ADDRESSING MODES & INSTRUCTIONS SET OF 8051 MICRO CONTROLLER

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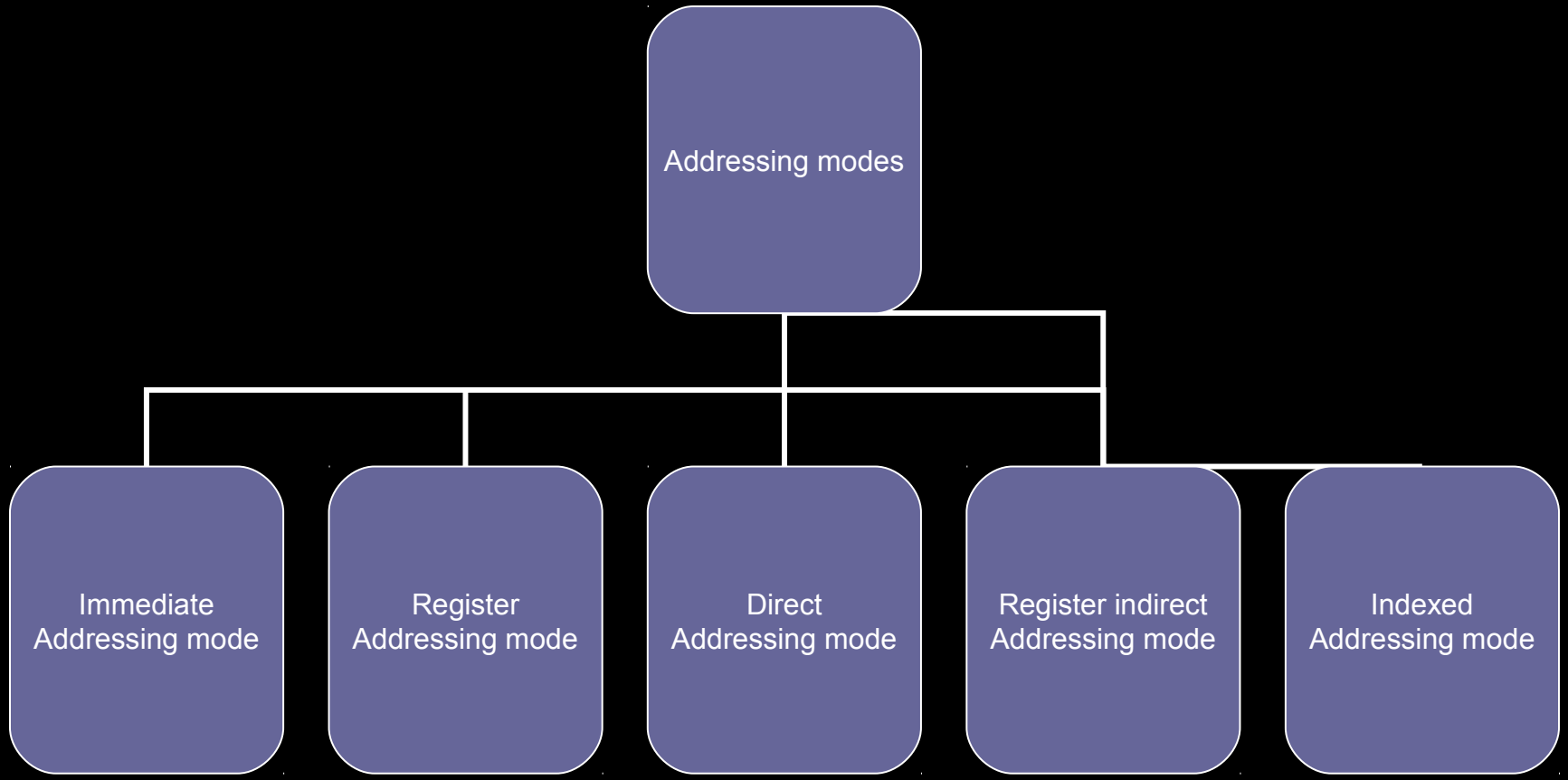
Addressing modes

- Definition:-

  The different ways in which a source operand in an instruction are known as the addressing modes.

  The 8051 provides a total of 5 distinct addressing modes.

Types of Addressing modes



Immediate addressing mode

In this addressing mode the source operand is constant. In immediate addressing mode, when the instruction is assembled, the operand comes immediately after the op-code.

Continue…

- The immediate data must be preceded by ‘#’ sign.
- This addressing mode can be used to load information into any of the register, including the DPTR.

Continue…

- Ex :-

```
MOV A,#25H          // load 25H in to A
MOV R4,#62          // load the decimal
                       value 62 into R4.
MOV DPTR,#4532H  // DPTR=4532H.
```

Register addressing mode

Register addressing mode involves the use of registers to hold the data to be manipulated.

Continue…

- Ex :-

  MOV A,R0 // copy the contents of R0 in to A.

  MOV R2,A // copy the contents of A in to R2.

  ADD A,R5 // add the content of R5 to content of A.

Direct addressing mode

In direct addressing mode, the data is in a RAM memory location whose address is known, and this address is given as a part of the instruction. Contrast this with the immediate addressing mode in which the operand itself is provided with the instruction.

Continue…

- Ex:-

```
MOV R0,40H  //  save content of RAM
                location 40h into R0.
MOV 56H,A   //  save content of A in
                RAM location 56H.
```

Register indirect addressing mode

In the register indirect addressing mode, a register is used as a pointer to the data. If the data is inside the CPU, only register R0 and R1 are used for this purpose. In other words,R2-R7 cannot be used to hold the address of an operand located in RAM when using this addressing mode.

Continue…

- When R0 and R1 are used as pointers , that is, when they hold the address of RAM locations , they must be preceded by the “@” sign.

Continue…

Ex :-

MOV A,@R0 // move contents of RAM location whose address is held by R0 into A.

MOV @R1,B // move contents of B RAM location whose address is held by R1

Indexed addressing mode

- Indexed addressing mode is widely used in accessing data elements of look-up table entries located in the program ROM space of the 8051.
- The instruction used for this purpose is “MOV A, @A+DPTR”.

Continue…

- The 16-bit register DPTR and register “A” are used to form the data element stored in on-chip ROM.
- Because the data elements are stored in the program space ROM of the 8051,it uses the instruction MOVC instead of MOV.

Continue…

- In this instruction the content of A are added to the 16-bit register DPTR to form the 16-bit address of the needed data.

Instruction set of 8051

8051 has simple instruction set in different groups. There are:

- Arithmetic instructions
- Logical instructions
- Data transfer instructions
- Branching and looping instructions
- Bit control instructions

Arithmetic instructions

These instructions are used to perform various mathematical operations like addition, subtraction, multiplication, and division etc.

Continue…

- ADD A, R1 // Add the content of register1 to Accumulator
- ADDC A,#2 // Add 2 to accumulator with carry
- SUBB A,R2 // Subtract content of register2 from Accumulator

Continue…

- INC A // Increment accumulator
- DEC A // Decrement accumulator

Logical instructions

- The logical instructions are the instructions which are used for performing some operations like AND, OR, NOT, X-OR and etc., on the operands.

Continue…

- ANL A, Rn // AND register to accumulator
- ORL A, Rn // OR register to accumulator
- XRL A, Rn // Exclusive OR Reg to Acc
- CLR A // Clear Accumulator
- CPL A // Complement Accumulator

Data Transfer Instructions

- These instruction are used to transfer the data from source operand to destination operand. All the store, move, load, exchange input and output instructions belong to this to this group.

Continue…

- MOV A, Rn // Move Reg to Acc
- MOVX A,@DPTR // Move external RAM to Accumulator
- PUSH direct // PUSH direct byte on to stack
- POP direct // POP direct byte from stack

Branch and Looping Instructions

- These instructions are used for both branching as well as looping.
- These instructions include conditional & unconditional jump or loop instructions.

Conditional Jump Instructions

- JC // Jump if carry equal to one
- JNC // Jump if carry equal to zero
- JB // Jump if bit equal to one
- JNB // Jump if bit equal to zero
- JBC // Jump if bit equal to one and clear bit

Continue…

- JZ // Jump if A=Zero
- JNZ // Jump if A not equal to zero
- DJNZ // Decrement and Jump if not equal to zero.

Unconditional Jump Instructions

- In 8051 there two unconditional jumps. They are:
- SJMP // Short jump
- LJMP // Long jump


ThankYou