FACULTY OF ENGINEERING & TECHNOLOGY

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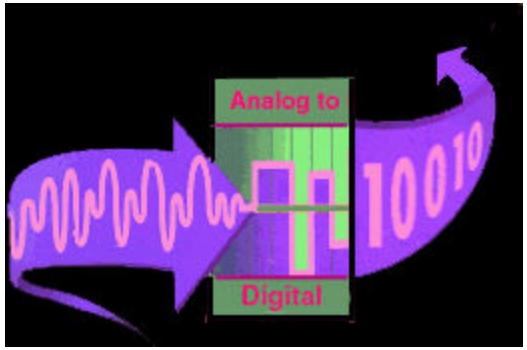
Data Converters: Basic Concepts

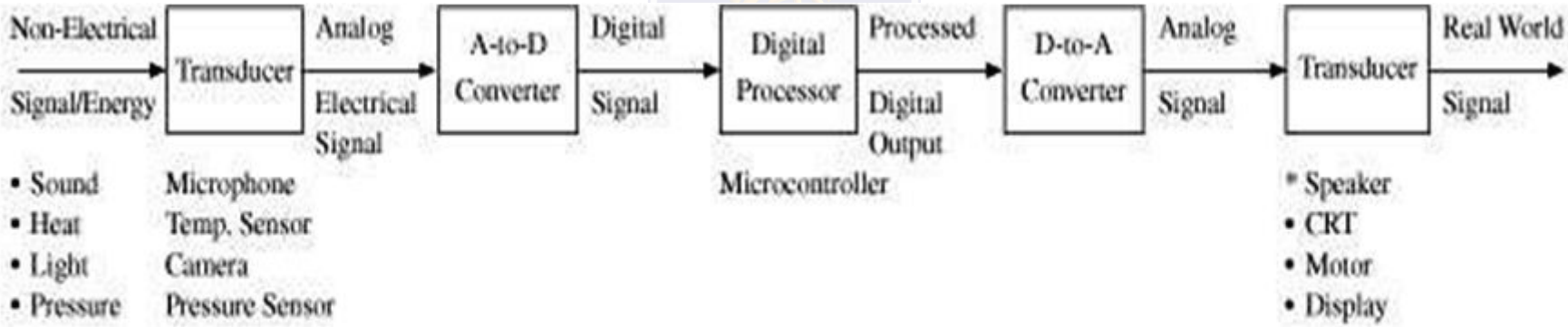
- Analog signals are continuous, with infinite values in a given range.
- Digital signals have discrete values such as on/off or 0/1.
- Limitations of analog signals
  - Analog signals pick up noise as they are being amplified.
  - Analog signals are difficult to store.
  - Analog systems are more expensive in relation to digital systems.
- Advantages of digital systems (signals)
  - Noise can be reduced by converting analog signals in 0s and 1s.
  - Binary signals of 0s/1s can be easily stored in memory.
  - Technology for fabricating digital systems has become so advanced that they can be produced at low cost.
- The major limitation of a digital system is how accurately it represents the analog signals after conversion.



A/D & D/A CONVERTERS

Embedded System

- A typical system that converts signals from analog to digital and back to analog includes:
  - A transducer that converts non-electrical signals into electrical signals
  - An A/D converter that converts analog signals into digital signals
  - A digital processor that processes digital data (signals)
  - A D/A converter that converts digital signals into equivalent analog signals
  - A transducer that converts electrical signals into real life non-electrical signals (sound, pressure, and video)

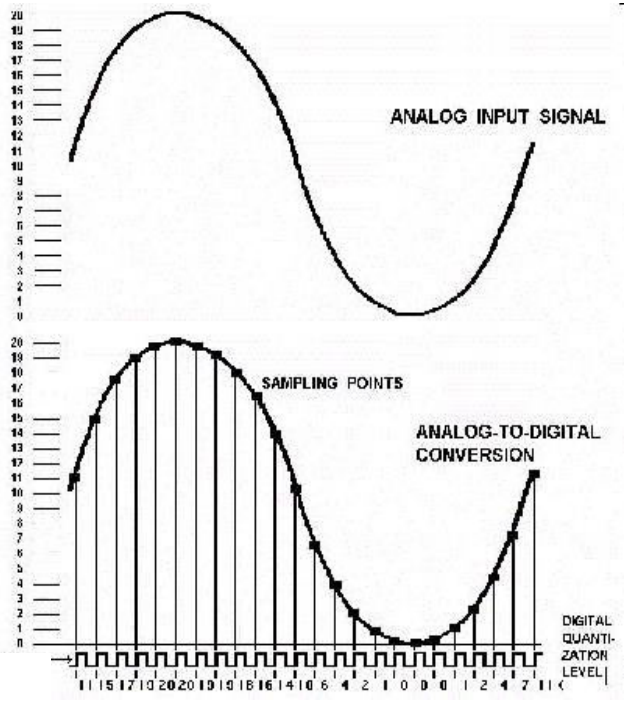


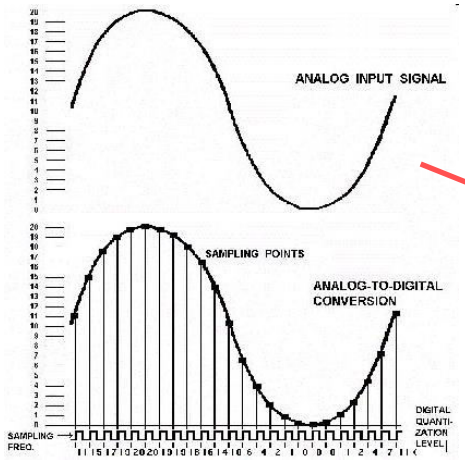
Embedded Systems: A-to-D and D-to-A Signal Conversion

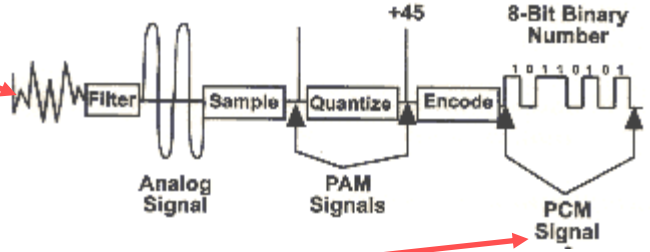
So, how does A/D Converter works?

Analog to Digital (A/D) Converter

- In order to change an analog signal to digital, the input analog signal is sampled at a high rate of speed.
- The amplitude at each of those sampled moments is converted into a number equivalent – this is called quantization.
- These numbers are simply the combinations of the 0s and 1s used in computer language – this called encoding.

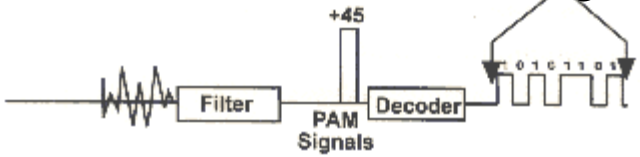






Modulation

PCM Signal



Demodulation