8051 ASSEMBLY LANGUAGE PROGRAMMING

The 8051 Microcontroller and Embedded Systems: Using Assembly and C
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INSIDE THE 8051

Registers

- Register are used to store information temporarily, while the information could be
  - a byte of data to be processed, or
  - an address pointing to the data to be fetched
- The vast majority of 8051 register are 8-bit registers
  - There is only one data type, 8 bits

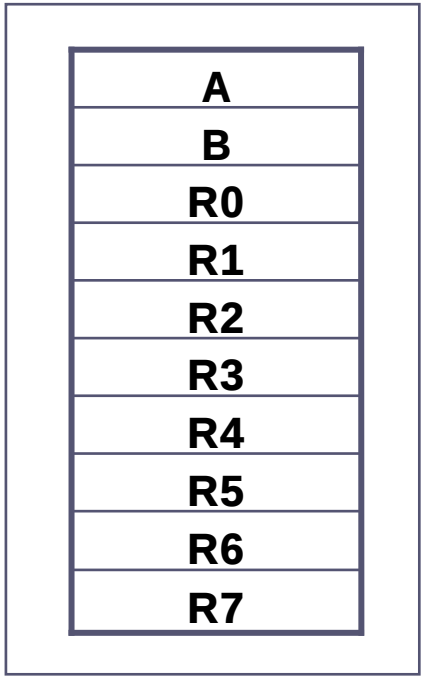
INSIDE THE 8051

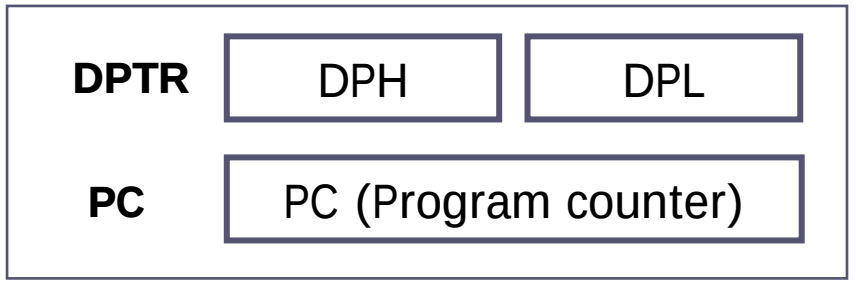
Registers (cont')

- The 8 bits of a register are shown from MSB D7 to the LSB D0
  - With an 8-bit data type, any data larger than 8 bits must be broken into 8-bit chunks before it is processed

8 bit Registers

- The most widely used registers
  - A (Accumulator)
    - For all arithmetic and logic instructions
  - B, R0, R1, R2, R3, R4, R5, R6, R7
  - DPTR (data pointer), and PC (program counter)





INSIDE THE 8051

MOV Instruction

MOV destination, source ;copy source to dest.

- The instruction tells the CPU to move (in reality, COPY) the source operand to the destination operand

"#" signifies that it is a value

```
MOV   A,#55H      ;load value 55H into reg. A
MOV   R0,A        ;copy contents of A into R0
                  ;(now A=R0=55H)
MOV   R1,A        ;copy contents of A into R1
                  ;(now A=R0=R1=55H)
MOV   R2,A        ;copy contents of A into R2
                  ;(now A=R0=R1=R2=55H)
MOV   R3,#95H     ;load value 95H into R3
                  ;(now R3=95H)
MOV   A,R3        ;copy contents of R3 into A
                  ;now A=R3=95H
```

INSIDE THE 8051

MOV Instruction (cont')

- Notes on programming
  - Value (proceeded with #) can be loaded directly to registers A, B, or R0 – R7
    - `MOV A, #23H`
    - `MOV R5, #0F9H`

BCD ✓

Binary ×

If it's not preceded with #, it means to load from a memory location

Add a 0 to indicate that F is a hex number and not a letter

  - If values 0 to F moved into an 8-bit register, the rest of the bits are assumed all zeros
    - "`MOV A, #5`", the result will be A=05; i.e., A = 00000101 in binary
  - Moving a value that is too large into a register will cause an error
    - `MOV A, #7F2H ; ILLEGAL: 7F2H>8 bits (FFH)`

INSIDE THE 8051

ADD Instruction

```
ADD A, source      ;ADD the source operand
                   ;to the  accumulator
```

- The ADD instruction tells the CPU to add the source byte to register A and put the result in register A
- Source operand can be either a register or immediate data, but the destination must always be register A
  - "ADD R4, A" and "ADD R2, #12H" are invalid since A must be the destination of any arithmetic operation

```
MOV A, #25H       ;load 25H into A
MOV R2, #34H      ;load 34H into R2
ADD A, R2 ;add R2 to Accumulator
                  ;(A = A + R2)
```

There are always many ways to write the same program, depending on the registers used

```
MOV A, #25H       ;load one operand
          ;into A (A=25H)
ADD A, #34H       ;add the second
                  ;operand 34H to A
```