A PROJECT PLAN

ON
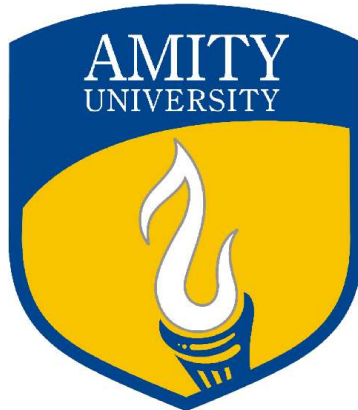
SMART HOME MANAGEMENT SYSTEM USING INTERNET OF

THINGS

SUBMITTED TO

Amity University Uttar Pradesh

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF

THE DEGREE OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND TECHNOLOGY

BY

Jitin Bahri

A2305214242

UNDER THE

GUIDANCE OF

DR. ANIL KUMAR GIRI

DEPARTMENT OF COMPUTER SCIENCE

AMITY SCHOOL OF ENGINEERING AND TECHNOLOGY

AMITY UNIVERSITY UTTAR PRADESH

DECLARATION

I, Jitin Bahri, student of B.Tech (CSE) hereby declare that the project titled "SMART HOME MANAGEMENT SYSTEM USING INTERNET OF THINGS" which is submitted by us to Department of Computer Science and Technology, Amity School of Engineering and Technology, Amity University Uttar Pradesh, Noida, in partial fulfilment of requirement for the award of the degree of Bachelor of Technology in CSE has not been previously formed the basis for the award of any degree, diploma or other similar title or recognition.

02/05/2018

JITIN BAHRI

CERTIFICATE

On the basis of declaration submitted by Jitin Bahri, student of B. Tech CSE, I hereby certify that the project titled "SMART HOME MANAGEMENT SYSTEM USING INTERNET OF THINGS" which is submitted to Department of Computer Science and Technology, Amity School of Engineering and Technology, Amity University Uttar Pradesh, Noida, in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology in CSE, is an original contribution with existing knowledge and faithful record of work carried out by him/them under my guidance and supervision.

To the best of my knowledge this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere.

Noida

Date:

(Guide)

Department of Computer Science Engineering

Amity School of Engineering & Technology

Amity University Uttar Pradesh, Noida

ACKNOWLEDGEMENT

Firstly, I would like to extend my heartfelt gratitude to my concerned faculty from the esteemed **Computer Science & Engineering Department**. These pages of paper would have never been as meaningful as if I didn't have your support and guidance throughout.

Special thanks to **Dr. Anil Kumar Giri**, my guide for Major Project, HOD sir and my program leader **Ms. Divya Upadhyay** who helped me and supported me and gave me a back throughout my entire project. Their involvement cannot be ignored at all. Their concern and constant provision of information is an unavoidable bunch of help. With the help of certain authors, bloggers, articles (both books and online), here I present to you my report on the topic "SMART HOME MANAGEMENT SYSTEM USING IOT".

It gave me immense pleasure putting together this set of facts and information, studying intact about the concerned topic and chalking it down in the form of this report. I hope you appreciate it as much as I rejoiced putting it up for you. I look forward to many more such enlightening topic related projects in the future too.

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JITIN BAHRI

A2305214242

B.Tech. CSE

ASET, Noida

2014-2018

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ABSTRACT

A Smart Home Management System or a Home Automation System is a network of home appliances and devices to the internet which can be controlled by us with the help of a mobile app, a central server or manually. The purpose of this project is to develop a cost effective smart home management system that improves the quality of life, is environmental friendly, child friendly and handicap friendly.

Our Smart Home Management system has a few basic features that set it apart from the existing Home Automation Systems in the market.

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CHAPTER 1: INTRODUCTION

1.1. Purpose of Plan

The purpose of our project is to develop a smart home management system using the concept of Internet of Things. This project aims to improve quality of life. An automated home will truly understand your and your needs.

1.2. Background Information

IOT

The Internet of things (IoT) is a network of devices, home appliances, vehicles and other items embedded with software, sensors, electronics, and network connectivity which enable the interconnectivity of objects to exchange data. Every device can be uniquely identified using its embedded computing system.[1] By 2020, 30 billion objects will be a part of the Internet of Things. The IoT allows objects to be controlled remotely across the network, creating opportunities for direct integration of the physical objects into computer-based systems, and resulting in improved efficiency, accuracy and economic benefits in addition to reduction in the human efforts.[2] When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as virtual power plants, smart homes, intelligent transportation and smart cities. The internet of things basically allows non-living devices to interact with one another over the internet.[1]

Home Automation System
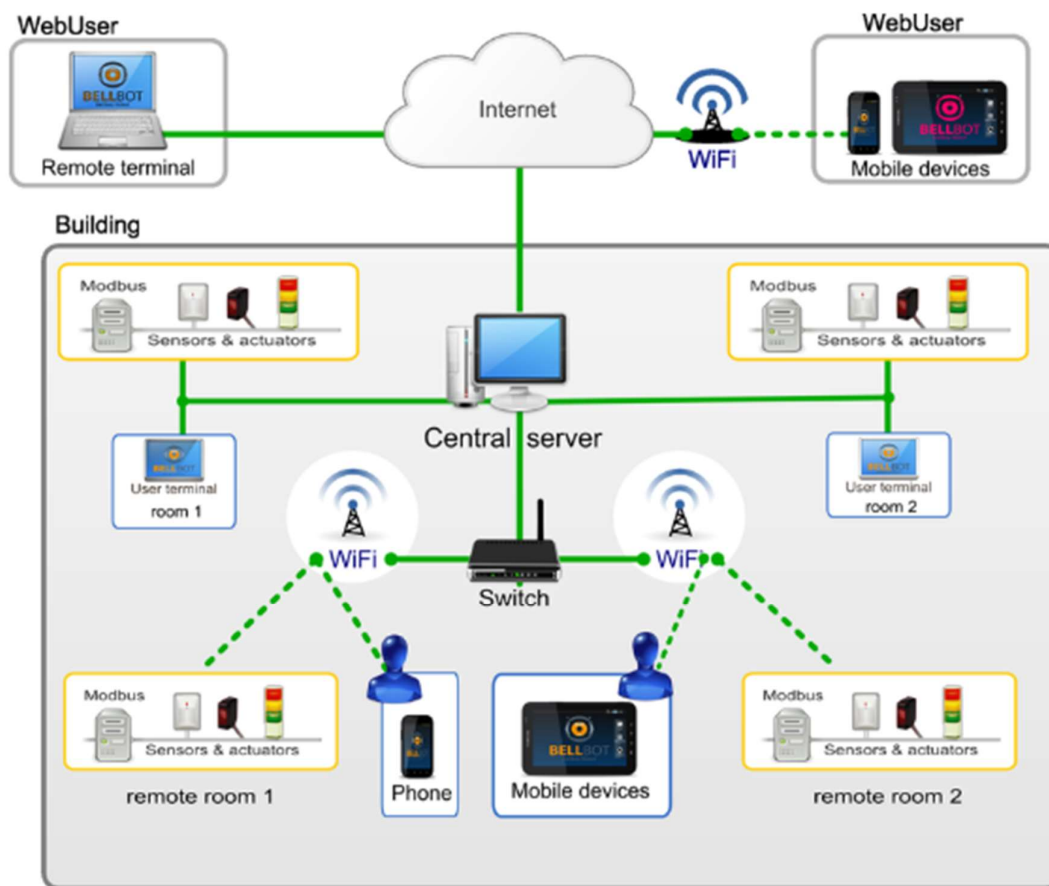
Figure 1.1 Home Automation System Network

In Layman's language, a home automation system is a connection of home devices to the internet which can be controlled by us with the help of a mobile app. Technology has definitely turned our lives way too much. Controlling our home appliances using a smartphone app is definitely the newest thing a human being can do. "With home automation, you dictate how a device should react, when it should react, and why it should react. You set the schedule and the rest is automated and based on your personal preferences thus providing convenience, control, money savings, and an overall smarter home."[3]

Raspberry Pi 3

Figure 1.2. Raspberry Pi 3

The Raspberry Pi Foundation gave rise to a hardware which is a series of computers in order to promote the teaching of computer science in various parts of the world. The Raspberry Pi hardware became extremely popular worldwide, selling for other markets like robotics.[4]

Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed. It is closely related to mathematical optimization, which delivers theory, methods, application domains to the field.[5]

Pattern recognition is a branch of machine learning that focuses on the recognition of patterns and regularities in data. Pattern recognition is the ability of computer systems to recognize a pattern of systems and deduce some information which can be further saved in a connected database.[6]

Our smart home management system is different from the existing home automation systems in the market because we have used Machine learning and pattern recognition in our project as follows:

1. We allow the system to find out a pattern of the devices and accordingly control them on its own. For example, if a person always comes back from work around 7 p.m., an average of his return from work will be recorded over 7-10 days. Once an average has been deduced by the automation system, the are switched on at the same time without exerting the person.

2. The home automation system consists of PIR sensors which can detect the presence of a human body nearby. If nobody is around and devices are still on, our smart home management system turns off the devices. Thus, saving a lot of energy. This factor is also useful when someone forgets to turn of the devices before leaving home.

3. Therefore, our smart home management system uses basic techniques which can be implemented to result in an evolutionary product for our future generations where saving electricity will be one of the biggest concerns.

1.3. Project Goals and Objectives

In today's fast pace world, everybody needs a home that understands them and their needs. With the advancement in technology and the emergence of the Internet of Things (IoT), an automated home management system is now possible. The primary focus of our project is to develop a home that understands you. Additionally, with the increasing number of thefts, security is a major concern these days. Our project also focuses on securing your home.

Our project has achieved the following goals:

1. A system that enables one-touch control of almost every device in the house.
2. Securing your house.
3. Keeping a track of all the devices.

CHAPTER 2: SCOPE

2.1. Scope Definition

- As we all are aware of the fact that our natural resources are exhausting at a very high rate, there is an urgent need to save electricity. A smart home management is the best way to save electricity as it senses the presence of a human nearby, if nobody is around, the electronic devices are switched off. The scope of such a system is not just useful for houses, schools, government and private offices, public centres can also use such a system.

- In school classrooms, fans, lights and projectors can be connected over the internet and controlled by a headmaster. Students who forget to switch off the lights and fans after leaving the classrooms tend to waste enormous amount of electricity. In such a case a smart home management system can be used to save electricity and make schools safe for children.

- In offices, other than lights and fans, computer systems, warmers and Air conditioners can also be connected to this smart system and controlled by a central management team so as to save energy and to cut down electrical costs.

- Additionally, it is a cost-effective home automation system.

2.2. Total Cost

The prerequisites of our project included knowledge of basic electrical engineering along with knowledge about Android, pattern mining and Linux. Additionally, a detailed analysis of Arduino, Raspberry Pi and PIR sensors is needed. Nowadays, everything is becoming smarter. Be it a mobile phone or computers or watches. But our homes, where we spend most of our time are yet not smart. Hence, there is an immediate need to make our homes, smart enough for our ease and security.

Following is the final project budget that includes Hardware and Software that as required to build the prototype of the project.

Hardware	Price
Raspberry Pi 3	Rs. 3500/-
Memory Card	Rs. 550/-
Connecting Wires	Rs. 100/-
Relay Drivers	Rs. 800/-
Bread Board	Rs. 250/-
Raspberry Box	Rs. 500/-
PIR Sensors	Rs. 1000/-
Connectors	Rs. 100/-
Bulb Holders	Rs. 200/-
Bulbs	Rs. 200/-
Alarm	Rs. 500/-
Raspberry Pi Charger	Rs. 250/-
Raspberry Pi Cable	Rs. 150/-
Switches	Rs. 100/-

Software	Price
Android Studio	Free
Raspbian OS	Free
OpenHab	Free
Apache Server	Free
SQL Server	Free
Linux Server	Free
Atom	Free
VNC	Free
GPIO Drivers	Free

Total cost of the working prototype costs **Rs. 8200/-.**

CHAPTER 3: CONSTRAINTS

3.1. Project Constraints

Even though a smart home management system is useful in numerous ways, everything has its pros and cons. The limitations or constraints of our smart home management system are:

1. There are certain devices that cannot be connected to the Smart Home Management system.

2. There is an issue of managing the functioning of certain devices through the mobile app, even if it's connected to the smart home management system. For example, a microwave can be connected over the internet. However, it can only be switched off/on using the mobile app. The microwave cannot be operated as the microwave has its own interface. Another example is that of a washing machine. A washing machine can be switched off/on using the mobile app once it is in the smart home management network. But its temperature cannot be maintained or it cannot be operated using the mobile app.

3. At the end of the day, a smart home management system is a machine that is developed to ease the work of humans. It can be attacked by hackers or viruses. Hackers can hack the entire smart home management system and turn off the security alarm of the house and cause thefts. Viruses can destroy the entire home management system.

CHAPTER 4: PROJECT MANAGEMENT APPROACH

4.1. Project Timeline

<div align="center">

Start date: 18/12/2017

End date: 06/04/2018

</div>

Date: 18/12/2017

Work done: Started creating web server

Date: 25/12/2017

Work done: Structured web server on localhost.

Date: 01/01/2018

Work done: Deployed web server on AWS.

Date: 08/01/2018

Work done: Learnt about location service in android.

Date: 15/01/2018

Work done: Started using location service in android app

Date: 22/01/2018

Work done: Started creating android app

Date: 29/01/2018

Work done: Connected android app with web server

Date: 05/02/2018

Work done: Gathered related work.

Date: 12/02/2018

Work done: Prepared Introduction for the Major Project Report.

Date: 19/02/2018

Work done: Preparing project report.

Date: 26/02/2018

Work done: Prepared the sequence diagram.

Date: 05/03/2018

Work done: Working on Methodology.

Date: 12/03/2018

Work done: Working on Methodology.

Date: 19/03/2018

Work done: Finalized methodology and gathered resources for result.

Date: 19/03/2018

Work done: Working on Result.

Date: 26/03/2018

Work done: Finalizing the hardware and software. Prepared a model to demonstrate the working.

Date: 02/04/2018

Work done: Finalizing the result.

4.2. Risk Assessment

With so much going on in one project, there could be many things that could go wrong. Even when we put in all our efforts, certain risks may show up that could harm or possibly even destroy our entire project.

A smart home management system is efficient, saves time and labor. But what could be the possible risks in such a system?

- A smart home management system is a computer-based system connected to the internet and a mobile app is used to manage our home appliances. It is prone to cyber and virus attacks. While securing the house, its own security may be breached. A cyber-attack or a hack can turn off the security alarms outside the house and the attacker may steal valuables while you're away. A home automation system can also be attacked by various types of viruses/trojan horses that can destroy the entire system and enable unusual behavior.[7]

- A smart home management system is controlled using a mobile app. If a mobile gets stolen or it is broken, you will not be able to control your home. In such a case, a backup remote control system is necessary.[8]

CHAPTER 5: LITERATURE REVIEW

The famous science fiction author Ray Bradbury's short story "There Will Come Soft Rains" mentioned a computer-controlled house that can do anything on its own. This story was written in 1950 and after 67 years, this theoretical concept is no longer a theory. The history of Home Automation system dates back to the 1900s when electric appliances like Vacuum cleaners, dishwashers, washing machines and water heaters were invented. These appliances effectively reduced time and human effort and thus a new era of advanced technology began.[9]

For many years, Smart Homes have only been in books and writings. There was no practical prototype or model. Smart Home Management systems have marked the beginning of a digital revolution.[10]

In 1966, ECHO IV, the first ever smart device was launched. It could turn on and off the appliances, maintain the temperature of the house and make shopping lists. A year later, The Kitchen Computer was developed. It had the capability of storing recipes. However, its tagline "If she can only cook as well as Honeywell can computer" didn't bring it any buyers.[10]

In 1991, Gerontechnology was introduced. This word is a combination of two words, Gerontology and Technology. "It is an interdisciplinary field of scientific research in which technology is directed towards the aspirations and opportunities for the older persons." In simple words, Gerontechnology is the method to enable technology to be helpful to the old people who get weaker and dependable. It was a great initiative to help senior citizens become independent. [10]

During the period 1998-2000s, home automation market rose rapidly. A variety of home automation devices were being sold all over the world. Consumers found these to be time and labour efficient.[10]

There have been notably 3 generations of Smart Home Management systems. These are:

1. <u>1st generation:</u> wireless technology with a proxy server, e.g. Zigbee automation.

2. <u>2nd generation:</u> AI controlled electrical devices, e.g. Amazon Echo.

3. <u>3rd generation:</u> a robot who communicates with humans, e.g. Roomba, Robot Rovio.[11]

In 2013, the home automation market was worth US$5.77 billion. It is predicted to reach a value of US$12.81 billion by 2020.[12]

The current scenario of home automation system is based upon security and saving energy. With a growing sense of responsibility to save the natural resources, humans are encouraging one another to use greener methods. Current trends in home automation include remote mobile control, automated lights, automated thermostat adjustment, scheduling appliances, mobile/email/text notifications etc.[1]

CHAPTER 6: PROJECT ANALYSIS AND FEASIBILITY

The feasibility of a project can be measured using the concept of Cost-Benefit analysis. The cost-benefit analysis is a technique in which the cost of development or the expenditure on a product is compared with the benefits it will yield. Cost and benefits are estimated in the same units so as to calculate profit or loss.

The cost of developing a smart home management is less than the amount of benefits it will be yielding. With a secure and safe environment, our smart home management system is handicapped and elderly friendly. Our smart home management system saves electricity and time. Children, paralyzed or disabled, anybody can manage to stay on their own with the help of this smart system.

CHAPTER 7: CONCLUSION AND FUTURE SCOPE

7.1. Conclusion

The developed prototype of a Smart Home Management System shows the qualities of **Connectivity, Reliability, Manageability and Security**. The Home Automation System is very easy to use and can even be used by children. It makes your life easier. It is cheaper than the existing home automation systems. Additionally, it has a number of features that haven't been integrated in any home automation systems.

Our Smart Home Management System is not an item of luxury. People who do not belong to very well-off families can also use this system to improve the quality of their lives.

7.2. Future Scope

The population of the world is growing at an exponential rate. The future of mankind does not just demand increased basic needs like food, shelter and food, it also demands increased demand of energy. The technology is growing at a really fast pace and there is definitely a need of cost-effective energy and resources.
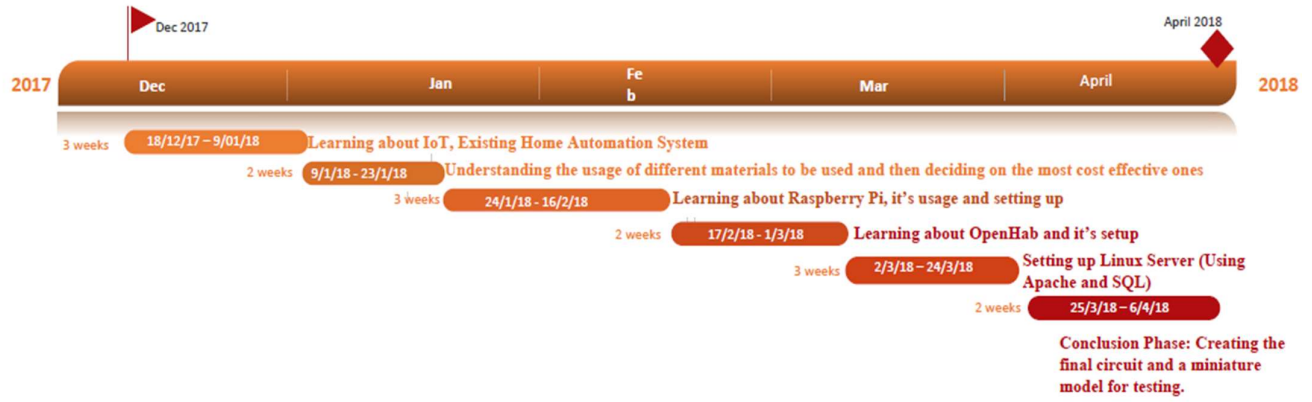
The future scope of the developed home automation system is that, we can integrate additional features according to the requirements of the user. Moreover, since it's elderly friendly, senior citizens staying alone can implement this easy to use technology at their homes and cherish their lives.

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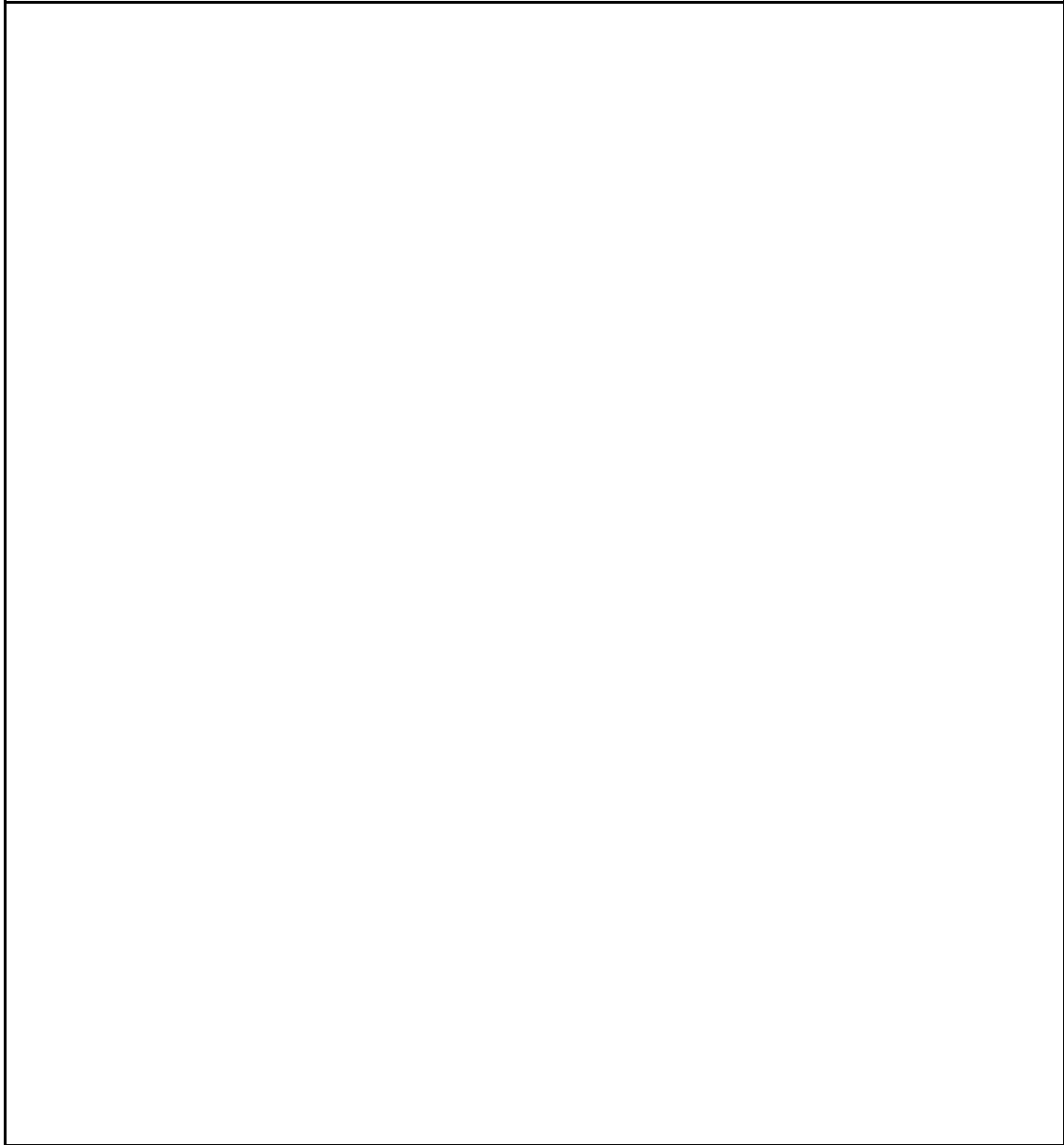ai-3064-article.

GANTT CHART

3 weeks · 18/12/17 – 9/01/18 · Learning about IoT, Existing Home Automation System

2 weeks · 9/1/18 - 23/1/18 · Understanding the usage of different materials to be used and then deciding on the most cost effective ones

3 weeks · 24/1/18 - 16/2/18 · Learning about Raspberry Pi, it's usage and setting up

2 weeks · 17/2/18 - 1/3/18 · Learning about OpenHab and it's setup

3 weeks · 2/3/18 – 24/3/18 · Setting up Linux Server (Using Apache and SQL)

2 weeks · 25/3/18 – 6/4/18 · Conclusion Phase: Creating the final circuit and a miniature model for testing.

COMMENT BY EXTERNAL EXAMINER

Name of the External Examiner:

Signature: