Deliverable C

GNG1103, Section # D Team: Automation 1

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Introduction:

The goal of deliverable C was to prioritize our design criteria and determine target specifications which will eventually help our group reach a final solution for our final project. One of the changes our group decided to act on from, last week, is that we will no longer be responsible for the power systems in the current project. We collectively decided with the solar group that they would be better suited for this part of the project. Instead our group will focus on lighting, heating and water. We will talk about the items we need in order to achieve proper lighting. The heating part of this deliverable will focus on ensuring that the heating will be tolerable, by the means of automation. The water system we hope to create, will be created with the construction team, we hope to create a design which is simple, efficient and automated.

Lighting:

The client expressed the need for proper lighting in the house. Proper lighting is listed as a need for the house. There will be a window to provide daylight during the daytime, and limit the need of lightbulbs. Thus, the window will help save energy and increase efficiency because the lightbulbs won't be required during the daytime. The entire automation design will be centralized on the Arduino. It will have several inputs and outputs. The light switch will be an input. The goal for this house is to be efficient as possible. Therefore, the light switch will have an automatic setting. A motion sensor will be placed in one of the top corners of the house to detect movement and determine whether someone is in the house. The motion sensor is also an input for the Arduino. Anytime movement is detected, a signal is sent to the Arduino and the lights are turned on, or stay on if they already are on. If movement is not detected for a specified time, for example 10 minutes, the Arduino will turn the lights off. The light switch will also have a manual setting. Therefore if the client wishes to control the lights themselves, they can simply change it to manual mode. In this mode, the light switch will have an on/off switch which sends a signal to the Arduino to turn the lights on/off accordingly. This will be useful during the night when the client is sleeping, since it would be frustrating to have the lights turn on every time they move in their sleep. It is also efficient because the client can choose to turn the lights off during the day when the daylight from the window is sufficient enough.

Furthermore, there is the possibility of setting specific times in the Arduino to turn the lights off. These specific times would be from sunrise to sunset, since the daylight from the window should satisfy the required lighting. This would improve efficiency and power saving. The Arduino will be programmed to take input information and perform the appropriate output function to the light bulb. The light bulb will be of type LED since it is cheap and very power efficient. There will be either one or two LED light bulbs, depending on their brightness and how well they light up the house.** In addition, in order for the arduino to be able to process the 120V being circulated around for utilities, a relay will be used in order to mitigate any damage to the arduino by the excess voltage **. Though, the lighting inside the house is a required need, lighting outside the house is a possible want. It would be useful for the client during the night time. They would be able to see who is outside if someone knocks on their door, or able to see their door and where to insert the key if they arrive home during the dark. Therefore, another motion sensor and input in the Arduino would be required. The light will need to turn on by detecting motion when the client arrives home in the dark. It would also require a manual switch in the house to turn it off when the client is in the house. However, the outside lighting is not a required need and would only be implemented if time and budget allows it. The inside lighting is a required need and will be designed and implemented.

Heating:

In terms of heating, the main concern of heating is to automate a majority of the process to insure that the living conditions are at the very least tolerable. The result of this is placing a heavier emphasis on heating as opposed to cooling; taking the general location of the portable homes into account.

The basis behind the automation for this house will be dependant on the arduino. By using a relay to ensure the incoming power doesn't damage the arduino, we can then use it for various inputs and outputs for the utilities and necessities around the home. Generally, the heating system will be reliant on similar -if not the exact same- sensors as the lighting systems, as the heating will have to be dependant on whether or not the user is at home. This means that one or two motion sensors will be used to determine movement inside the home, and if that proves to be true, the sensors will then send an input to the arduino. From there the temperature will be regulated depending on the current temperature read from another separate sensor. In the case that the user follows a general schedule or is sleeping, the system will then be made to adjust in order to conserve as much energy as possible. Ideally, the heating system will lower the base temperature when the user is out of home or is sleeping, and will turn up the base temperature when the user is expected to be back or wakes up. In addition to this, a manual switch will also be included should the user feel uncomfortable, or if the automatic system malfunctions. This will act as an override to the schedule.

The above applies to heating only, as that is considered to be a requirement for the house. Due to the previously mentioned location, heat from the external weather will be minor compared to the cold. As a result, it will not be included in the design unless both budget and time allow for such, in which case the automation will follow a similar algorithm to above.

Water:

Next, for the water system we will need to work with the construction team in designing a simple, while also efficient and automated (as much as possible) sink. To do this we will need to make sure that the sink is not too big for our prototype's size. After we find a suitable size we will then create the base of our sink. This will contain most of the piping and possible some storage for soap or sponges. After this, we will move on to create the top of our sink which will include the bowl and the faucet itself. Lastly, once the bowl and counter top is complete we will need to work on the faucet. This is where most of our automation aspects will come in! Some ideas we had were to use a motion sensor to activate the water flow. We thought about purchasing a motion sensing faucet, but the cost was far too large for our budget. So if we want a motion sensing faucet we will have to design our own. However, this may prove harder than we thought and it might not even be possible in the end. Our current idea is to attach a motion sensor to a faucet and then place a thin plastic cover so it will not get damaged by any splashes of water. When this sensor is activated we will have it hooked up to an Arduino board which will then tell the pump to turn on. This however is a want not a need and if it proves too difficult to set up we may have to go with a generic handle faucet. Overall, for water our only need is to design and create a working sink, but if we have time and the resources we want to automate it by adding a motion activation sensor to the sink.

	Input	**Output**
Lighting	Power Light switch Motion sensor	Light
Heating	Thermostat Motion sensor	Heating unit
Water	Water level sensor	3 LEDs

NEED: Lighting, heating, water

WANT: AC, water level sensor, solar panel efficiency, automatic heating system

Conclusion:

In conclusion, we have listed and expanded upon our design criteria and have determined our target specifications for the three main areas we cover as the automation team. These areas include heating, lighting and water. For each of these areas we have come up with needs and wants and how we are going to actually achieve these goals in our given time frame and budget.