Lab 7: Analog Modulation SUMMER CHALLENGE COURSE SMART LIGHTING

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VLC Tranceiver





Analog vs. Discrete vs. Digital



Input: 1. Acoustic air ->

variations pressure electrical signal

- 2. ADC: electrical signal -> digital data
- 3. Digital System: stores, manipulates, processes data -> stream output values
- 4. DAC: digital samples -> continuous time electrical signal
- 5. Acoustic output: voltage
 - -> air pressure variations







- Sampling: continuous signal to discrete signal
- Sample: value at a point in time or space
- Sample Frequency: Samples per Second (Hertz)
- Reciprocal: Sampling period
- Bit depth: number of bits of information recorded per sample

- The Nyquist Sampling Theorem: 2 times signal maximum
- Human hearing range is between 20 Hz and 20 kHz.
- Minimum sampling rate for audio?
- CDs use 44.1 kHz
- Example:
 - 74 minutes CD music:
 - •44.1KHz sampling frequency
 - •16-bits bit-depth or sample-width
 - •2-channels



- •Bit rate = 44.1KHz*16-bits*2-channels = **1,411,220 bits/sec**
- •Require storage = 44.1KHz * 16-bits * 2-channels * 60 seconds * 70 mins = **5,927,040,000 bits**

Amplitude Modulation

- Carrier Modulation: Putting information onto a high frequency carrier for transmission
- Carrier Demodulation: Extracting the low frequency information from the carrier-modulated signal





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Converting Pitches:

To Higher Pitch: Divide Frequency by 2 for each octave

To Lower Pitch: Multiple Frequency by 2 for each octave

https://musicmotivated.com/wp-content/uploads/2013/09/piano-guitar-bass-frequency-chart-88-keys-pitches.jpg



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