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ECE131L/E01

Lightbulb Controlled Temperature using Arduino

Project Description

The aim of this lightbulb operation is to show how switched systems can be controlled. The temperature of the lightbulb is improved by switching on the lightbulb and the temperature of the lightbulb is lowered by switching off the lightbulb (up to environmental boundaries). The lightbulb is a two-state binary system, on or off. The lightbulb may or may not be connected to the AC source; its intensity cannot be modulated. In this project, the lightbulb's resulting "chattering" conduct and explore alternative methodologies to reduce this chatter's frequency or smooth the chatter by using dead bands, low-pass filters, and pulse-width modulation.

Technically, it does not need a model of the plant (the lightbulb) to execute our temperature control system. Using the logic that turns on the lightbulb when the temperature measured is below desired and turns off the lightbulb when the temperature is higher than required. However, it would like to be able to explain the control system's resulting conduct (and maybe even try to design the control algorithm more smartly). Therefore, it will generate a model for the thermal behavior of the lightbulb based on its observed response.

Block Diagram of the Proposed Project

Arduino board (e.g. Uno, Mega 2560, etc.)

lightbulb (incandescent, LED, CFL, etc.)

AC solid-state relay (hockey-puck type, etc.)

temperature sensor (TMP36, etc.)

In this instance, a TMP36 sensor (inexpensive, comparatively precise, adequate range) measures the lightbulb temperature. The Arduino board supplies the sensor with energy and reads the output of the sensor via an analog input. Also used is the Arduino board to generate the Digital Output that turns on and off the solid-state relay. In other words, the digital output connects and disconnects the light bulb via the relay from the AC power source (from the wall) to switch on and off the light bulb. Within MATLAB, which is also used to visualize the temperature of the lightbulb and the control signal, the control logic used to determine when to turn the relay on and off is introduced.

Sample GUI

