

Damon Boorstein & Lonnie Souder II  
Dr. Al-Quzwini  
Systems & Controls  
March 26, 2018

## Room Lighting Control System

For our final project we would like to implement an automatic room lighting control system. Instead of spending a large sum of money to light an entire room, we would like to recreate a small model of a room in a small box (roughly the size of a shoebox or slightly larger). This will allow us to set our focus on the control system instead of the logistics of lighting an entire room. The model will consist of a box that should be closed on all sides (just like any other house). On one side there will be a *window* consisting of automatic blinds that we plan to open and close with a small stepper or servo motor. At the top of the *room* there will be a light source (or possibly many light sources). There will also be light sensors inside the room and outside of the *house*. This will allow us to maintain **full** control over the level of brightness in the room at all times of day.

The basic functionality of the system is as follows. Because there is no “anti light” that we can use to dim the room even when the outside world is shining light through the window (disturbance), we have decided to use the shades to dim the room if necessary during the day, while the light source can light the room at night. For power efficiency, the system will always first take into account the desired brightness and the outside brightness. If the amount of light outside is sufficient to brighten the room to the desired level, then the light source should stay off completely and the shades will open to a point at which the room’s brightness is just right. If the outside light is not sufficient to brighten the room, then the light source will be used as a supplement.

The image below, is our rough draft model of the system as we see it so far (minus some conditionals to be implemented alongside the control system). Essentially our inputs are R1 and R2 which represent the voltage inputs to the light source and the motor controlling the blinds respectively. G1 represents the physical characteristics of the light source and its ability to convert power to light. H1 is our transfer function based off of the indoor brightness reading which is used to close the loop. G2 represents the blinds and how much light they allow through at certain angles. H2 is our transfer function based off of the outdoor brightness measurement and desired brightness, which will control the angle of the shades. As mentioned before, this is a rough model, and pieces may still be removed or added before the final submission as we find that pieces of our model are either incorrect or unnecessary.

