Feedback Control Systems Reading Oct 31st

Blaine Swieder

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1 Ch 1: Introduction

Definition 1.1. *We define* ***feedback control systems*** *as the analysis and design of closed-loop control systems.*

Closed-Loop Control Systems are defined as a system that forces signals (known as **inputs**) are determined, at least partially, by certain responses of the system (known as **outputs**). Essentially works like a function.

Example 1.1 (Temperature Control in a Home)**.** A temperature control system is a example of a feedback control system in a home.

- In a home, the system input is a reference signal and we want it to be similar to the system output. (This is the setting of a thermostat)
- The system input is changed via the thermostat setting, and we change the system as we change the temperature.
- A plant, in this example, is if we assume that temperature is increased by using a gas furnace.
  - Plant Input: An electrical Signal that activates the furnace.
  - Plant Output: Actual Temperature of the living area.

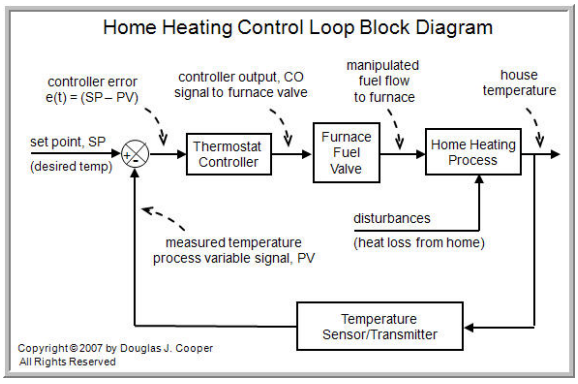

Figure 1: Diagram of Temperature Closed-Loop Control System

To control any physical variable, we employ a **signal** and the system that measures a given variable is known as a **sensor**. The **plant** is the part of a control system that is to be controlled. In most closed-loop control systems, we need to use a **compensator**, a **controller**, and a **filter**.

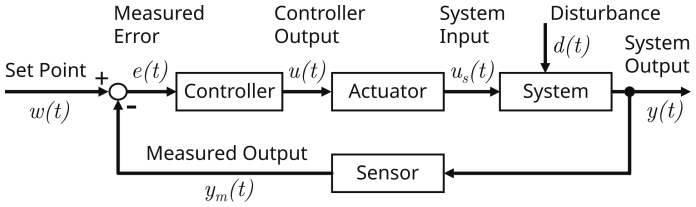

Figure 2: Diagram of Simple Closed-Loop Control System

The system output is measured by the sensor, and the measured value is compared with or subtracted from the input. This is known as the **error signal**. If the output is equivalent with the input, and the difference is 0, and then no signal reaches the plant. Hence, the plant output remains at the current value.

Definition 1.2. *Control Systems are divided into two classes,* ***regulator control systems*** *and* ***servomechanism control systems****.*