EE2361 - Lecture 26

11/7/16

- Moodle Page Updated
  - Lecture material added, more to come
  - See reading for 11/9 (part 2)
  - HW3 & HW4

---

Exam 2 Friday 11/11/16

$I^2C$ - Code this 2 ways

1. Use the module on the PIC24F (see section 24 of the PIC24F FRM) → Microchip AN1079

2. Bit-banging
   write C functions that communicate with an $I^2C$ slave device
   → Microchip AN1100

AN1079 & AN1100 communicate with $I^2C$ EEPROMs

Discussed AN1100

Bit-banging $I^2C$ for a microchip Serial $E^2PROM$

# Analog to Digital Converters

Converts an Analog signal to a digital signal

# ATD specs

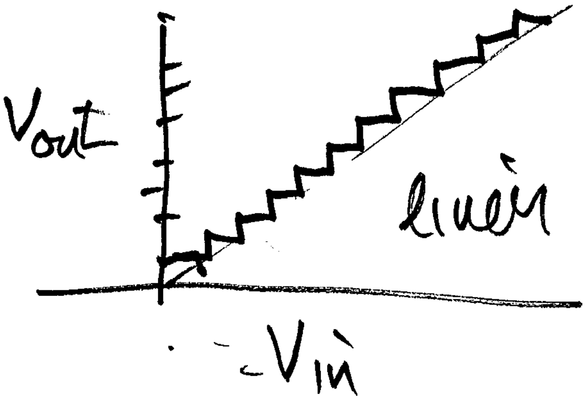
Precision - the numbers of distinguishable inputs (e.g. 256 levels or 8 bits)

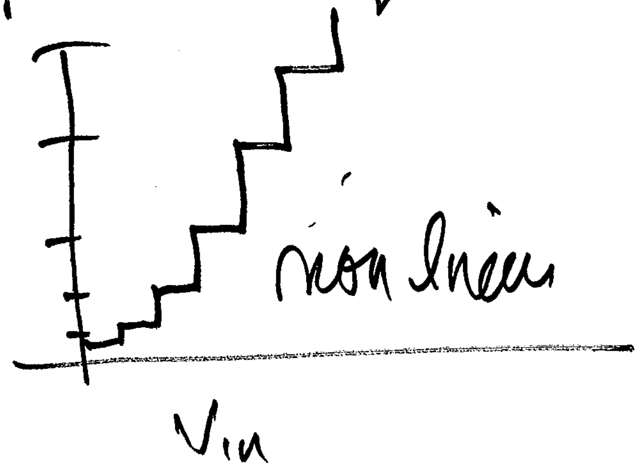
Range - The maximum and minimum ADC input values (volts, amps, °c)

Resolution - the change in input that produces a change in the LS bit of the output (±1)

## The resolution

The ATD is *linear* if the resolution is constant through the range



<u>Example</u>: What is range and resolution of an 8-bit (ADC) with $V_{REF+} = 10V$ and $V_{REF-} = -10V$?

Range is $V_{REF+} - V_{REF-} = 10 - (-10) = 20V$

Given the 8-bit <u>precision</u>

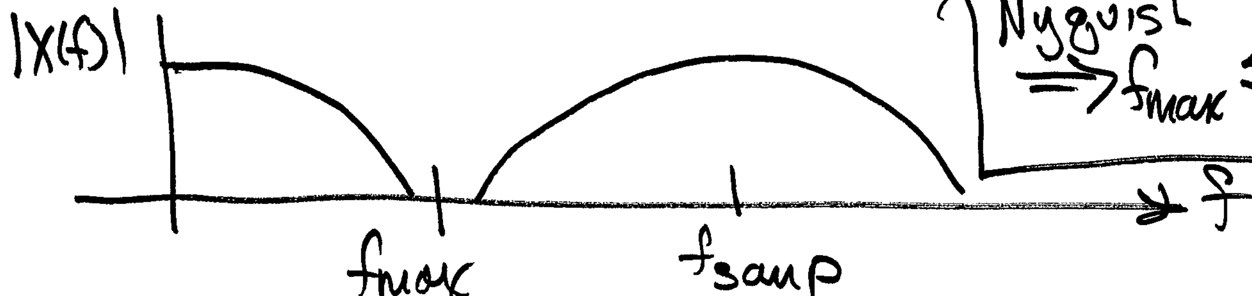
$$\text{resolution} = \frac{\text{range}}{\text{precision}} = \frac{20V}{2^8} = \frac{20V}{256} = 78.125mV$$

The conversion time or speed of the ~~ADC~~ ATD is the time it takes to convert a signal

$$f_{samp} \leq \frac{1}{\text{conversion time}}$$

In the freq domain, look at spectrum

$$\boxed{\text{Nyquist} \Rightarrow f_{max} \leq \frac{f_{samp}}{2}}$$



Example: What is the maximum sampling frequency of an 8-bit ATD with a conversion time of 2.5 μS

$$f_{samp} = \frac{1}{\text{conversion time}} = \frac{1}{2.5\times10^{-6}} = \underline{400\,kHz}$$