Intro:

Within the past several years, the prevalence of “smart” homes and the interconnection between networked devices has been on the rise. Considering this, it should come as no surprise that signal processing is playing an increasing role in the day-to-day life of the average consumer. In this lab, we’ll work with both the CyDAQ and the MATLAB tool Simulink to develop and simulate a home automation system.

Background:

We would like to be able to minimize our spending on running the air conditioner in a home. By leaving the air conditioner running while no one is using it, we could potentially be losing out on a couple hundred dollars per summer. While this is certainly not great for an average sized home, it becomes even worse as we consider the implications for large office buildings with several air conditioned rooms.

You have been tasked with developing a simple system to determine when a room is empty (and thus, should not be running the AC). As a design constraint, you are able only to use a light sensor to determine this.  
  
As such, we wish to construct a system that will bring in readings from a light sensor, determine whether we are seeing natural or artificial light, and decide what actions need to be taken pertaining to cooling the room.

Setup:

Using light sensor

* Develop a method to determine which sensor values correspond to artificial light readings
* Identify when lights are on or off
* Analyze frequency domain results to see artificial light frequency characteristics

Next, we consider the possibility of natural light coming in through a window or skylight.

Using simulink:

* Pass in readings from the light sensor
* Corrupt with additive gaussian noise (modeling natural light)
* Re-evaluate system to ensure accuracy even in presence of modeled natural lighting
* Analyze frequency domain results using FFT