Addressing Modes

8051 Programming

Today’s class

Moving data

Three main types

1. MOV destination, source
2. PUSH source or POP destination
3. XCH destination, source

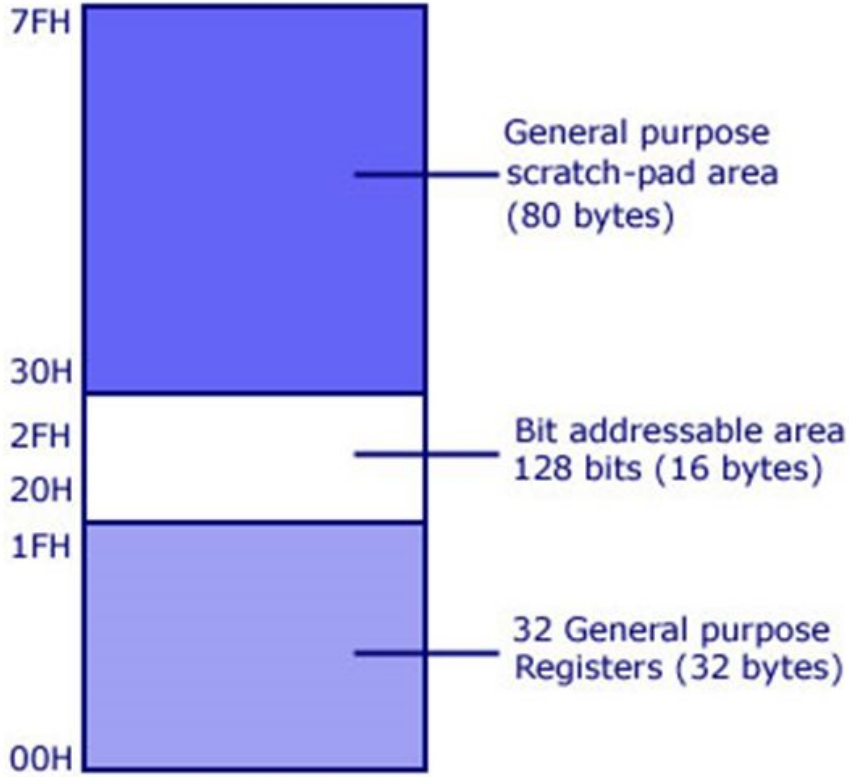
Four addressing modes

1. Immediate
2. Register
3. Direct
4. Indirect

Memory types

1. Internal RAM
2. Internal special-function registers
3. External RAM
4. Internal and external ROM

Lower 128 Bytes of Internal RAM 8051



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Five types of opcodes

1. MOV
2. MOVX
3. MOVC
4. PUSH and POP
5. XCH

Immediate highlights

Instr. using #	Next Byte(s) are data

Source of data only

Immediate Syntax

MOV Rr, #n

MOV A, #n

Immediate Example

```
MOV R0, #00h
; put the immediate 8 bit
; number 00h in register R0
```

Immediate Example

```
MOV A, #0AAh

; put the immediate 8 bit

; number AAh in register A
```

Immediate Example

```
MOV R7, #07h
; put the immediate 8 bit
; number 07 in register R7
```

Register highlights

Instr. Using R0 to R7
Register R0 to R7 in Current Bank

Source or Destination of data

Register syntax

MOV A, Rr

MOV Rr, A

Register Examples

```
MOV A, #0F1h

MOV R5, A

MOV A, R0
```

Register Examples

```
MOV A, #0F1h

; Move the immediate data byte

; F1h to the A register
```

Register Examples

```
MOV R5, A

; copy the data in register A

; to register R5
```

Register Examples

```
MOV A, R0

; copy the data in register R0

; to register A
```

Register Examples

```
MOV R3, #1Ch

;

;
```

Is this allowed?

```
MOV #04h, A

; immediate data as a destination
```

Is this allowed?

```
MOV A, #FFh

; numbers start with an alphabet
```

Direct highlights

Instr. Using a RAM address
Address in RAM

Source or Destination of data

Direct syntax and example

MOV A, add

MOV add, #n

MOV add1, add2

Direct example

```
MOV A, 80h

; copy data from the port 0

; pins to register A
```

Direct example

```
MOV R0, 12h

;

;
```

Direct example

```
MOV 5Ch, A

;

;
```

Is this allowed?

```
MOV 0FAh, A

; addresses above 7Fh
```

Is this allowed?

```
MOV 3Ah, 3Ah
; moving data from a direct address
; to itself
```

Is this allowed?

```
MOV 3Ah, 3Ah
; moving data from a direct address
; to itself
```

Indirect highlights

Instr. Using @R0 or @R1
Register R0 or R1 in Current Bank
Address in RAM

Source or Destination of data

Address of data

Indirect Syntax

MOV @Rp, #n

MOV A, @Rp

MOV add, @Rp

Indirect Examples

```
MOV A, @R0

; copy the contents of the

; address in R0 to the A reg
```

Indirect Examples

```
MOV @R1, #35h

;

;
```

Indirect Examples

```
MOV @R0, 80h

;

;
```

Is this allowed?

R0 | FAh |

```
MOV @R0, #35h
; number in register R0 is
; not a RAM address
```

Is this allowed?

```
MOV @R5, #35h

; using register other than R0 or R1
```

Summary

- Programming with 8051
  - Lines of code
  - 8051 Instruction Syntax
  - Labels
  - Instructions; comments

Summary

- Opcodes that move data
  - Within 8051
  - 8051 and external data memory
- Addressing modes
  - Immediate, register, direct, and indirect.