VIT-AP UNIVERSITY

MODULE-III : LECTURE-15

ARM ASSEMBLY LANGUAGE PROGRAMMING

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CONTENT

- ✓ **Assembly Language Programming: Applications**
- ✓ **Assembly Language Programming: Examples**

EXAMPLE-1

Automated Gate

EXAMPLE-1

✓ Write an ALP for Automated Gate. When any car in front of Gate then Gate will OPEN. When NO car in front of Gate then Gate will CLOSED.

Assume

- IR value is available in 0xFF00FF11 memory address.
- When any car in front of gate then AAH will be provide by IR sensor.
- To OPEN gate, Store FFH value in 0xFF11FF00 memory address.
- To CLOSE gate, Store 00H value in 0xFF11FF00 memory address.

EXAMPLE-1

Read the IR sensor

```
If(IR = 0xAA)
{
   Gate OPEN;
}
else
{
   Gate CLOSE;
}
```

```
            MOV R0, #0xAA
            LDR R1, =0xFF00FF11
LOOP:       LDR R2, [R1], #1
            CMP R2, R0
            BNE SKIP
            MOV R3, #0xFF          ; Open gate
            B Forward
SKIP:       MOV R3, #0x00          ; Close gate
Forward:    LDR R4, =0xFF11FF00
            STR R3, [R4], #1
            B LOOP
STOP        B STOP
            END
```

EXAMPLE-2

Temperature Monitoring Unit of Food Industry

EXAMPLE-2

EXAMPLE-2

- ✓ Write an ALP for Temperature Monitoring Unit of Food Industry.
  - If Temp>20^0 C then Cooler must be ON
  - If Temp<20^0 C then Cooler must be OFF

Assume

- ❖ Temp value is available in 0xFF00FF11 memory address.
- ❖ 20^0 C in Hexadecimal value is 14H.
- ❖ For ON of Cooler, Store FFH value in 0xFF11FF00 memory address.
- ❖ For OFF of Cooler, Store 00H value in 0xFF11FF00 memory address.

EXAMPLE-2

Read the Temperature

```
If(Temp>20⁰C)
{
   Cooler ON;
}
else
{
   Cooler OFF;
}
```

```
            MOV R0, #0x14
            LDR R1, =0xFF00FF11
LOOP:       LDR R2, [R1], #1
            CMP R2, R0
            BLE SKIP
            MOV R3, #0xFF        ; Cooler ON
            B Forward
SKIP:       MOV R3, #0x00        ; Cooler OFF
Forward:    LDR R4, =0xFF11FF00
            STR R3, [R4], #1
            B LOOP
STOP        B STOP
            END
```

EXAMPLE-3

Automated Light

EXAMPLE-3

- ✓ Write an ALP for Automated Light system.
  - When person is present in room then LED light must be ON.
  - When no person is present in room then LED light must be OFF.

Assume

- ❖ PIR sensor value is available in 0xFF00FF11 memory address.
- ❖ When any person is present then DDH will be provide by PIR sensor.
- ❖ For ON LED, Store ADH value in 0xFF11FF00 memory address.
- ❖ For OFF LED, Store BCH value in 0xFF11FF00 memory address.

EXAMPLE-3

Read the Temperature

```
If(PIR= 0xDD)
{
   LED ON;
}
else
{
   LED OFF;
}
```

```
            MOV R0, #0xDD
            LDR R1, =0xFF00FF11
LOOP:       LDR R2, [R1], #1
            CMP R2, R0
            BNE SKIP
            MOV R3, #0xAD       ; LED ON
            B Forward
SKIP:       MOV R3, #0xBC       ; LED OFF
Forward:    LDR R4, =0xFF11FF00
            STR R3, [R4], #1
            B LOOP
STOP        B STOP
            END
```

EXAMPLES

- ✓ Finding the maximum of a set of numbers

R0 – Pointer for the data
R1 – Stores the largest number
R2 – Stores the total number of numbers

```
    LDR R0, =0xF0000100
    EOR R1, R1, R1          ;clear R1 to store the largest
    CMP R2, #0
    BEQ Over                ;if block is empty, done
Loop
    LDR R3, [R0]            ;get the data
    CMP R3, R1              ;do comparison
    BCC Looptest            ;skip if R1 is bigger
    MOV R1, R3              ;else get the larger in R1
Looptest
    ADD R0, R0, #4          ;increment pointer R0
    SUBS R2, R2, #1         ;decrement number of elements left
    BNE Loop                ;if not done, loop
Over
                            ;R1 holds the largest
```

EXAMPLES

- ✓ Comparing two null terminated strings

```
Loop
        LDRB R3, [R0]     ;get next character of string 1
        LDRB R4, [R1]     ;get next character of string 2
        CMP R3, R4        ;compare
        BNE Notsame       ;if not same, strings do not match
        CMP R3, #0        ;check if end of string reached
        BEQ Same          ;if equal, same
        ADD R0, R0, #1    ;increment pointer to string 1
        ADD R1, R1, #1     ;increment pointer to string 2
        B   Loop          ;branch always to check next character
Notsame
        MOV R2, #-1       ;mark not matched
        B   Over
Same
        MOV R2, #0        ;mark matched
Over
                          ;R2 holds the match
```

Thank You

Please follow the instructions of the government and stay safe