# Lesson 1: Overview of Sequential Control and Data Acquisition

EET 438b Sequential Control and Data Acquisition

Department of Technology

# Learning Objectives

After this presentation you will be able to:

- Explain the difference between Digital and analog control loops
- List advantages and challenges of using digital process control.
- Give an overview of the data acquisition problem.
- Give examples of sequential control applcations

# Digital Control of Analog systems

Analog Controllers
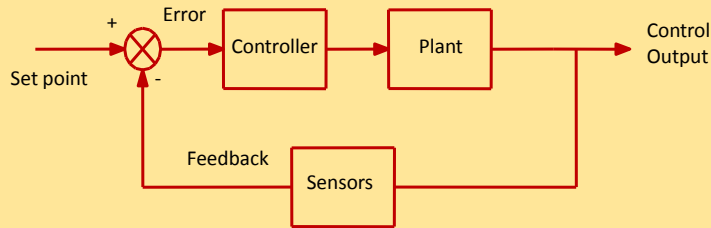


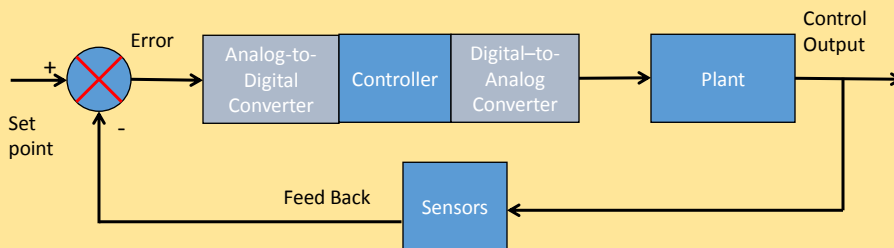Controller implemented with analog electronics (OP AMPS)

Summing  (error generation)
Integration  (integral control)
Differentiation  (derivative control)
Amplification (proportional control)

# Digital Control of Analog Systems

Digital Controllers



**Characteristics**
Analog Inputs and outputs
Continuous signals converted to digital values
Controller -  Implemented with microprocessor
System control variable modified by mathematical functions + - x /
Result converted to analog signal by digital-to-analog conversion

# Advantages and Challenges of Digital Process Control

Advantages

Can implement complex control algorithms along with P-I-D
Software-based controller
Direct input of digital sensors

Challenges

Need Analog-to-Digital (A/D) Conversion- World is analog
High speed sampling required for rapidly changing signals

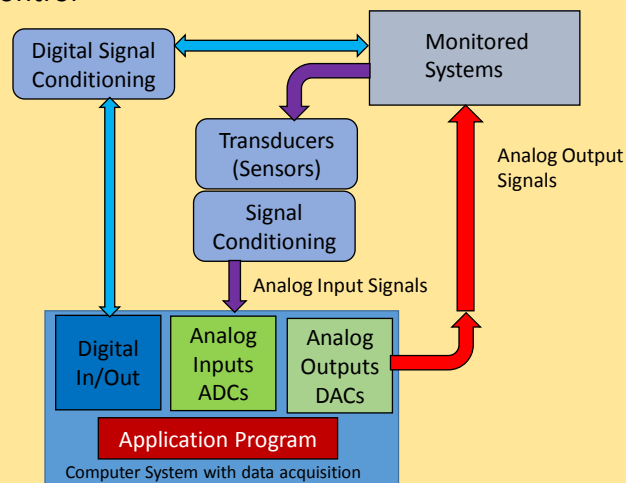Precision of converted value. Infinite number of values mapped to
a finite number of bits
Must reconstruct most signals to analog for output to analog
world. Need DAC (digital-to-analog converters)

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# Overview of the Data Acquisition Problem

Use computers to gather data, process data, and control system:
Higher level control



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# Overview of the Sequential Control Problem

Control of a staged processes with discrete steps.

Examples around the home

Cloths Dryers

Washing Machines



Dishwashers





All processes driven by timing of the events

Time-driven sequential processes

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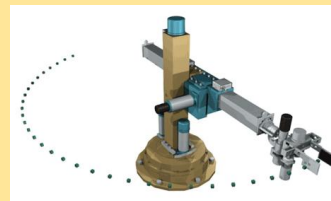# Overview of the Sequential Control Problem

Event-Driven Sequential Processes

Next step of process can not take place until an external event occurs

Examples

Motion sequence depends of position of mechanical part

Robotic Arms





Sensors are switches that Indicate position

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# End Lesson 1: Overview of Sequential Control and Data Acquisition

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