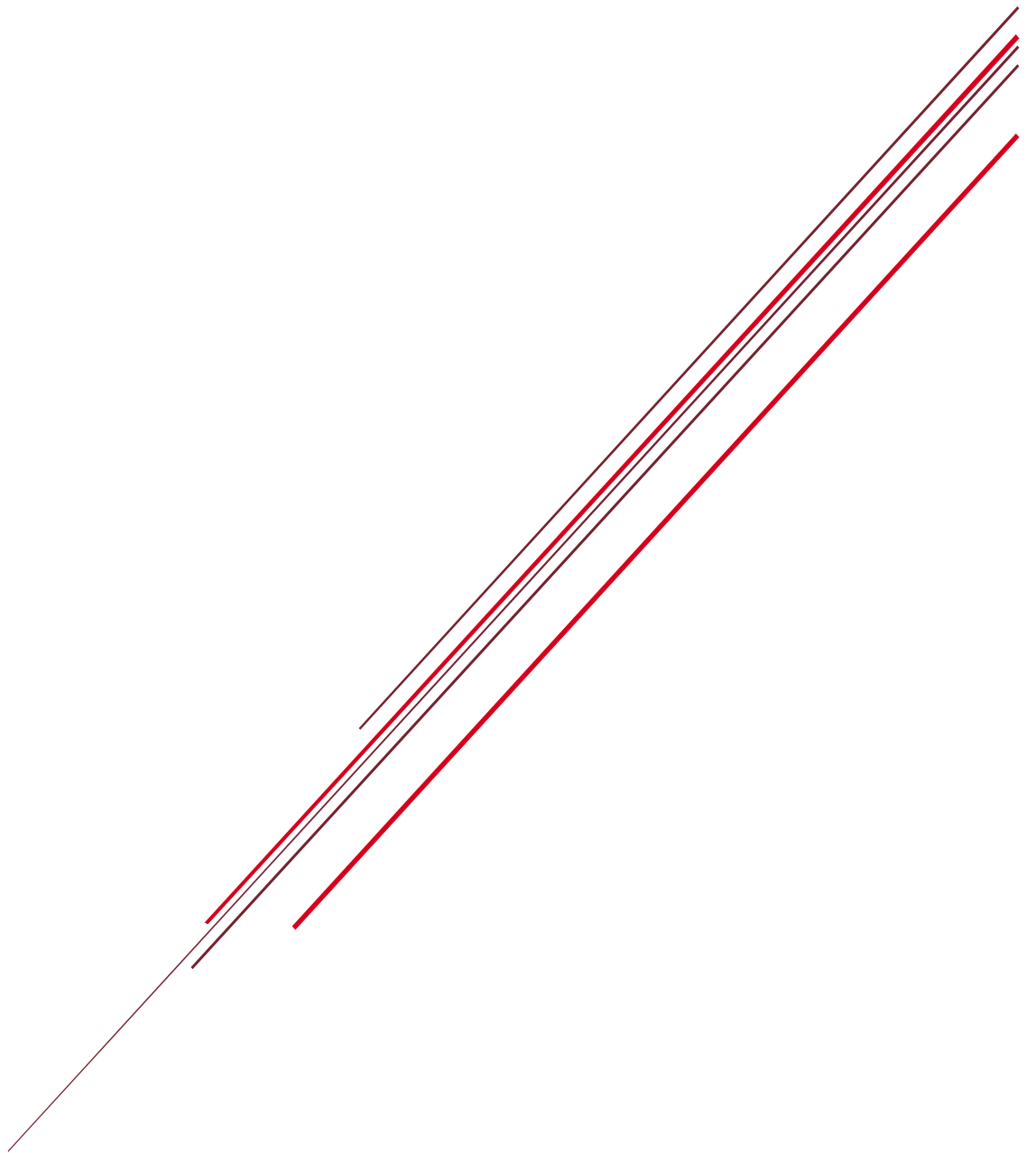


HOME AUTOMATION USING EMBEDDED SYSTEMS

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Document Version

Version	Description	Author	Date
0.1	Initial thoughts on CPD project. Began a list of dot-points with ideas for CPD projects.	Hannes Venter	18/3/20
0.2	Created Title Page and TOC. Further filled in ideas for CPD project.	Hannes Venter	19/3/20
0.3	Selected Final Idea. Wrote topic and motivation	Hannes Venter	20/3/20
0.4	Finalised project timeline and first ideas about how to achieve the project	Hannes Venter	22/3/20
1.0	Finalised first draft	Hannes Venter	22/3/20

Initial Project Ideas

After reflection and research of what kind of SE I want to be, I decided to complete a project on embedded systems.

NFC Door lock

I thought of creating an NFC enabled door lock that unlocks when someone in the family's phone is tapped. I realised that there are already too many systems that offer this and would do it far better than I could. Another thing that turned me away from this was the security requirements since it will control our front door.

Automatic Lights

I thought about creating a system that controls the lights in our garden. Having the lights turn on when it notices that it gets dark, and then turns off when it gets light again. This seemed too simple.

Automatic Blinds

Our family room has windows on 3 of its walls, meaning that the afternoon sun is very prominent. We have external blinds that can be lowered with a remote control, and we often have to lower it in segments as the sun goes down in the afternoon. Once the sun is down, we raise it again. I thought about creating a system that uses light sensors at certain increments which lowers the blinds gradually as the sun goes down and raises it again once the sun is gone. In winter, we enjoy having the sun warm the room, so I would combine the light sensors with a thermometer, which only lowers the blinds once the room reaches above a certain temperature.

Ceiling Vents

A final idea that I thought of was placing a vent/fan in the ceiling which turns on once the temperature in the ceiling space rises above a certain threshold.

Topic

This project will consist of 2 smaller projects, both centred around home-automation. The projects will both be embedded systems and will vary in complexity as they progress.

Ceiling Vents

This first project will create a system which draws hot air out of the ceiling, thus cooling the house. The fan will turn on once the temperature inside the ceiling reaches a certain temperature and will run until the ceiling is sufficiently cooled. To further expand the project, multiple temperature sensor could be used to possibly warm the house during winter by using the heat in the ceiling. These could work in conjunction with light sensors to ensure that the fan is off or quiet during the night.

Automatic Blinds

The second project will be far more complex. It will require multiple light sensors and temperature sensors to gradually lower the blind with the setting sun. This will ensure that the room remains cool during summer and reduce the glare of the sun throughout the room. Once again, the system will be tailored to ensure that the room is naturally heated during winter, before lowering the blind. Additional sensors could be used to raise the blinds during strong winds to prevent any damage.

Motivation

I reflected on the type of software engineer I would like to be, and embedded systems seemed most interesting. I thoroughly enjoyed my work on the ENGG projects, however I feel that I still have a significant amount to learn. The code was quite unreliable and far from efficient. This embedded systems project will allow me to perfect my code and gain valuable insight into working with hardware.

Achieving this Project

Timeline

This project has a timeline of six weeks. Initial work will begin with research into the best components for the project. This will be followed by research into the selected hardware and software. The next will be prototyping and testing, before integrating the components into the

larger system. The final stage will be the presentation. The following Gantt chart provides an overview of the project over the next six weeks.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Initial Research						
Purchasing Components						
Small Scale Prototyping						
System Prototyping						
Testing						
Building						
Completion						

Hardware

The computing power for the project will be provided by a microcontroller motherboard such as Arduino or Raspberry Pi. Final decisions will be made during the research phase of the project.

The sensors and other components will be selected once a microcontroller has been chosen.

Software

The software used will depend on the types of hardware chosen. Arduino uses its own language and integrates with C and C++. A Raspberry Pi is a general-purpose computer, usually with a Linux operating system, and the ability to run multiple programs.

Knowledge

Significant research will be conducted to ensure the project is successful. Regardless of which hardware is selected, a vast amount of additional knowledge will be required to have reliable systems. The first choices will be which microcontrollers to use.