2
MOV r4,r4,LSR #1
MOV r4,r4,LSL #2
ADD r4,r4,r1
LDR r5,[r4]
CMP r5,r3
BEQ found
BLT gogreater
B golesser
```

gogreater:

```
MOV r1,r4
B initloop
```

golesser:

```
MOV r2,r4
B initloop
```

found:

```
ldr r1,=OUTPUT1
B LOOP
```

failed:

```
ldr r1,=OUTPUT2
B LOOP
```

LOOP:

```
LDRB R0,[R1],#1
CMP R0,#0
SWINE 0x00
BNE LOOP
SWI 0x11
```

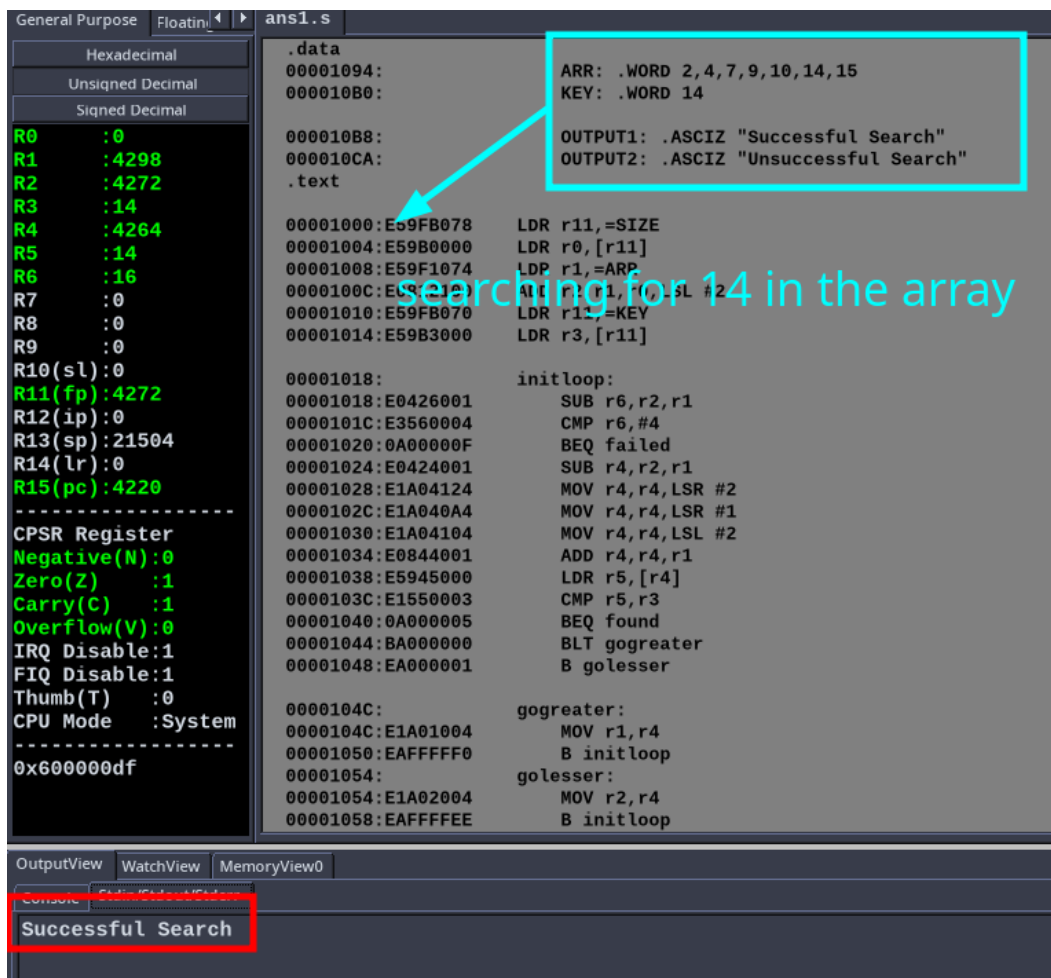
end: .end

Screenshots:

The screenshot displays a debugger interface with the following components:

- Registers Panel (Left):** Shows the state of various registers. R15 (PC) is highlighted in green and set to 4220. Other registers like R0, R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14 are also visible.
- Assembly View (Center):** Displays the assembly code for a program named 'ans1.s'. The code includes data definitions and a search loop. A cyan arrow points to the instruction 'ADD r7, r1, r0, LSL #2' with the text 'searching for 3 in the array' overlaid.
- Data Definitions (Cyan Box):** A cyan box highlights the following data definitions:

```
.data
00001094: ARR: .WORD 2,4,7,9,10,14,15
000010B0: KEY: .WORD 3
000010B4: SIZE: .WORD 7
000010B8: OUTPUT1: .ASCIZ "Successful Search"
000010CA: OUTPUT2: .ASCIZ "Unsuccessful Search"
.text
```
- Console View (Bottom):** A red box highlights the console output, which shows 'Unsuccessful Search'.



Question 2 : Search for a substring in a string using ARM7TDMI

Code:

```
.data
    STRING: .ASCIIZ "My name is Bond"
    SUBSTR: .ASCIIZ "name"
    OUTPUT1: .ASCIIZ "String Present"
    OUTPUT2: .ASCIIZ "String Absent"

.text
```

```
LDR r0,=STRING
LDR r1,=SUBSTR
```

```
initmatch:
```

```
    LDRB r2,[r0],#1
    LDRB r3,[r1]
    CMP r2,#0
    BEQ notfound
    CMP r2,r3
    MOV r4,r0
    ADD r5,r1,#1
    BEQ submatch
    B initmatch
```

```
submatch:
```

```
    LDRB r2,[r4],#1
    LDRB r3,[r5],#1
    CMP r3,#0
    BEQ found
    CMP r2,r3
    BEQ submatch
    B initmatch
```

```
found:
```

```
    LDR r1,=OUTPUT1
    B LOOP
```

```
notfound:
```

```
    LDR r1,=OUTPUT2
    B LOOP
```

```
LOOP:
```

```

LDRB R0, [R1], #1
CMP R0, #0
SWINE 0x00
BNE LOOP
SWI 0x11

```

Screenshots:

The screenshot shows a debugger interface with the following components:

- General Purpose Register Window:** Displays registers R0 through R15. R15 (PC) is highlighted at 4200.
- CPSR Register Window:** Shows status flags: Negative(N):0, Zero(Z):1, Carry(C):1, Overflow(V):0, IRQ Disable:1, FIQ Disable:1, Thumb(T):0, CPU Mode: System.
- Assembly Code Window:** Shows the disassembly of the assembly file 'ans2.s'. The data section contains:


```

.data
0000107C: STRING: .ASCIZ "My name is Bond"
0000108C: SUBSTR: .ASCIZ "name"
00001091: OUTPUT1: .ASCIZ "String Present"
000010A0: OUTPUT2: .ASCIZ "String Absent"

.text
00001000:E59F0064 LDR r0,=STRING
00001004:E59F1064 LDR r2,[r3],#1
00001008: initmatch:
00001008:E4D02001 LDRB r2,[r2],#1
0000100C:E5D13000 LDRB r3,[r1]
00001010:E3520000 CMP r2,#0
00001014:0A00000D BEQ notfound
00001018:E1520003 CMP r2,r3
0000101C:E1A04000 MOV r4,r0
00001020:E2815001 ADD r5,r1,#1
00001024:0A000000 BEQ submatch
00001028:EAF0FF66 B initmatch

0000102C: submatch:
0000102C:E4D42001 LDRB r2,[r4],#1
00001030:E4D53001 LDRB r3,[r5],#1
00001034:E3530000 CMP r3,#0
00001038:0A000002 BEQ found
0000103C:E1520003 CMP r2,r3
00001040:0AFF0FF9 BEQ submatch
00001044:EAF0FFEF B initmatch

00001048: found:
00001048:E59F1024 LDR r1,=OUTPUT1
0000104C:EA000001 B LOOP
00001050: notfound:
00001050:E59F1020 LDR r1,=OUTPUT2

```
- Console Window:** Shows the output 'String Present'.

General Purpose Floating ans2.s

Hexadecimal
Unsigned Decimal
Signed Decimal

R0 :0
R1 :4271
R2 :0
R3 :74
R4 :4235
R5 :4237
R6 :0
R7 :0
R8 :0
R9 :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):21504
R14(lr):0
R15(pc):4200

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
0000107C: STRING: .ASCIZ "My name is Bond"
0000108C: SUBSTR: .ASCIZ "James"
00001092: OUTPUT1: .ASCIZ "String Present"
000010A1: OUTPUT2: .ASCIZ "String Absent"

.text
00001000:E59F0064 LDR r0,=STRING
00001004:E59F1064 LDR r1,=SUBSTR
00001008: initmatch:
00001008:E4D02001 LDRB r2,[r0],#1
0000100C:E5D13000 LDRB r3,[r1]
00001010:E3520000 CMP r2,#0
00001014:0A00000D BEQ notfound
00001018:E1520003 CMP r2,r3
0000101C:E1A04000 MOV r4,r0
00001020:E2815001 ADD r5,r1,#1
00001024:0A000000 BEQ submatch
00001028:EAF0FF66 B initmatch
0000102C: submatch:
0000102C:E4D42001 LDRB r2,[r4],#1
00001030:E4D53001 LDRB r3,[r5],#1
00001034:E3530000 CMP r3,#0
00001038:0A000002 BEQ found
0000103C:E1520003 CMP r2,r3
00001040:0AF0FF69 BEQ submatch
00001044:EAF0FF6F B initmatch
00001048: found:
00001048:E59F1024 LDR r1,=OUTPUT1
0000104C:EA000001 B LOOP
00001050: notfound:
00001050:E59F1020 LDR r1,=OUTPUT2

searching for James in the string

OutputView WatchView MemoryView0
Console
String Absent