

Data Representation

There are two types:

1. Analog – continuous scale of values
 - i. Radio (analog transmission) – AM (amplitude modulation), FM (frequency)
 - ii. More cycles/second, higher value
 - iii. 1 cycle/second is 1Hz (Hertz)
- b. Sampling rate – how many samples/second
2. Digital – 0s and 1s, discrete values
 - a. Digital modulation – provides a means of transmitting data from one system to another (picture)
 - i. One approach is to use digital data to modulate the amplitude of a sine wave, called a carrier
 - ii. 2.4 GHz ($G=10^9$, $H=10^6$, $k=10^3$)
 - b. TV – digital transmission (can detect and correct errors)
 - c. How to represent data
 - i. Numbers – only two symbols, 0 and 1. We use 10 symbols, 0 to 9, called base 10. $726 = 7 \times 10^2 + 2 \times 10^1 + 6 \times 10^0 = 700 + 20 + 6 = 726$
 1. $10110 = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 16 + 4 + 2 = 22$
 2. $1110 = 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 = 8 + 4 + 2 = 14$
 3. $111001 = 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^0 = 32 + 16 + 8 + 1 = 57$
 4. $726 = 0 \times 2^{10} + 1 \times 2^9 + 0 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 01011010110$
 5. $17 = 10001$
 6. $10111_2 = 16 + 4 + 2 + 1 = 23_{10}$
 7. $37_{10} = 32 + 4 + 1 = 0100101_2$
 8. If left number is 0, it is positive; if left number is 1, it is negative
 - ii. Characters – A B a b, . ? (8 bits is 1 byte, we use 1 byte for 8 symbols) ASCII