# Block Heater

## Problem

As the weather gets colder in Wyoming, some trucks need their engines to be warmed up in order to start properly. Many of these trucks have block heaters that need to be turned on in order to warm up the engine.

## Overview

The way to solve this problem could be by having a system that reads temperatures and turns on the power to the block heater if needed. The system could be designed and programmed in various ways.

## Constraints

- Truck has to be manually plugged into the extension cord
- Temperature gage has to work well in wyoming weather conditions
- Program is compatible with the houses 120VAC cord

## Assumptions

- User is going to manually plug truck in
- Only going to get plugged in during the winter
- Circuit is sustainable for size of block heater

## Questions

- Are we going to have separate breaker for this
- Are we going to need some sort of box for the relay information
- How much money is the hardware going to cost
- Is it going to be possible to do this all with a raspberry pi

## Mid term review and breakdown:

For our project we are trying to create the hardware and software needed to use a temperature sensor to trip a relay in order to turn on an outlet.

The first thing that we needed to do was pick out a sensor. We first thought that we should use the DS18B20 Temperature sensor. The DS18B20 is a digital temperature sensor that can measure temperatures between -55°C and +125°C with the Raspberry Pi, with the input and output linked on the same wire. We thought this sensor would be good because it has a steel probe at the tip of it which would be great for the Wyoming weather. Once we found out that we did not have that sensor in the kits, we were given the DHT11 Sensor. This sensor is very simple as it just contains 4 pins, and it reads temperature and humidity.

Next, we learned how to get the sensor to connect to the Raspberry Pi. The sensor only uses three of the four pins.

Pin 1 - Power

Pin 2 - Signal

Pin 3 - Unused

Pin 4 - GND

We used a diagram from Raspberry Pi and found out that the sensor could be connected to the breadboard and then to the Pi without any resistor.

 Softwear:

Once our sensor was connected to the breadboard and that was connected to the Pi, it was time to code. We got our code base line from pimylifeup.com. Writing the code included multiple updates to the Raspberry including "sudo update" and "sudo update y". The program is written in Python which was a new language for both of us. We learned that it does not have to be compiled like c++ does. Also, it is very case and space sensitive unlike c++ where it is just stylistic. One major problem that we had with the program was downloading the libraries. It came down to a simple fix of just connecting our Pi to the internet.

License:

The license we chose was the GNU LESSER PUBLIC LICENSE. This license was created in 1999 by the Free Software Foundation. It states that we have the freedom to share our work, and it can be changed for free by anyone as it is public.

Future Plans:

For the next upcoming weeks of class, we are planning to learn and write the code to identify a specific temperature. We think this is going to be an if statement. For example, if the temperature is less than 40 degrees, send a message to the relay. Before we can code it though, we need to learn and understand how to use a relay. We also need to research which type of relay we should use, and we need to get one. We are unsure at this time but somehow we need to use the relay to convert power to an outlet so a cord could be plugged into it.

One major challenge that we think we are going to face is going to be getting enough power to the outlet. Will we have enough power for a 120 volt outlet or will our raspberry pi not be able to handle that?

Conclusion:

Overall we have enjoyed this project. It has incorporated the electrical engineering we are interested in by involving both hardware and software. We think that this project has a lot of potential for more than just a block heater because anything could be plugged into the outlet. Also there are other factors that could be included into the project such as the time of the day or the amount of time that it runs for. With dedication and effort, a great project will be completed.

Arthur: Wired the sensor with the bread board and lined it up to connect with the raspberry pi. After this continued to type out the program into the raspberry pi.

Kaden: Researched diagrams and found the code. Created a Git repository and typed the write up paper.

Video Log: https://my.yuja.com/V/Video?v=12588021&node=54966774&a=116788352