Lecture 26:
Advanced Addressing Modes

Today’s Goals

- Use decrement/increment/test with branch instructions to reduce code size and/or execution time

- Use predecrement, preincrement, postdecrement, and postincrement instructions to reduce code size and/or execution time

Decrement/Increment/Test with Branch

- In many programs, we used a variable to track how many times to perform a loop.

- A loop count variable and conditional branches.
  - DEC, DECA, DECB, DEX, DEY
  - INC, INCA, INCB, INX, INY
  - BEQ, BNE,

- This is very common in programming.

- HCS12 has following instructions.
  - DBEQ reg, offset: Decrement by 1 and Branch if EQual
    - reg: A, B, D, X, Y, or SP
  - DBNE reg, offset: Decrement by 1 and Brach if Not Equal
  - IBEQ reg, offset: Increment by 1 and Branch if EQual
  - IBNE reg, offset: Increment by 1 and Branch if Not Equal
  - TBEQ reg, offset: Test and Branch if EQual
  - TBNE reg, offset: Test and Branch if Not Equal

Example

- The program that convert a list of 4-byte Big-Endian numbers to an array of 4-byte Little-Endian numbers.

```
       ORG   $1000

BEnd   DS.W  1
LEnd   DS.W  1
Length DS.W  1

       ORG   $2000
       LDX   BEnd
       LDY   Lend
       LDD   Length
       BEQ   Done     ; Cycls,bytes
Loop   MOVB  0,X,3,Y ; 5,4
       MOVB  1,X,2,Y ; 5,4
       MOVB  2,X,1,Y ; 5,4
       MOVB  3,X,0,Y ; 5,4
       LEAX  4,X     ; 2,2
       LEAY  4,Y     ; 2,2
       SUBD  #$0001  ; 2,3
       BNE   Loop    ; 3,2
Done   SWI
```

```
        ORG   $1000

BEnd    DS.W  1
LEnd    DS.W  1
Length  DS.W  1

        ORG   $2000
        LDX   BEnd
        LDY   LEnd
        LDD   Length
        BEQ   Done
Loop    MOVB  0,X,3,Y
        MOVB  1,X,2,Y ; 5,4
        MOVB  2,X,1,Y ; 5,4
        MOVB  3,X,0,Y ; 5,4
        LEAX  4,X     ; 2,2
        LEAY  4,Y     ; 2,2
        DBNE  D,Loop  ; 3,3

Done    SWI
```

We can save two cycles in a loop!!

Auto Pre/Post Increment/Decrement (IDX)

- Effective Address: Value supplied in index register as with indexed addressing but with no offset

- Format:
  - inc/dec value, (+/-)reg
  - inc/dec value, reg(+/-)

- Example:
  - LDD 2,X+

- Note:
  - Unlike regular indexed, the value in X, Y, SP is changed
  - Pre-version modifies BEFORE the memory access is made
  - Post-version modifies AFTER the memory access is made
  - Inc/Dec value is +/-1 to 8
  - Cannot use an inc/dec value of 0 (not make sense!)

```
        ORG     $1000

BEnd    DS.W    1
LEnd    DS.W    1
Length  DS.W    1

        ORG     $2000
        LDX     BEnd
        LDY     LEnd
        LEAY    3,Y
        LDD     Length
        BEQ     Done         ; Cycles,bytes
Loop    MOVB    1,X+,1,Y-    ; 5,4
        MOVB    1,X+,1,Y-    ; 5,4
        MOVB    1,X+,1,Y-    ; 5,4
        MOVB    1,X+,7,Y+    ; 5,4
        DBNE    D,Loop       ; 3,3
Done    SWI
```

We can save even four more cycles in a loop from the previous improved implementation!!

Questions?

Wrap-up

What we’ve learned

What to Come