Faculty of Engineering
Department of Biomedical Engineering

08
Data Acquisition

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BME 312
Biomedical Instrumentation II

What is Data Acquisition?

Data acquisition

- Data acquisition is the process of **sampling signals**

Interfacing of Sensor to DAQ

Analog Signals

- The real world is analog.

Digital Signals

- The microprocessor world is digital.

Analog Digital Conversion Definitions

- Sensor Measurement Span:

  Possible maximum minus minimum value of sensors physical quantity measurement.

- Sensor Output Span:

  Maximum minus minimum value of sensors output signal.

- ADC Input Voltage Span:

  Maximum minus minimum possible values of ADC input voltages.

Example

Assume a temperature sensor:

- Sensor Measurement Range:
  – 30°C to 170°C
- Sensor Output Range:
  – 10V to 10V
- ADC Input Voltage Range:
  0 to 5V
- ADC Quantization Levels
  4096

Example

Assume a temperature sensor:

- Sensor Measurement Range:
  – 30°C to 170°C
- Sensor Output Range:
  – 10V to 10V
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  0 to 5V
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Span:

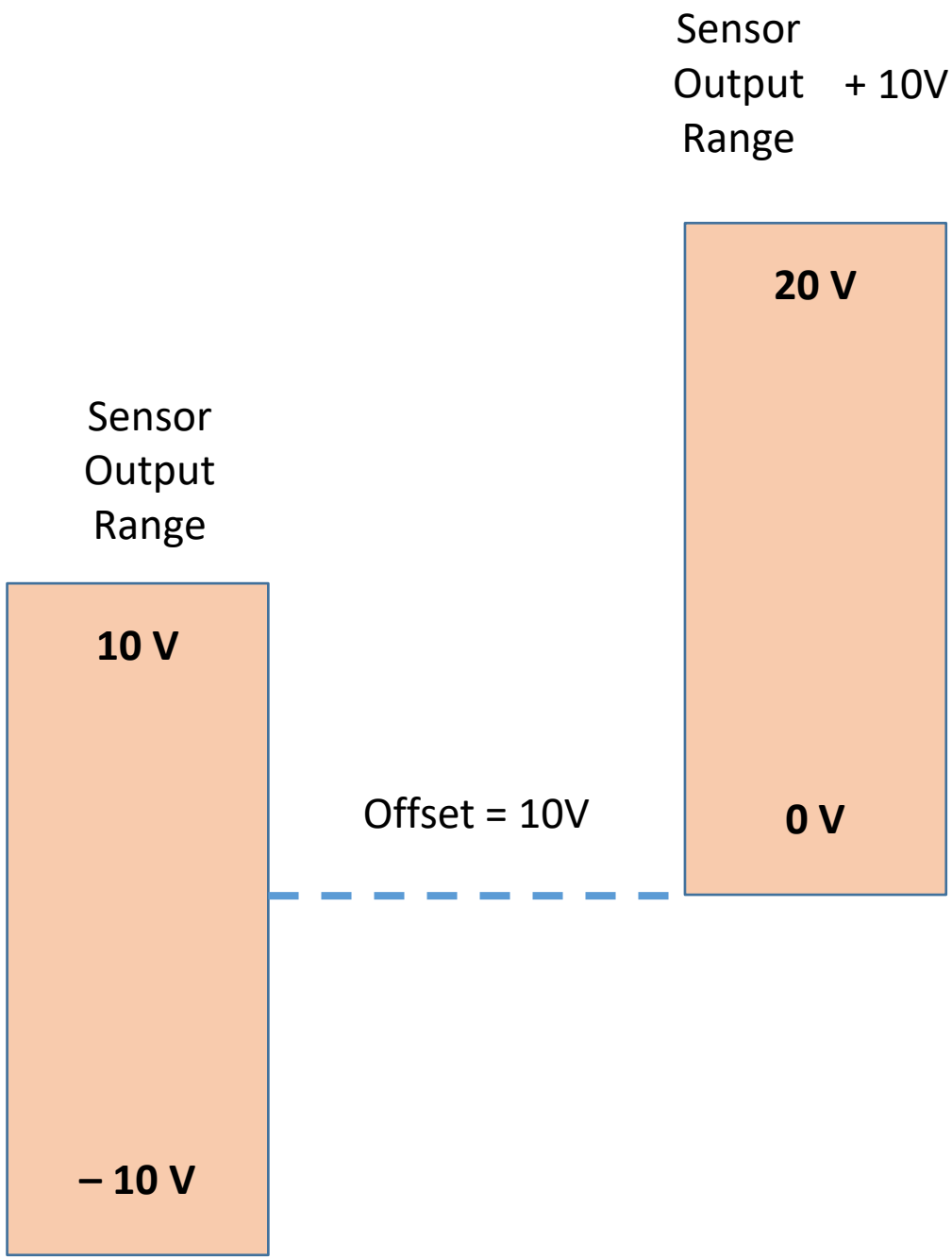
- Sensor Measurement Span:
  170°C – (– 30°C) = 200°C
- Sensor Output Span:
  10V – (– 10V) = 20V
- ADC Input Voltage Span:
  5V – 0 = 5V

- Bit resolution of ADC.
  – 12 bit

2^n=4096 Quantization Level

n=12 bit

- Voltage resolution of ADC = (ADC Input Voltage Span)/(ADC Quantization Level)
  = 5V / 4096 = 1.22mV
- Measurement system resolution = (Sensor Measurement Span)/(ADC Quantization Level)
  = 200 °C / 4096 = 0.049°C


Sensor
Output
Range
+ 10V
20 V
0 V
Sensor
Output
Range
10 V
– 10 V
Offset = 10V