Arrays and Addressing Modes

Computer Organization and Assembly Language

Agenda

- Introduction
- One Dimensional Arrays
- Addressing Modes
- Two Dimensional Arrays

Arrays

- An array is a structure which is collection of elements.
- Each element of an array can be accessed with an index.

One dimensional arrays

- A one-dimensional array is an ordered list or elements of same type.
- The array can be created as:

  weights DW 10, 20, 30, 40, 50, 60

- Or an array of characters or string as:

  MSG DB 'whats up'

- The address of the array is called the base address of the array.

DUP Operator

- To define arrays whose elements share a common initial value by using the DUP (duplicate) operator:

  repeat_count DUP (value)

- This operator causes value to be repeated the number of times specified by repeat_count. For example:

  nums DW 100 DUP (0)

- Sets an array of 100 words, with each entry Initialized to O.
- Similarly,

  DELTA DB 212 DUP (?)

- Creates an array of 212 uninitialized bytes.

DUP Operator

- DUPs *may* be nested. For example:

  arr DB 5, 4, 3 DUP (2, 3 DUP (0) , 1)

- Which is equivalent to:

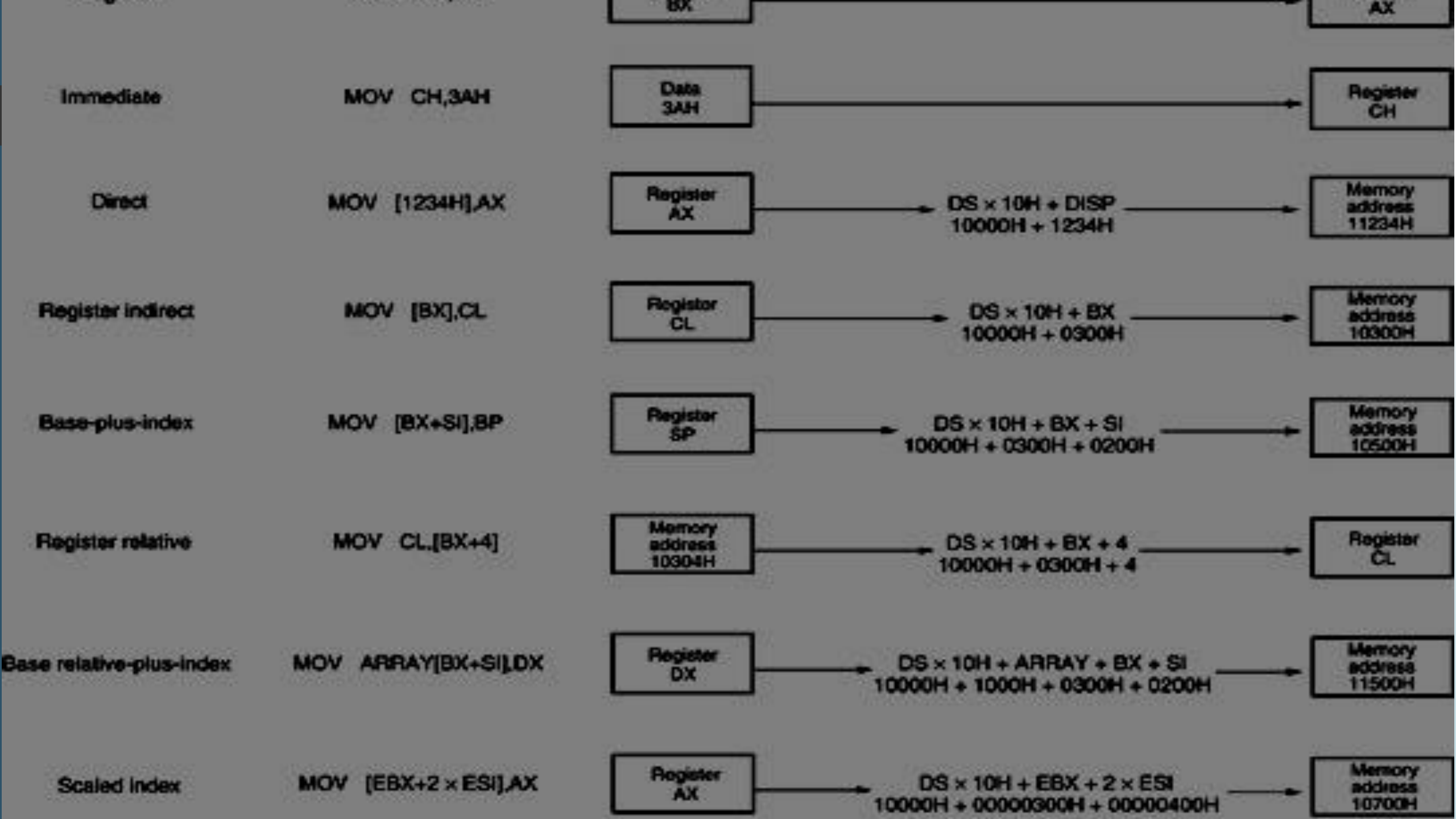
  arr DB 5, 4, 2,0,0,0,1,2,0,0,0,1,2,0,0,0,1

Addressing Modes

- Addressing modes specify a rule for interpreting or modifying the address field of the instruction (before the operand is actually referenced).
- In other words, its a way of accessing data.
  - They give programming flexibility.
- Efficient code for the microprocessor requires familiarity with the addressing modes.

Addressing Modes

- The next figure summarizes the addressing modes.


BX
AX
Immediate
MOV CH,3AH
Data 3AH
Register CH
Direct
MOV [1234H],AX
Register AX
DS × 10H + DISP
10000H + 1234H
Memory address 11234H
Register indirect
MOV [BX],CL
Register CL
DS × 10H + BX
10000H + 0300H
Memory address 10300H
Base-plus-index
MOV [BX+SI],BP
Register BP
DS × 10H + BX + SI
10000H + 0300H + 0200H
Memory address 10500H
Register relative
MOV CL,[BX+4]
Memory address 10304H
DS × 10H + BX + 4
10000H + 0300H + 4
Register CL
Base relative-plus-index
MOV ARRAY[BX+SI],DX
Register DX
DS × 10H + ARRAY + BX + SI
10000H + 1000H + 0300H + 0200H
Memory address 11500H
Scaled index
MOV [EBX+2 × ESI],AX
Register AX
DS × 10H + EBX + 2 × ESI
10000H + 00000300H + 00000400H
Memory address 10700H