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The Z80 and the 8051

Tuesday, December 18, 2012 introduction to microcontrollers 0 comments

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To see the differences in concept between a microprocessor and a microcontroller, in the following table we will examine the pin configurations, architecture, and instruction sets for a 1980s-era 8-bit microprocessor, the Zilog Z80, and a microcontroller, the 8-bit Intel 8051:

Note that the point here is not to show that one design is "better" than the other,- the two designs are intended to be used for different purposes and in different ways. For example, the Z80 has a very rich instruction set. The penalty that is paid for this abundance is the number of multi-byte instructions needed, some 71% of the total number. Each byte of a multi-byte instruction must be fetched from program memory, and each fetch takes time; this results in longer program byte counts and slower execution time versus single-byte instructions. The 8051 has a 62% multi-byte instruction content; the 8051 program is more compact and will run faster to accomplish similar tasks.

The disadvantage of using a *lean* instruction .set as in the 8051 is increased programmer effort (expense) to write code,- this disadvantage can be overcome when writing large programs by the use of high-level languages such as BASIC and C, both of which are popular with 8051 system developers. The price paid for reducing programmer time (there is *always* a price) is the size of the program generated.

	Z80	8051
Pin Configurations		
Total pins	40	40
Address pins	16(fixed)	16
Data pins	8(fixed)	8
Interrupt pins	2(fixed)	2
I/O pins	0	32
Architecture		
8 - bit registers	20	34
16 - bit registers	4	2
Stack size	64K	128
Internal ROM	0	4k
Internal RAM	0	128
External memory	64K	128k
Flags	6	4
Timers	0	2
Parallel port	0	4
Serial port	0	1
Instruction Sets (types / variations)		
External moves	4/14	2/6
Block moves	2/4	0
Bit manipulate	4/4	12/12
Jump on bit	0	3/3
Stack	3/15	2/2
Single byte	203	49
Multi-byte	490	62