A Report on

VOICE CONTROLLED SMART HOME AUTOMATION

Under the Subject of

DESIGN ENGINEERING -2B

SEMESTER-6, BE-3rd year

Submitted By

ANURAAG PAL (190130111026)

SHUBHAM HARISH GUPTA (190130111055)

Guided by

Prof. DEVENDRA H. PATEL

Department of ELECTRONICS AND COMMUNICATION ENGINEERING,

Government Engineering College, Gandhinagar

A Report Submitted to

Gujarat Technological University

In the partial fulfilment of Requirements for

Subject of **DESIGN ENGINEERING**

Department of ELECTRONICS AND COMMUNICATION ENGINEERING,

Government Engineering College, Gandhinagar 2021-2022

CERTIFICATE

This is to certify that **Design Engineering** work that has been embodied in this report entitled ***"VOICE CONTROLLED SMART HOME AUTOMATION"*** having ***Team ID:*** has been carried out by ***ANURAAG PAL*** and ***SHUBHAM HARISH GUPTA*** in **6**th semester has submitted to **Gujarat Technological University (GTU),** in the partial fulfilment of the requirements of the subject Design Engineering in **ELECTRONICS AND COMMUNICATION ENGINEERING** at **Government Engineering College, Gandhinagar.**

DATE: *22th April, 2022*

Place: *Gandhinagar*

Guided by-

Prof. DEVENDRA H. PATEL

ACKNOWLEDGEMENT

*I would like to express my special thanks of gratitude to my teacher **(Prof. DEVENDRA PATEL)** as well as our principal **(Mrs. SHWETA DAVE)** who gave me the golden opportunity to do this wonderful project on the topic **(VOICE CONTROLLED SMART HOME AUTOMATION)** which also helped me in doing a lot of Research and i came to know about so many new things I am really thankful to them.*

Secondly I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

ANURAAG PAL

SHUBHAM GUPTA

ABSTRACT

Today, home automation using IOT is a major domain which is attracting attention of large tech companies. We all want to own a smart home but sometimes accessibility becomes a barrier in setting it up. Most of the existing home automation systems support only few languages generally English. But we are going to make a home automation system that will allow us to control our appliances with voice commands given using app through voice or through clicking buttons provided in the app. This system uses Smartphone Application to control smart devices. We will make an app to control these appliances and integrate its code to ESP32.

TABLE OF CONTENTS


SMART HOME


Smoke Detector
Environment Sensor
Fuel Gas detector
Smart Socket
Remote Controller
Door Sensor
PIR Motion Detector


LOCK
GARAGE


Abt
Home Automation


Smart Home Choice of Smart People


VARN
Agni
VARN DIGITAL

CHAPTER – 1 INTRODUCTION

1.1 Introduction of Domain

Smart Home is collaboration of technology and services through a network for better quality living. A smart home allows the entire home to be automated and therefore provide ease and convenience to everyday activities in the home. This technology is used to make all electronic devices to act ‘smart’. In the near future almost all the electronic devices will take advantage of this technology through home networks and the internet. Many people think this technology as pure networking. Others think this technology will reduce their work load, but smart home technology is combination of both and much more. Smart home technology is currently being implemented for entire house in particularly kitchen and living room. Basically, smart home facilitates users with security, comfortable living and energy management features as well as added benefits for disabled individuals. This technology might sound new but it just uses the existing technologies. A smart device is a common appliance with a much more complex computer installed to give it more functionality. These functions are the ones which makes it so different. Cable broadband, DSL, Bluetooth and wireless technologies provide a way to have a home networked for devices to communicate with each other as well as internet. These technologies either wired or wireless provide foundation on which smart home will operate. The research standards have already anticipated a smart, connected home where multiple devices cooperate to pamper to users wishes with little or no effort. For example, in a home with remotely controllable lights, cameras and locks, it should be easy to automatically alter lights based on the weather and time of day as well as remotely view who is at the door before unlocking it. But such straight forward home-wide tasks are remarkably unavailable from the mainstream despite the fact that the needed hardware devices (such as wireless light switches, door locks, and cameras) are reasonably priced. Many analysts predict that the smart home of the future is likely to contain 15 to 30 connected devices and sensors, all linked via a home area network and connected to the Internet. The collective revenue generated from home automation and home energy management (HEM) segments will be worth more than $44bn in 2016, according to the predication made from market analyst companies ABI and Berg Insight. The comprehensive revenue possible of the smart home, however, will be somewhat on a higher side as devices from the entertainment, health and home security sectors will also become connected.

1.2 Problem Definition

Home automation is all about safety, security and convenience at your finger- tips. Home automation devices help to sort out the common problems which we usually face to manage the functioning our home such as home security, energy management. For instance, we usually forget to switch off our home appliances. A home automation device allows us to control all the electronics of home through mobile application from anywhere around the world.

Let’s discuss some common problems which home automation system solves smartly:

Energy Management
We usually forget to switch off our home appliances due to hectic schedule which results high energy bills. Home Automation is all about the management of your home and daily life. You can remotely control lights, turning off the appliances when not in use. This is a one-time investment and it can axe your energy bills smartly.

Security
Nowadays, security is a major concern of all. As thieves are becoming smart and using modern technology to break-in, People have largely opted for cameras to secure their home assets. Using home automation system allows you to remotely view the recordings of your indoor cameras from a cloud-based app when you don't have time to go back to your home and check the recordings and integrated smart sensors gives alerts on your phone in case any door, windows or cabinets open unexpectedly.

Safety
Safety is what we all are concerned about to whom we love the most. Home automation system lets you take control over your home’s safety from cloud based mobile application. With our application, get notifications when motion or audio is detected. You can also use timeline feature to look back at events based on detection.

1.3 Motivation

Smart homes may make life easier and more convenient. Who wouldn't love being able to control lighting, entertainment and temperature from their couch? Whether you're at work or on vacation, the smart home will alert you to what's going on, and security systems can be built to provide an immense amount of help in an emergency. For example, not only would a resident be woken with notification of a fire alarm, the smart home would also unlock doors, dial the fire department and light the path to safety.

1. Light a path for nighttime bathroom trips.
2. unlock your door automatically as you approach.
3. Feed your pets on a schedule with a preset amount of food.
4. Instantly create mood lighting for any occasion.
5. Program your television so that your children can watch only at certain times.
6. Warm the bedroom before you get out of bed so that it's nice and toasty when you get up.
7. Turn on the coffee maker from bed.

Smart homes also provide some energy efficiency savings. Because systems like Z-Wave and ZigBee put some devices at a reduced level of functionality, they can go to sleep and wake up when commands are given. Electric bills go down when lights are automatically turned off in empty rooms, and rooms can be heated or cooled based on who's there at any given moment. One homeowner boasted that her heating bill was about one-third less than a same-sized normal home. Some devices can track how much energy each appliance is using and command power hogs to use less.

1.4 Importance of Domain

Here’s a closer look at some of the biggest benefits that home automation provides.

- **Savings:** Smart thermostats and smart lightbulbs save energy, cutting utility costs over time. Some home automation technologies monitor water usage, too, helping to prevent exorbitant water bills. Certain devices even offer rebates.

- **Safety:** Many home automation technologies fall under the umbrella of home security. Consumers purchase these devices because they want to make their homes safer and more secure. Automated lighting thwarts would-be burglars, and motion sensors help people enter doors and walk hallways late at night Security cameras offer benefits through either remote monitoring of package deliveries or real-time video of home inhabitants or unwanted visitors.

- **Convenience:** Because home automation technology performs rote tasks automatically, end users experience great convenience. Lots of smart gadgets are compatible with one another, and you can set different triggers between devices to automate regular home processes. For instance, you could set your smart locks to turn on your smart lighting when you unlock the front door.

- **Control:** Consumers also choose smart home devices to better control functions within the home. With home automation technology, you can know what’s happening inside your home at all times.

- **Comfort:** Some people use smart technology to record shows or to play music throughout the home. Connected devices can also help create a comfortable atmosphere—they provide intelligent and adaptive lighting, sound, and temperature, which can all help create an inviting environment.

- **Peace of Mind:** Finally, many consumers invest in home automation technology for peace of mind. A new mom or dad can check on their little one thanks to smart cameras and other technologies. Or, if you can’t remember whether you closed the garage after you left, you can verify remotely with an app.

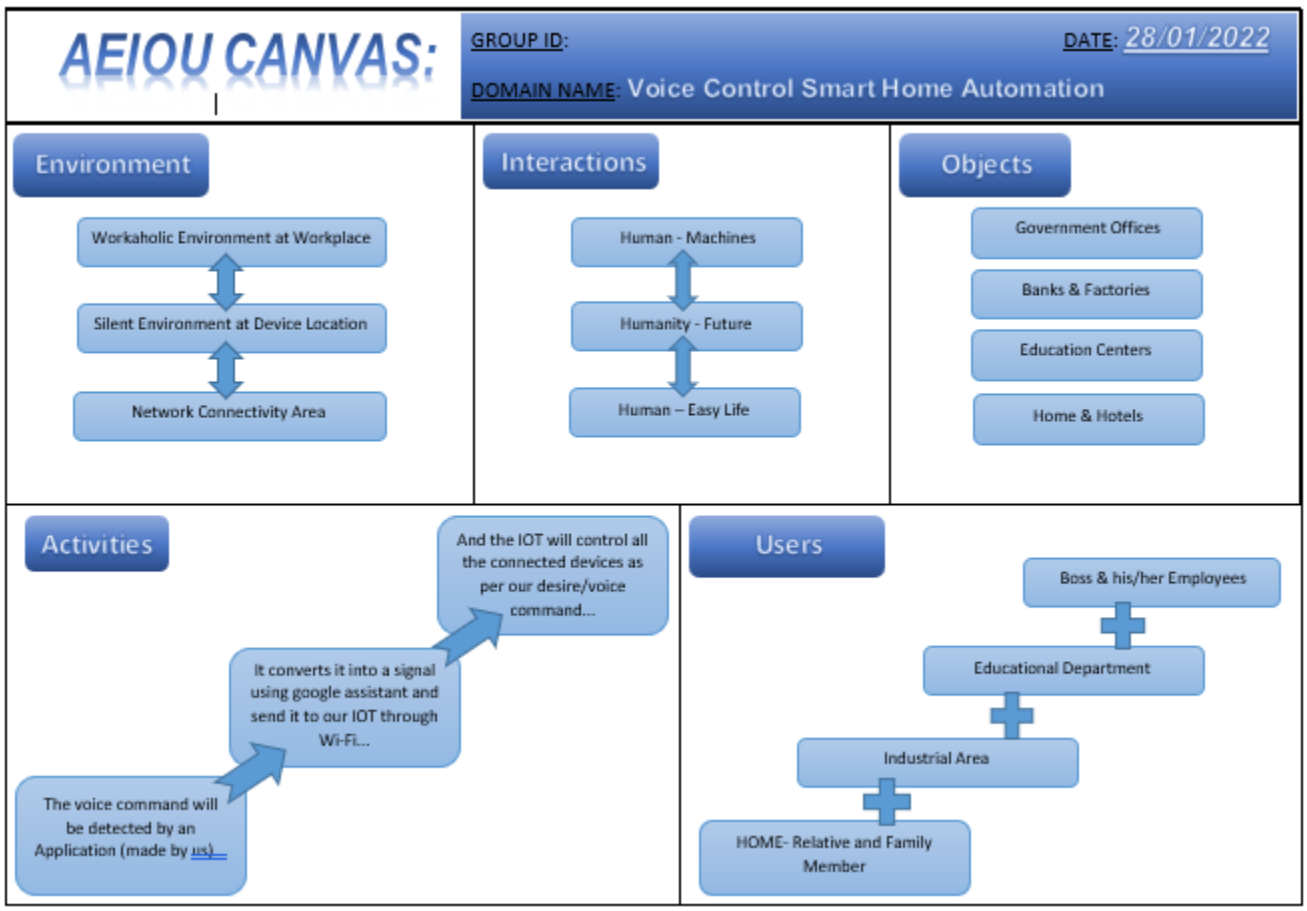
- **Quality of Life** You can't buy happiness. We know that. But more money means less stress, and that's something you can't beat. As cool as it is to tell Alexa to play the latest single from across the room, having more room in your budget is even cooler. And plus, energy-efficient homes put a considerably less amount of strain on the environment, making life better for all of us. So, do yourself a favor, start replacing those old appliances with smart, sustainable devices that will actually make you, and the rest of us, a little happier.

CHAPTER – 2 DESIGN ENGINEERING METHODOLOGY

2.1 Design methodology & Analysis

A Design methodology is an overarching approach to design that may include a set of philosophies, principles, processes and techniques. In some cases, they are associated with a type of design such as architectural or graphic design. It is also possible for a methodology to be generic enough to apply to all design. The following are common type of design methodology.

Design to Value	Emergent Design
Flat Design	Inclusive Design
Interactive Design	Transition Design
Universal Design	Value Sensitive Design



Observation through AEIOU and other methods:

Understanding the problem of society, it is one of the biggest challenges for engineering student as till now we were making projects on imaginary ideas. So, the first sessions were based on understanding the domain of the problem in broader sense with emphasized on interacting with the people of our domain area which include more casual talks than technical sections. We were mostly observing what are the major of the basic problems in our domains. The area our domain was steering system as we know there are number of people are present for their different purpose or reasons or duties all of them are from different background and have to platform different function or utilized the space in different way. As in our first canvas of activities we have observed the following activities

Activities of Users:

General Impression/Observation: - Massive Data Flow, Remote Functions, Voice Command, Bluetooth Control, Data Processing.
Element, Features and Special Notes: - AI Control, LED Display, Sensor Device, Lighting Control, Temperature Monitor

Environment:

General Impression/Observation: - Wi-Fi Enable, High Speed Connectivity, Cloud Computing, Bluetooth Connectivity, Data Processing **Element, Features and Special Notes: -** IOT Devices, Remote Control, Data Availability, Medical Data Security

Interactions:

General Impression/Observation: - Database Store Data, API Manage Action, RFID/Sensor Technology, On Demand Service
Element, Features and Special Notes: - Fans to Actuators, Home access to Database, Lights to Actuators, Sensor to Home Devices

Objects:

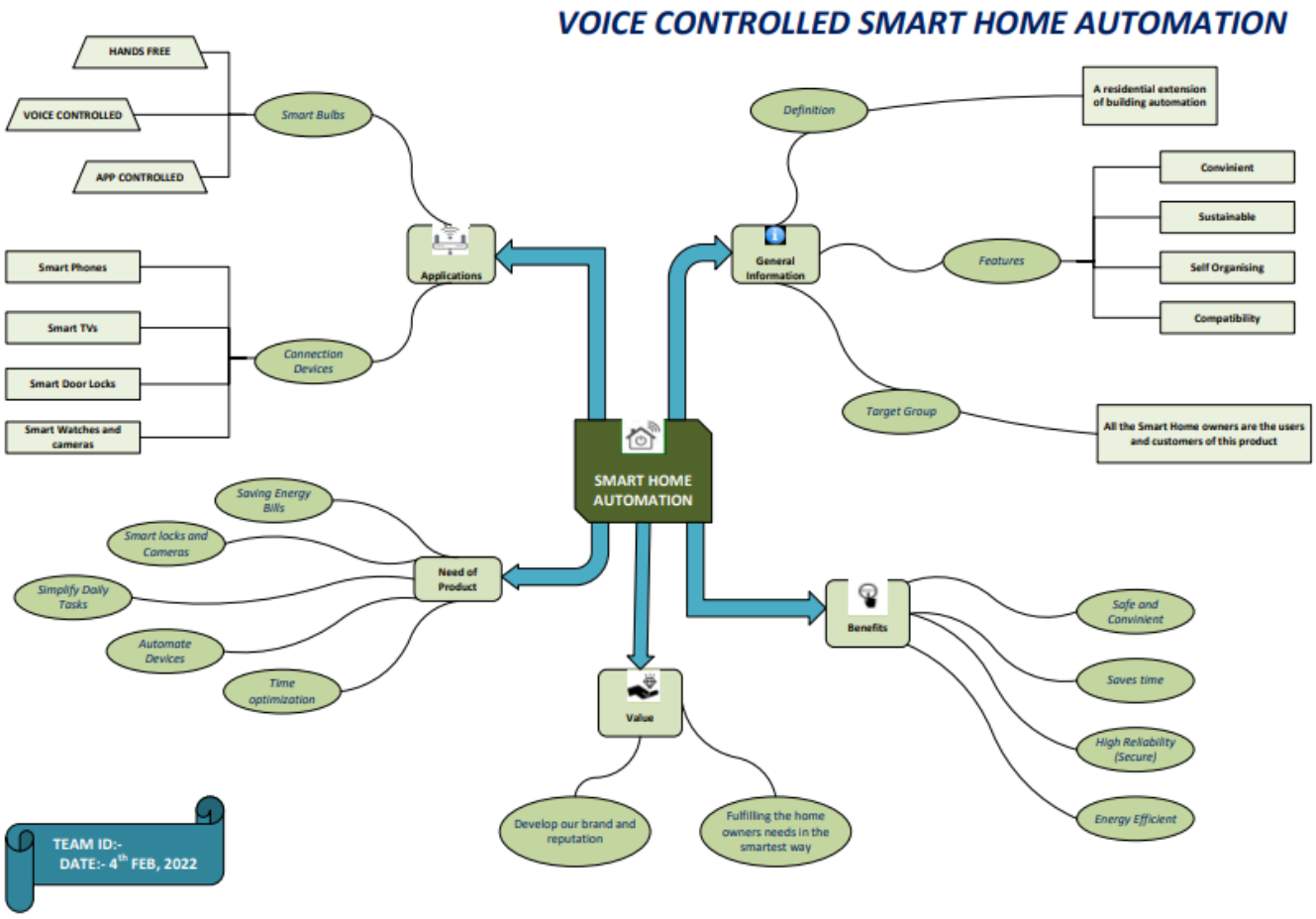
General Impression/Observation: - Books, Fans/AC/Heater, TV/Speaker, PC/Phone/Laptop
Element, Features and Special Notes: - LED Display, GPS Tracking Devices, WIFI, Music System
Inventory of Key Objects: - Time Saving, Easy to Access, Centralized Control Units, Full Security, Energy Saving

Users:

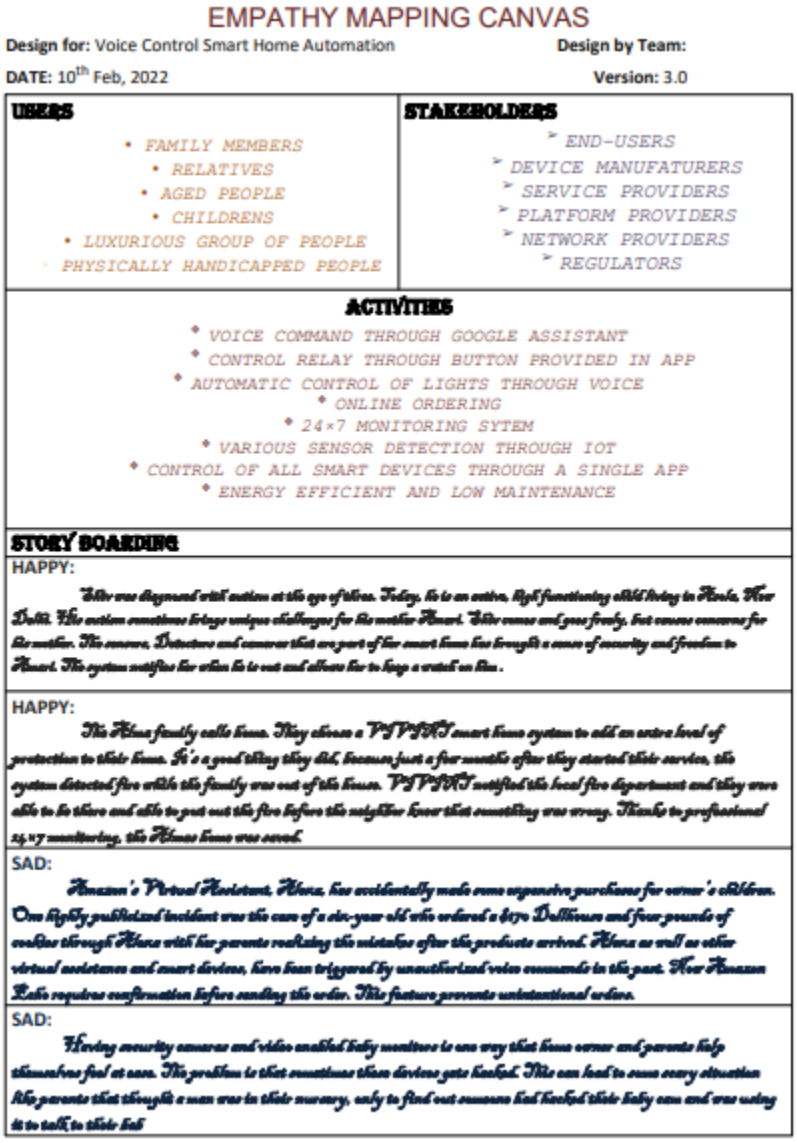
General Impression/Observation: - Home Guard, Family Member, Relatives
Element, Features and Special Notes: - Watching TV, Watering Garden, Car Washing, Command to Another IOT Devices

2.3 Mind Mapping Canvas

Then we had coggle for our mind mapping. It provides great platform to make a mind map which can be used for easy analysis. The Snap-shot of our coggle sheet is below:



2.4 Empathy Canvas



User:

Family Member, Relative Member, Weak memory Person

Activities:

Fire Alarm to Actions, Sensor Detects, Security Camera, Transmitter Send SMS, Voice Command, Online Order, Hacked Camera, 24x7 Monitoring

Stakeholders:

Service Provider, Device Manufacturers, Civil Administrator, Platform Provider

STORY BOARDING

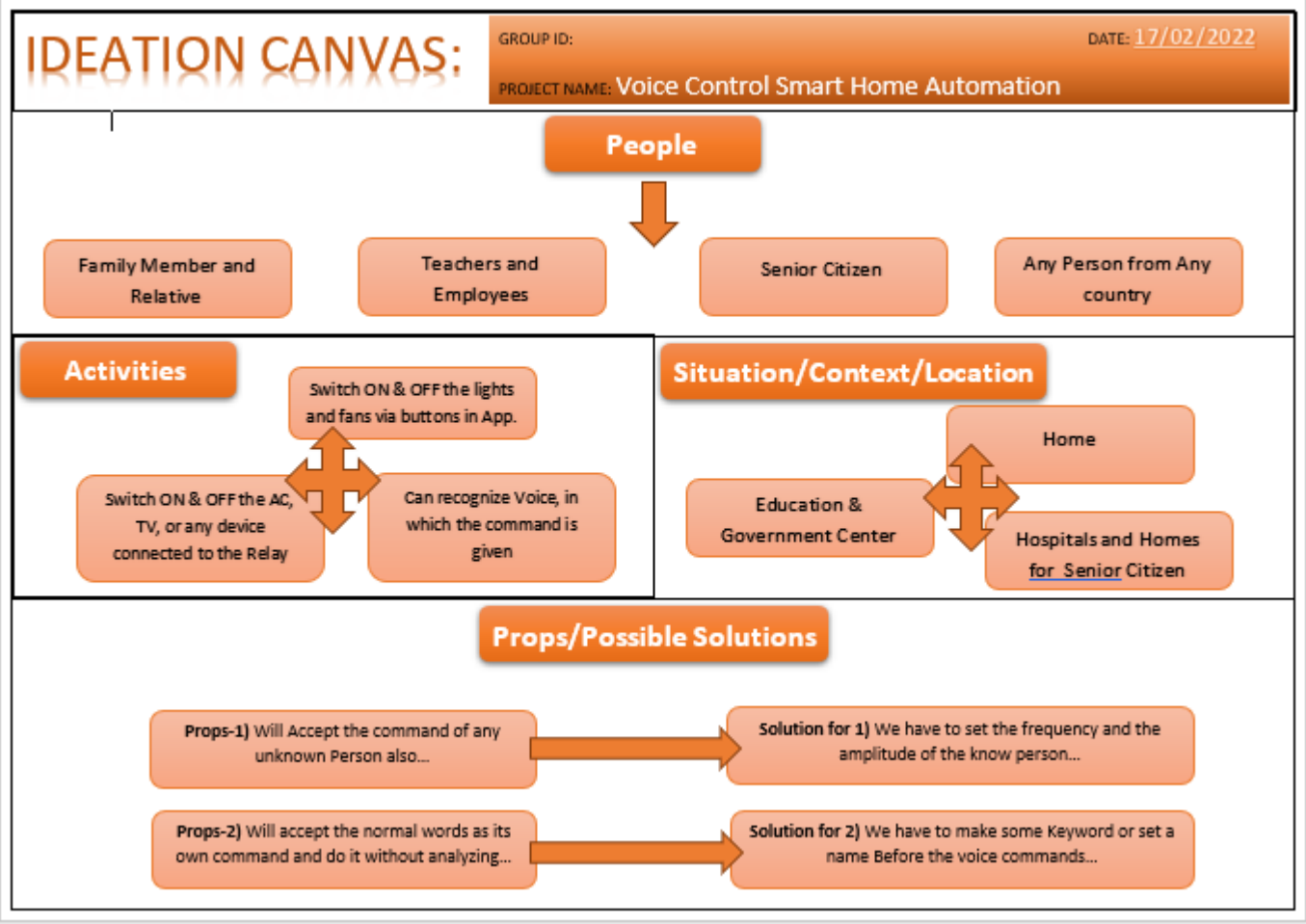
HAPPY:- Sulphur spring, Bangalore, is a small family-friendly city, and its where the Alam family calls home. They Choose a VIVINT smart home system to add an extra level of protection to their home. It a good thing they did, because just a few month after they started their service, the system detected a fire while the family was out of the house. VIVINT notified the local fire department and they where able to be there and put out the fire before the neighbour even knew something was wrong. Thanks to professional 24x7 monitoring, the Alam's home was saved.

HAPPY:- Shiv was diagnosed with autism at the age of three. Today, he's an active,high functioning child living in Asola, New Delhi. His autism sometime brings unique challenges for his mother Amari. Shiv comes and goes freely, which is great for him, but causes concerns for his mother. The sensor, detectors,and cameras that are part of her smart home has brought a sense of security and freedom to Amari. The system notifies her where her son is at and allows her to see him**.**

SAD:- Amazon's virtual assistant Alexa has accidently made some expensive purchases for owner's with children. One highly publicized incident was the case of a six year old who ordered a $170 Dollhouse and four pounds of cookies through Alexa with her parents realizing the mistake after the products arrived. Alexa as well as other virtual assistants and smart devices, have been triggered by unauthorized voice commands in the past. Now Amazon Echo requires confirmation before sending the order through . this features prevents unintentional orders.

SAD:-Having security cameras and video enabled baby monitors is one way that home owner and parents help themselves feel at ease. The problem is that sometimes these devices get hacked. This can lead to some scary situations like the parents that thought a man was in their nursery, only to find out someone had hacked their baby cam and was using it to talk to their baby.

2.5 Ideation Canvas



We started with ideation canvas where first we started with peoples, where we simply thought about the peoples of for whom we want to solve the problem:

People: Disable person, Older people, Neurological disable, Family member

Activities: Lock & unlock door, Home surveillance, Irrigation automation, Home keeping, Temperature control, Smart lighting

Situation/Context/Location: On-demand access, Away from home, command central, Home control, On vacation, Efficient monitoring, Energy saving

Props/Possible Solutions: Bluetooth, Smart devices, GSM/GPS, Zigbee, IoT platform, Wi-Fi

Following points were developed to make a successful ideation canvas: -

- Smart technology is a way of connecting your home through innovative technology to control and give homeowners an “on-demand access to various systems throughout your home. From video, data, telephone, wireless, security, climate, lighting and other home lifestyle factors that affect you and your family’s daily life. Smart home technology can help your home run more efficiently while also helping family members live in total comfort while at home or away.
- Your kitchen has always been “command central” when it comes to cooking, entertaining, enjoying family discussions and more. You will be surprised how smart technology pairs with your favorite appliances, faucets, and cooktop surfaces can be controlled through smart technology.
- Many smart home technologies actually help keep your family safe while saving you water and energy in the kitchen. Induction cooktops are one of these examples that produce heat that only heats the cookware when the metal comes in contact with the induction cooktop surface. This means a safer kitchen to work in, and less heat being generated for comfort while cooking.
- Your home can have smart technology that helps you control and monitor your energy usage with thermostats such as the Nest learning thermostat. It “learns” your family’s lifestyle and connected to a Wi-Fi connection enables homeowners to control settings from any internet enabled smart device. Register your email and home location and you will get monthly energy usage reports sent to you directly to see how you compare with other homeowners in your city.
- From automating your interior shades and exterior awnings from your bedroom to controlling your pool temperature, lighting and music before your guests arrive – all at the touch of a finger is mind-blowing. In this new era, smart home technology is fast and ever changing.

2.6 Product Development Canvas

PRODUCT DEVELOPMENT CANVAS *Team/Date/Version:*

Product

- Control of media system
- Ensure Security
- Enhance Accessibility
- Improve Comfort and quality of life

Product Experience

Handy
One-Click Control
Feels Relaxed
All Control in Single App

Product Functions

- Monitor Home
- Remote Control Through App
- Voice Control Based on Google Assistance
- Automated Feeders

Product Features

Smart Intelligence
Connectivity
Energy Efficient
Sensing
Safety and Security

Customer Revalidation

Customer is fully satisfied by the product

People

Older People
Physically Handicapped
Family Members
Guests
Children
Relatives

Components

Smart LED Bulbs
Smart phone
Thermostat
Raspberry Pie
Security Cameras
Smart Fans
Smart TV
Sensors
Smart kitchen Appliances
Smart WIFI connectivity

Reject/Redesign/Retain

Product is Retained

Purpose:

Control of media system, Improve comfort, Ensure security, Enhance accessibility

People:

Older people, Disable person, Family member, Travelers

Components:

Thermostat, HVACs, Smart light, Surveillance camera, Smart lock, Smart kitchen appliances

Product feature:

Intelligence, Sensing, Connectivity, Safety, Energy

Product functions:

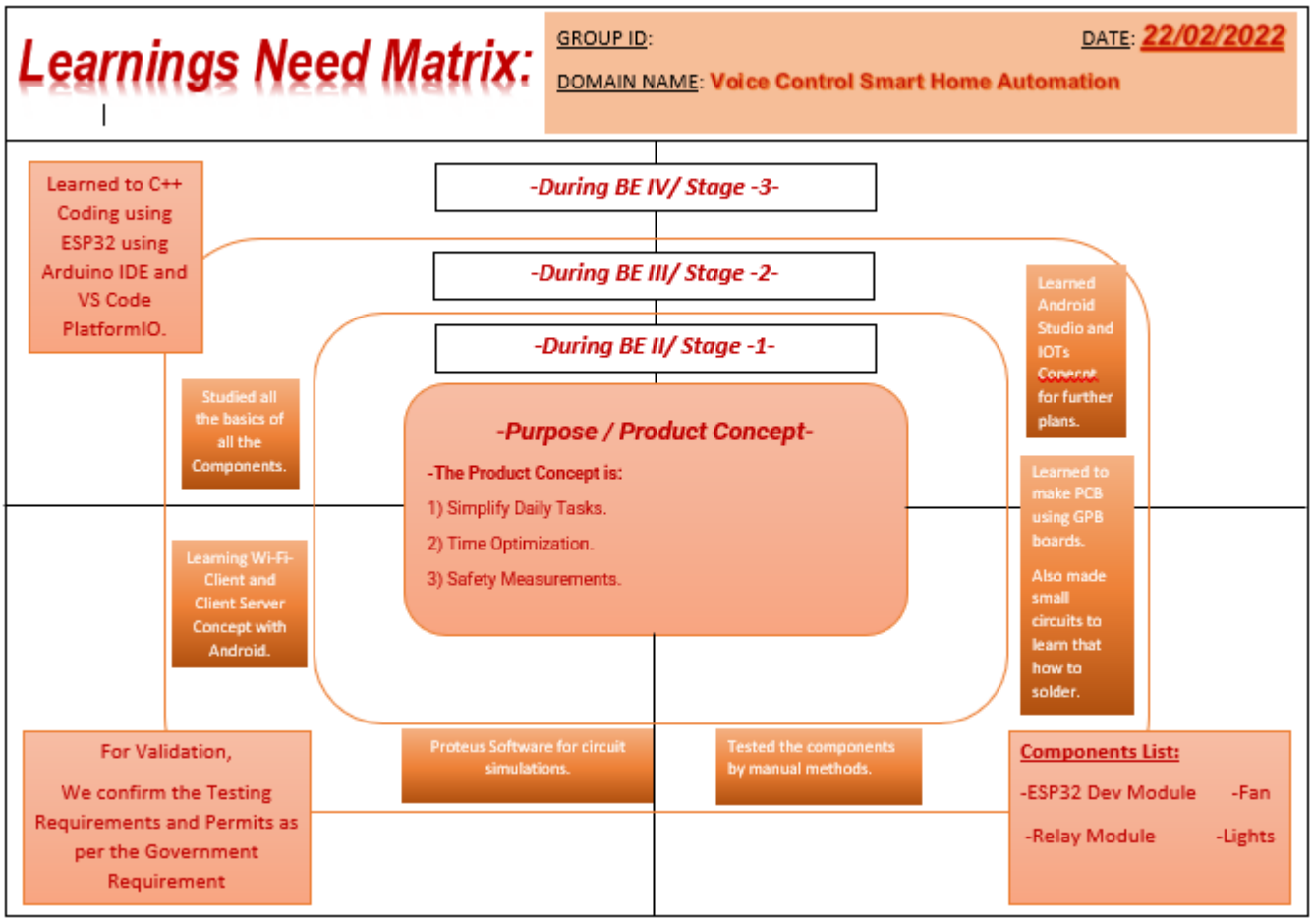
Remote control, Monitor home, Smart lock & unlock, System monitor, Automated feeders

Product Experience:
Handy, Feel relaxed, One click control

Customer Re-validation:
Fully satisfied

Reject/Redesign/Retain:
Retain

Learning Needs Matrix Canvas (LNM)



2.7 Feedback Analysis

Integrating customer knowledge in the research and development phase is a way of refining products both before and after launch. The information collected on various channels can be easily filtered in R&D. Thus, feedback analysis helps us to improve our product. It also provides new ideas from the customers. Being responsive to customer feedback also brings companies closer to their target audience. Here are some feedbacks from the audience who will use our applications.

Feedback 1: The targeted audience for our application are disabled people, older people, family member, travelers. The growing technology will undertake responsibilities of home security, home maintenance. There was the positive feedback reported from them. They thought it will reduce the efforts as they could easily get results.

Feedback 2: Another group of targeted audience were students and professors. We recorded a positive response from them. They thought of it as it would relieve their work. Now they could easily concentrate on multiple work which would be time saving.

Feedback 3: A negative response was recorded which gave us an idea that we need to classify the given data into a proper database which would have a simpler graphics which could be easily understood by everyone.

CHAPTER – 3 STUDY & ANALYSIS

3.1 Prior Art Search

A) Voice recognition

Inventor: - Ken Hanzawa
Publication number: - 20070027693
Publication Date: - February 1, 2007

Abstract: - a voice recognition system has a recognition dictionary storing voice information, a primary voice recognition means for performing primary voice recognition in response to input voice information pronounced by a user by the use of the recognition dictionary, and a recognition result judging means for deciding whether the primary voice recognition result is to be accepted or rejected. The voice recognition system includes a transceiver means for ending the input voice information of the user to an additional voice recognition means when the primary voice recognition result is rejected by the recognition result decision means and for receiving a secondary voice recognition result produced as a result of secondary voice recognition of the additional voice recognition means, and a recognition result output means for outputting the primary or secondary voice recognition result to an exterior of the voice recognition system

3.2 Learning from Design Thinking

1. Gives us the opportunity to view a problem from a different perspective
2. Allows us to delve into a problem to determine its root cause
3. Encourages innovating thinking and problem solving
4. Ensure that the final outcome meets objectives and client requirements
5. Enables us to continually expand our knowledge
6. Results in an experience that is more effective and informative for our learners

CHAPTER – 4 PROPOSED IDEA

4.1 Functions and Advantages

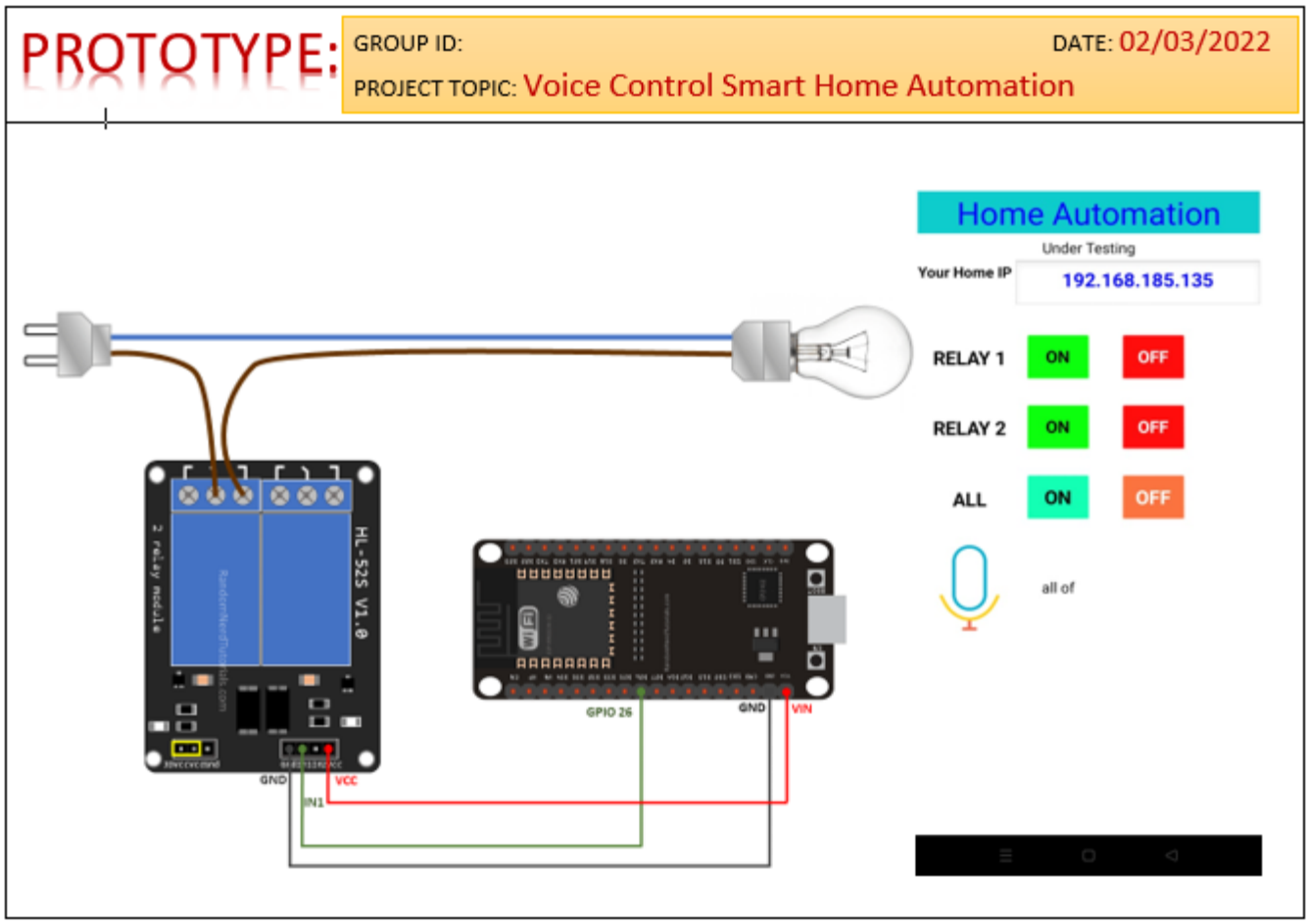
Function: -

A smart home is a convenient home setup where appliances and devices can be automatically controlled remotely from any internet-connected place in the world using a mobile or other networked device. A smart home has its devices interconnected through the internet, and the user can control functions such as security access to the home, temperature, lighting, and home theater. Related terms include "home automation" and "smart building. "A smart home's devices are connected with each other and accessible through one central point – a smartphone, tablet, laptop or game console. Door locks, televisions, thermostats, home monitors, cameras, lights and even appliances such as the refrigerator can be controlled through one home automation system. The system is installed on a mobile or other networked device, and the user can create time schedules for certain changes to take effect.

Advantage: -

- Managing all of your home devices from one place
- Flexibility for new devices and appliances
- Maximizing home security
- Remote control of home functions
- Increased energy efficiency
- Improved appliance functionality
- Home management insights

4.2 Prototype



Using the above prototype model, we have made this Voice Controlled Home Automation System. It uses 2 GPIO pins of ESP 32 controller. The complete system is controlled using smartphone application.

CHAPTER – 5 CONCLUSION

5.1 Conclusion

For the project creation we have to find difficulties which occur in human life. According to domain **(VOICE CONTROLLED SMART HOME AUTOMATION)** we found the problem that so many people have problem in doing multitasking in an efficient manner, our main aim of the project is to provide the useful services to the needed person by providing the features like remote control, on demand service, smart appliances, security. We can conclude our report with the list of activities performed in our objects. The information collected by us lead to the following conclusion: we need a wireless or internet connection for the connectivity. The feature and function of our project lead us to accomplish our project successfully reducing the burdens of the people.

5.2 Future Scope

- ✓ More Security Concerns
- ✓ Higher Cross-Compatibility Standards
- ✓ Increased Voice Control Integration
- ✓ Increased Efficiency, Control and Customization

CHAPTER – 6 REFERENCE

a. https://en.wikipedia.org › wiki › Home_automation

b. https://www.researchgate.net › publication › 331133954_Internet_of_Things...

c. https://www.intechopen.com › online-first › smart-home-systems-based-on...

d. https://smarthomesolver.com › reviews › smart-home-for-beginners-refere...

e. https://developer.amazon.com › docs › understand-the-smart-home-skill-api

f. https://www.samsung.com › Home › Smart Home https://dzone.com › articles › home-automation-using-iot