**Smart Home Monitoring System Technical Description**

Luka Banjanin

250968309

Dr. Anwar Haque

University Summer Research Internship

2020

**Purpose**

The Smart Home Monitoring System is a software application which would monitor all smart appliances in a home. Based on the current usage trends of a user, the software would schedule routine tasks and predict the monthly costs of electricity, hydro, and gas. The software would provide users with an optimal schedule of use which would be determined by optimizing:

1. Convenience to the user
2. Minimizing expenses through scheduling events at low cost hours

**Scope**

The software prototype built for this project features much of the same functionality as the full-scale product, but in an oversimplified implementation. A few key differences between the capabilities of the prototype and the finished product are:

1. The prototype has a pre-set list of appliances with no way for the user to create a unique appliance on their own
2. Only one of each appliance can be created in the prototype
3. The interaction between the program and the excel database is hardcoded for a database of specific size which would be an issue for scaling the software (SQL would be used to more efficiently interact with the database of a large-scale system)
4. The GUI is non-existent in the prototype so a user-friendly GUI would need to be implemented in a finished product
5. The final product would feature an additional “monitor” setting which would provide 24/7 monitoring for each smart appliance connected to the system. It would update monthly bill projections in real time and alert a user if an appliance is running outside of optimal scheduling hours.
6. The monitor function would also let users control appliances from the software interface (if they left the oven on but they left the house, they would get a notification and could turn it off remotely)
7. There would be an AI aspect to the software which would analyze the data from the monitor function and look for reoccurring patters in the usage of specific appliances. It would then analyze a user’s routine and suggest improvements to accommodate certain patterns of behaviour by the user.

**Infrastructure Requirements**

As far as infrastructure is concerned, all relevant details for the energy usage of an appliance are currently held in an excel file which the program reads from when an instance of an appliance object is created. The program reads in all relevant default values and then uses an algorithm to project a monthly expense for each appliance. The database would need to be much more sophisticated for a large-scale system but excel was sufficient for this prototype. Additionally, a much more sophisticated and aesthetically pleasing GUI would need to be created for the same reason as the database.

**Functional Requirements**

The following have been identified as key functional requirements for the Smart Home Monitoring System:

1. The system needs to allow users to connect their appliances (through some form of smart-plug sensors)
2. The system must provide a default (optimal) schedule which is primarily concerned about minimizing costs through efficient scheduling of routine tasks during “off-peak” hours
3. The system must allow the user to edit the schedule to suit their needs
4. Once a schedule is finalized, the system must provide an expected monthly cost projection assuming this schedule is followed
5. The system will then monitor the usage of the appliances 24/7 and will alert the user if they are using certain appliances outside of their scheduled times and automatically update the cost projections according to this new usage schedule.