**Smart Home – smartphone-controllable house monitoring managing device**

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**Declaration of Joint Authorship**

Alen Alimkhanov, Heorhii Nechyporenko, Mykyta Nechyporenko and Nikita Smirnov confirm that this breakdown of authorship represents our contribution to the work submitted for assessment and our contribution is our own work and is expressed in our own words. All parts and areas (hardware, programming) of the report and project have been jointly completed by the work group (Alen Alimkhanov 25%, Heorhii Nechyporenko 25%, Mykyta Nechyporenko 25%, Nikita Smirnov 25%). Any uses made within the Project Report of the works of any other author, separate to the work group, in any form (ideas, equations, figures, texts, tables, programs) are properly acknowledged at the point of use. A list of the references used is included.

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1.0 INTRODUCTION  
Nowadays, the constant use of smartphones and other electronics has become a norm and, because of that, a lack of automation or remote accessibility often negatively affects everyday life. After having to deal with this ourselves our team has decided to assist in getting rid of this problem and came up with an idea of “SmartHome” - our own device that would act like a utilities-controlling system that can be manipulated either by direct contact via pressing buttons or remotely via a smartphone. SmartHome is being developed for the consumer electronics market and is targeted at a general audience.  
SmartHome is a device that comes with a number of sensors (including optional ones) that in combination with mechanical parts, that either come with a chosen package or are compatible with the SmartHome software, allow to monitor a current situation at home, like a real-time surveillance television or smoke detector and interacting with a house, like opening curtains when it is morning or turning on A/C. Device features depend on what package a customer has chosen, it could be a surveillance-only version or a house-controller version; a joint version can be set up as well. As the project continues to become better and better, we have a currently in development package which comes with a security Roomba-type robot.  
1.0.1 SOFTWARE  
SmartHome’s software runs on C/Python/Arduino: because it is best (if not the only) for hardware programming of our level; and Java: because it is 1 of 2 only choices for Android app.   
Modern standards suggest that most of the electro-mechanical devices/utilities we use should be able to be controlled and monitored with a smartphone, for that reason SmartHome can be controlled via a downloadable free app (currently available only on Android) with which remote-control feature can be accessed, that allows setting detailed options like a schedule for turning on a specified device, and managing your home while you are out. The app works by interacting with data from a Firebase database to which SmartHome is network-connected (Ethernet or Wi-Fi), which allows a fast and secure experience.   
1.0.2 HARDWARE  
Compared to the other market proposals we decided that SmartHome would work best on the hardware of Raspberry Pi and STM32. The performance of these microcontrollers perfectly fits the project’s requirements. Generally, the hardware would work by just connecting a sensor and/or mechanical part, that is if the hardware has already been programmed. Once a sensor is recognized, the app shows the related information. Currently, for the project which is just a prototype of SmartHome, we plan to only have wired connections to/with sensors and appliances, but the phone use is still remote.  
The development of the project is going to be remote for each member of the team, for that reason each team member will have their own ~sensor to program and sometimes small meetings will be held for prototyping. To simulate how SmartHome would work in real life we plan to build a prototype that looks like a bunch of connected computer parts, that is, physical appearance is not important for functioning.

1.1 BACKGROUND

Our team aims to build a device in the sphere of customer services. Smart home devices are a fast-growing field. Every year, we accommodate new gadgets in our houses, therefore a device that can build a local network and interact with all devices in our homes seems to be a convenient solution to this issue. Taking a look at the history of smart houses, the concept of smart houses were revealed by Nicola Tesla in 1898.

The principle of smart houses was interpreted as the usage of cutting edge technologies back in the days. Those new devices were electrical vacuum cleaners, electrical washing machines, etc. Roughly 200 hundred years have passed and people’s thoughts and expectations from smart houses have changed drastically. Nowadays, when someone asks you:” What are your thoughts about smart houses?”. The first idea that comes to your mind is remote control of your house/room which implies controlling the heating system, securing your house, detecting deluge, power consumption, etc. As we take the first steps in the development of a smart house system, the core idea behind our project is to make it as simple as possible so that the end ­­user without any technical background will not experience any hardships with the installation of our device/software in their houses. Secondly, we would like to design the most desired features of the smart house, users don’t want to enter or leave their houses with the opening app of a smart house and adjusting sliders of temperature, etc. Our smart house should bring the feeling of the full stand-alone system with the minimum involvement from their side. Additionally, our design envisages the mount of our smart house system on both houses and apartments.

The light sensor will be used to control the light level in the house by changing the position of the curtains. A humidity sensor is going to be used to control the level of water in the air when the humidity level drops, the system automatically rectifies it and the user receives an appropriate acknowledgement. The water level detection sensor will be connected to the microcontroller to detect deluge and in case of it, the user will be notified immediately. Sound sensor, there are no clear ways to interpret these indications, but for instance, if the user adjusts the acceptable level of the noise and this level will be exceeded, our app will notify the user and provide solutions such as clothing windows, doors. Our team analyzed existing products that are related to the smart house field and according to other companies’ products, we have more sensors and capabilities to control houses.

Summarising all the above, the idea of developing a smart house has its advantages and disadvantages. Since it is our first project is dedicated to solving a real-world problem, we realize that obstacles on our way are going to be hard and challenging but behind every successful project is a long story of successful and unsuccessful trials.

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