Final Project Proposal: Fan Regulator for Heating and Cooling

ECE 4220

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**Abstract**

The purpose of this project is to help to heat and cool all rooms in a house or building at an even rate. Therefore if there is a room that is significantly cooler that another room, a fan hidden in the duct work of the furnace will be able to turn on and pull more of the warm air into this cooler room while the rest of the room are just being heated as normal. All of this will be implemented using a Raspberry Pi in order to read the current room temperature using a temperature sensor and connected to a computer that will be able to wirelessly connect to another Raspberry Pi that will control the amount of power needed to run the fan at specific speeds. The program will check the temperature and turn the different fans on for the different speeds needed to maintain the house at a constant temperature.

**Introduction**

Imagine a home, not just any home, but the very home that you grew up in. Now think back to all those times that you ended up in the same comfortable spot in this home. Now think as to why you chose that spot as a child. Did it have something to do with how warm it was in the coldest part of the winter, or how cool it was when it was scorching hot outside? Think if everywhere in your home was now this temperature instead of just that favorite room or closet, or nook. Do you think you would have been more inclined to venture to other parts of the house to play or help out? Well, my project is going to help to make that more of a reality. As we all know, large home air conditioners and furnaces turn on and blow air through duct work within the house and it is all controlled by one individual fan at the source. When the air is blown throughout the house, it escapes at random through vents in the duct work and can provide very uneven heating or cooling throughout larger and smaller rooms. With this project, we can hope to control the amount of air flow within a room to help bring it to the correct temperature. By using a wireless temperature sensor, I will be able to regulate how much of a temperature difference between the different rooms and adjust the speed of different fans located at air vents in these set rooms. From there, rooms should be able to reach the desired temperature around the same time and continue to heat and cool at the same rate.

**Problem Statement**

I plan to use a Raspberry Pi to control the sensor that will be monitoring the temperature and sending information to the fans as to how fast they are needed to blow air through a vent to cause even air control. After the information is received, I will be using another Raspberry Pi to implement the speed control of the fan. For this project, I will only be assembling one room and controlling the fan to lower its’ speed as it gets closer to the desired room temperature. Through this project, I hope to gain a better understanding of how things are implemented on a Raspberry Pi. I will also have to research how wireless communication is possible through a wifi connection between the computer and secondary Raspberry Pi.

I will be coding the temperature sensor in C and using several things from this year’s class to implement the project. These items include threads, semaphores, pipes, and kernels. I will be using a kernel to read the temperature sensor at a given time interval and then using a pipe to send this to the main program. The main program will then be using different threads to control what will happen. The first thread will be used to get any information received from the temperature sensor and then store it in the program. The second thread will take the stored sensor data and then calculate the fan speeds needed. The third thread will take all the data and store it into a database that is then accessible by the second Raspberry Pi.

As far as the software goes, the first thing I will need to learn is how to work with the GPIO pins on the Raspberry Pi. The next thing is that I would need to learn to go through the code generated by the sensor and then be able to set controls as to the different fan speeds needed. This fan speed program would be preprogramed for slowing the fan as the temperature of the room reaches the optimal level which should be 72 degrees Fahrenheit in the winter and 68 degrees Fahrenheit in the summer. There will also be a program designed to switch seasons between winter and summer or to just turn the fans on at a preset speed to help circulate the air throughout a house in the fall and spring.

**Hardware Flowchart**

