Title

Digital Electronics

8/23/2023

Intro

- Software (typically from a high level programming langauge), abstracts certain computational functions to make writing code more feasible
- the next step will be the assembly process, written in pure references of transistor processes
- transistor switching

Binary Numer Systems

there are three types of number systems → `Decimal, Binary, Hexadecimal`

Bits

A **bit** is simply a single binary value. These are the followin notations for increases in the number of bits.

- 8 bit → 1 byte
- 16 bits → 1 words, 2 bytes
- 32 bits → 2 words, 4 bytes (floats)
- 64 bits → 2 longs, 4 words, 8 bytes (double in programming)

64 bits are usually called a `long long` in hardware. Additionally, B → bytes 8B is 8 btes, and b → bits, 4b is 4 bits.

2^n, where n is the number os bits, is the number of possible values that could be represented by said number of bits. This entails

- Min and max number a binary
- possible input combination to a digital circuit

Number System

Numbers in everyday use are reffered to as decimal Numbers

$$7,392 = (7 * 10^3) + (3 * 10^2) + (9 * 10^1) + (2 * 10^0)$$

Value of # = $V_0(B^d) + V_0(B^d) + V_0(B^d)$... where V is the value of a digit, B is the base, and d is the digit's place.

Binary systems are base 2, only compirsed of the value 1 & 0. Hexadecimal an doctal numvers are base 16 and 8 respectively. Hex digits have 16 values, and octal digits have 8 values.

Subscripts to the right most of a digit denotes its base.

- $1101_{10} \rightarrow$ base 10
- $1101_2 \rightarrow$ base 2

Converting Binary to decimal

Raise the value to the power of it's place. 10011011 $\downarrow [V_0(B^d) + V_0(B^d) + V_0(B^d)...]$

$$2^7 * 1 + 2^6 * 0 + 2^5 * 0 + 2^4 * 1 + 2^3 * 1 + 2^2 * 0 + 2^1 * 1 + 2^0 * 1$$

- `LSB` $\rightarrow$ least Siginficant Bit
- `MSB` $\rightarrow$ Most Siginficant Bit

*If the LSB is 1, the decimal number is odd, if 0 it's even.

Converting Decimal to Binary

- Divide decimal number by 2 and remainder is binary value
- continue to divide result by 2 using remainder as binary value
- stop when no more division can occur

10: 10/2 = 0 (LSB), 5/2 = 1, 2/2 = 0, 1/2 = 1