**{THE TITLE OF YOUR PROJECT}**

{GROUP MEMBERS WITH MATRIC ID}

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# **CHAPTER ONE**

# **INTRODUCTION**

# **1.1** **BACKGROUND**

The world is advancing at a rapid rate and so is its technology (Martinez et al., 2019). The capabilities of modern technology are on the rise, and so is the decline in the cost to put it together, hence this topic was designed with the capability of it being both practical, implementable and affordable in mind. The focus of this final year project will be a home management system, retrofitted with a set of unique features such as real time status of your home (comprising of indicators such as gas level indicators, electricity status, fire watch, smoke watch, etc.), hidden camera surveillance, a security system with its key component being based on motion sensors.

The concept of home management has been in existence since the beginning of societal civilizations and probably even before that, the desire to consistently improve upon this need coupled with the recent rapid advancement in technology within the 20th century till date gave rise to the phenomena we know as the smart home. Home automation or Domotics is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things ("IoT"). A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses either wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet. Early home automation began with labor-saving machines. Self-contained electric or gas-powered home appliances became viable in the 1900s with the introduction of electric power distribution and led to the introduction of washing machines (1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers.

In 1975, the first general purpose home automation network technology, X10, was developed. It is a communication protocol for electronic devices. It primarily uses electric power transmission wiring for signaling and control, where the signals involve brief radio frequency bursts of digital data, and remains the most widely available. By 1978, X10 products included a 16-channel command console, a lamp module, and an appliance module. Soon after came the wall switch module and the first X10 timer.

According to Alam & Jahangir (2012), “A smart home is an application of ubiquitous computing in which the home environment is monitored by ambient intelligence to provide context-aware services and facilitate remote home control. It constitutes a branch of ubiquitous computing that involves incorporating smartness into dwellings for comfort, healthcare, safety, security, and energy conservation”.

And upon further research into what makes a home a smart one, there are several quotes but none that portray the fundamentals of what a smart home truly requires to be seen as a smart home as the quote below:

“A home needs three things to make it smart:

1. Internal network – wire, cable, wireless

2. Intelligent control – gateway to manage the featured systems

3. Home automation – products within the home and links to services and systems outside the home (“Homepage banner,” 2017).

Several research projects have been conducted for this field in past years and most projects usually provide between these three main services which are:

1. Comfort: This includes – Activity identification and event automation and Remote access and control
2. Healthcare: This includes – Local Monitoring and Remote Monitoring.
3. Security: This includes – User and device authentication.

Smart houses aim to solve a problem or in other cases automate a series of actions in order to give a higher sense of comfort to the individual or family living in the home. In the area of problems, smart homes address a myriad of problems within a society which can range from the simple and somewhat mundane to the very important such as:

1. Security: A household security system integrated with a home automation system can provide additional services such as remote surveillance of security cameras over the Internet, or access control and central locking of all perimeter doors and windows.
2. Ease of Use: Home automation makes the utilization of home appliances quite easier, all devices that have been integrated into the system can be controlled from your device and monitored for effective home management.
3. Home Management: Home automation makes it easier to know what is going on at your home, such as tracking energy consumption or gas leaks to even turning off appliances remotely.
4. Therapeutic Living: In this case, home automation is directed at helping the elderly or the sick. With control of a home’s functions and capabilities being accessed from a single device, it makes living in a home a lot easier and less strenuous on the body and mind.
5. Infant and Pet Tracking: Home automation is a blessing to both new parents and pet owners because it can let you monitor everything that is going on your house in real-time using a surveillance system.
6. Improved Living: Home automation allows home owners to improve their method of living and experience a calming stress-free environment when at home with control of their houses all at their fingertips.

For our project, the aforementioned problems can be solved with the help of Internet of Things(IoT).

‘Internet of Things’ is an umbrella term used for all technologies that enable the connection of a device to the Internet. Such systems depend on the collection of data. The data is then used for monitoring, controlling and transferring information to other devices via the internet. This allows specific actions to be automatically activated whenever certain situations arise. In a simple example, consider a smart kettle. The kettle can be programmed to automatically turn off once it reaches a specific temperature. It might also send a notification to the user on the same platform. Now apply the same concept to the entire home and all the devices present. That is a smart home powered by IoT. Instead of manually going up to the device and acting, those actions can be taken at the press of a button. These days, most smart IoT home automation devices allow you to control them via an app or even via voice commands (Rushabh, 2020). Areas application for IoT: Lighting, Doors and windows, Thermostat, etc.

Today, IoT devices are more plentiful than ever, and the cost of smart home systems keeps dropping, making them an attractive option for homeowners. Let us look at what the future has in store for Home Automation:

Future homes will be able to offer almost all required services, e.g., communication, medical, energy, utility, entertainment, and security. As we move into the next generation, more and more devices will begin to connect to one another. The dream is a future in which data is communicated between devices and humans without relying on manual input of individual bytes. For example, a smart thermostat that is able to automatically gauge the temperature of a room and then adjust the central heating and cooling units as necessary or a washing machine that automatically detects its contents and programs itself to be finished washing at a specified time. The future healthcare service provider will consider the smart home an effective way of providing remote healthcare services, especially to the elderly and disabled who do not require intensive healthcare support. As technologies continue to advance, you can expect the house of tomorrow to be even more automated than that of today. (Bluespeedav, 2016).

# **1.2** **STATEMENT OF PROBLEM**

The main problems this study addresses are the need for security, easy home management for the elderly (Therapeutic living) as well as working class families. The issue of therapeutic living is backed up in the work published by Nugent, Finlay, Fiorini, Tsumaki, & Prassler, 2008. The article explains that mobility is one of the key characteristics of independence. Usually, mobility is not an issue for young and healthy people, and therefore all home automation solutions addressing mobility refer to the needs of elderly and disabled people. In terms of household security, Home automation and security have been common problems for decades and different systems are devised to solve them(Atukorala et al, 2009). These are problems that have been around for a while which we intend to address using the project.

We intend to solve these issues because, we see there is a market for the resolution of these issues as well as because we believe it is our duty as innovators to address problems not only on a global scale but problems that affect us and our community locally.

# **1.3** **AIM & OBJECTIVES**

The aim of this project is to design and implement an IoT-based automation system that will provide an easy and comfortable way for people to monitor and control the activities that occur in their homes. This automation system will consist of smart devices for various lighting, security, home entertainment applications.

To achieve this aim, we have set out specific objectives which are to;

1. Build a testing framework for the IoT automation system
2. Perform sensor testing using the built framework
3. Develop web and mobile applications for the automated system control

# **1.4** **PROJECT METHODOLOGY**

This IOT-based Home Automation system will consist of an amalgamation of various linked sensors and smart devices set up for the maintenance and software platforms designed for control of the system. All these components are incorporated into an organized network that receives input from the sensors and sends them to a cloud gateway to be transmitted to the software platforms to be viewed by the users. This will allow the users to be aware of what is going on within their home’s premises at all times. The smart devices which consist of microcontrollers and Bluetooth adapters will be used to make the appliances interact with the software and hence be controlled by the user, allowing for easier and more immersive control of the home properties.

# **1.5 SIGNIFICANCE OF WORK**

As stated in the problem statement the purpose/importance of this research project is to provide an easy to use, all access platform to manage, review and control the actions/on goings in the home. Being tailored to help such groups as Working citizens, Patients in need of therapeutic living conditions and the elderly. It also important because it helps users deal with security concerns such as burglaries, unlocked homes or perhaps home appliance malfunctions, etc.

# **1.6 SCOPE OF WORK**

The product area of use is in health care, home care and security sectors. In the health care sector, it is intended for it to be used for the elderly and patients undergoing physical therapy and hence in need of therapeutic and comfortable living arrangements. In the area of home care, it is intended for working class individuals that require conducive and easy to manage living arrangements. In the area of security, it is intended to be used by families in unsafe areas or as a means to manage and ensure the safety of the members of a household.

**Timeline:** The projects estimated timeline for completion is within a period of 3-4 months

**Organization of the project:**

The remaining part of this project is organized to have in chapter two, the literature review which establishes the essence of this project and reviews related works as regards to this project. The chapter three follows up with the methodology adopted in this project. Chapter four establishes the implementation and the testing of the developed framework used in the project. Chapter five provides the summary and conclusion of the project.