Computer Structure and Language

The 8086/8088 Assembly Language

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Computer Structure & Language, Lecture#6: String and decimal instructions

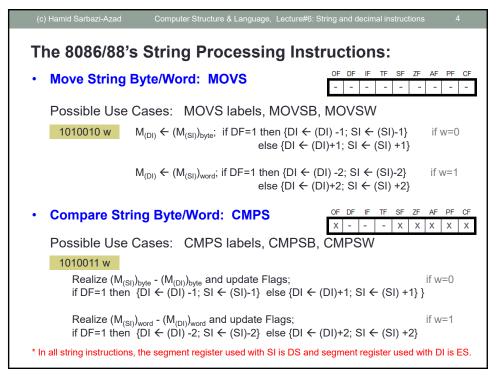
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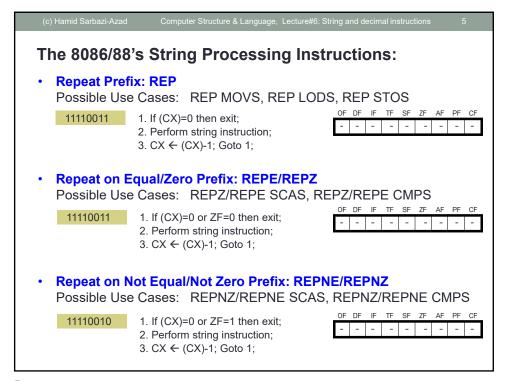
8086/88 has 7 types of instructions:

- 1. Data Transfer Instructions
- 2. Arithmetic Instructions
- 3. Bit Manipulation Instructions
- 4. String Instructions
- 5. Program Execution Transfer Instructions
- 6. Processor Control Instructions
- 7. Interrupt Instructions

(c) Hamid Sarbazi-Azad The 8086/88's String Processing Instructions: Load String Byte/Word to AL/AX: LODS Possible Use Cases: LODS label, LODSB, LODSW $AL \leftarrow (M_{(SI)})$; if DF=1 then SI \leftarrow (SI)-1 else SI \leftarrow (SI)+1; if w=0 1010110 w $AX \leftarrow (M_{(SI)})$; if DF=1 then SI \leftarrow (SI)-2 else SI \leftarrow (SI)+2; if w=1 Store String Byte/Word from AL/AX: STOS -Possible Use Cases: STOS label, STOSB, STOSW $M_{(DI)} \leftarrow (AL)$; if DF=1 then DI \leftarrow (DI)-1 else DI \leftarrow (DI)+1; if w=0 1010101 w $M_{(DI)} \leftarrow (AX)$; if DF=1 then DI \leftarrow (DI)-2 else DI \leftarrow (DI)+2; if w=1 x - - - x x x x Scan String Byte/Word: SCAS Possible Use Cases: SCAS label, SCASB, SCASW 1010111 w Realize (AL) - $(M_{(DI)})$ and update Flags; if DF=1 then DI \leftarrow (DI)-1 else DI \leftarrow (DI)+1; if w=0 Realize (AX) - $(M_{(DI)})$ and update Flags; if DF=1 then DI \leftarrow (DI)-2 else DI \leftarrow (DI)+2; if w=1 * In all string instructions, the segment register used with SI is DS and segment register used with DI is ES.

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The 8086/88's Decimal Computing Instructions:

Decimal numbers can be shown in two formats:

- Packed Decimal: Each byte shows two decimal digits
- ASCII (unpacked) Decimal: Each byte shows one decimal digit

It is the programmers duty to keep the sign and define decimal numbers using **db** directive.

Machine has few limited instructions to support decimal calculations. They include AAA, AAS, AAM, AAD, DAA, DAS.

All instructions work on one byte decimal numbers

- 2 digits for packed decimal, and
- one digit for ASCII numbers).

The 8086/88's Decimal Computing Instructions: **ASCII (unpacked) Decimal Computing Instructions:** ASCII Adjust for Addition: AAA u u x u x 00110111 if (AL) \land 0Fh > 9 or AF=1 then AL \leftarrow (AL) + 6; AH \leftarrow (AH) + 1; $AF \leftarrow 1$; $CF \leftarrow AF$; $AL \leftarrow (AL) \land 0Fh$; *AAA is used after actual binary addition. ASCII Adjust for Subtraction: AAS u u x u x 00111111 if (AL) \land 0Fh > 9 or AF=1 then AL \leftarrow (AL) - 6; AH \leftarrow (AH) - 1; $AF \leftarrow 1$; $CF \leftarrow AF$; $AL \leftarrow (AL) \land 0Fh;$ *AAS is used after actual binary subtraction.

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