

**GUJARAT TECHNOLOGICAL UNIVERSITY****Sarvajnik College of Engineering & Technology**

(Faculty of Computer Engineering, Computer Department)

A
Project Report
On

GEST-O-HOME

Under the course of
DESIGN ENGINEERING – 2A (2150001)
B. E. III, Semester – V

(Computer Engineering)

Submitted by:

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Academic Year:-2019-20

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CERTIFICATE

This is to certify that Design Engineering work embodied in this report entitled “**Gest-O-Home**” has been carried out by **Kartik Gondaliya** (170420107015), **Sahil Shingala** (170420107051), **Nevil Ghelani** (170420107014), **Anvi Kaklotar** (170420107020) of **B.E 3rd Year** (Computer Engineering) **Semester V** have successfully completed the course work and related tasks for the course of **Design Engineering-(2A) (2150001)** during the academic term ending in the month of September 2019.

Date:

Place: SCET, Surat

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We have put best efforts in our project. However, it would not have been possible without the support of our parents. We are highly indebted to our guide Prof. Fagun Vankawala for their able guidance and constant monitoring; supervision as well as for providing pivotal information regarding the project and also their humble co-operation for completing our project. This project won't be possible without her encouragement. Our gratitude and appreciation goes to our friends in manifesting the project and other teaching and non-teaching staff (All Stakeholders of Computer Department) who have willingly helped us with their abilities.

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Chp.1- Introduction

1.1 About the Topic

Engineering design is the creative process of identifying needs and then devising a solution to fill those needs. This solution may be a product, a technique, a structure, a project, a method, or many other things depending on the problem. The general procedure for completing a good engineering design can be called the Engineering Method of Creative Problem Solving.

Problem solving is the process of determining the best possible action to take in a given situation. In order to address lower grade levels, an alternate list has been developed and is included in the Teacher Notes section of this module.

1. Identifying the problem.
2. Gathering needed information.
3. Searching for creative solutions.
4. Overcoming obstacles to creative thinking.
5. Moving from ideas to preliminary designs (including modelling).
6. Evaluating and selecting a preferred solution.
7. Preparing reports, plans, and specifications. (Project Planning)
8. Implementing the design. (Project Implementation)

Here, in this project by means of design thinking, we have developed a gesture detection system for Home Automation named Gest-O-Home.

Controlling the home appliances and electronic gadgets through an infrared remote control is now in general. But the same controlling tasks can be done more easily. The primary motive of proposing the new system of hand gesture remote control is to remove the need to look into the handheld remote and to search for a specific key for specific function. An accelerometer, gyroscope and magnetometer are used to recognize the hand gestures in 3 perpendicular directions and transmitted through wireless protocol using radio frequency. The data is received by the hub section which controls the home appliances according to the decisions made. This project proposes a simple and easy way of controlling the home appliances.

In all around the world gestures consist as a universal language that preferable everywhere.

Gestures recognition is the process of identifying human gestures. The Gesture recognition automation system is suitably used for home automation in a cost-effective manner. In this system data from the xyz –axis of the accelerometer and gyroscope module is given to the transmitter. From there the encoded data is send to the receiver hub. The received data is decoded and given

to the microcontroller. Decision making is done by the microcontroller using the received data. According to the decisions the device such as fan, light and music system will function.

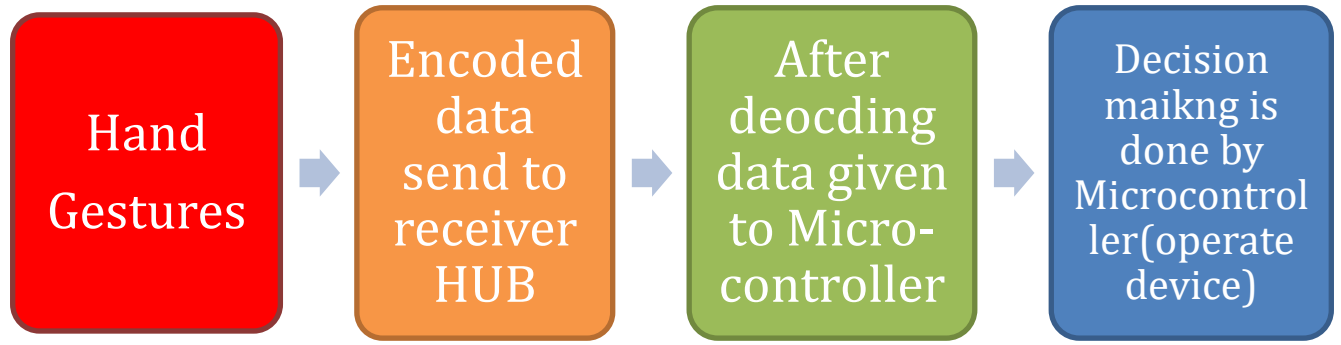


Fig 1.1 Basic Flow diagram of our system

1.2 Prior Art Search

Part 1: Patent Search Technique Used				
	Patent 1	Patent 2	Patent 3	Patent 4
Patent Search Database used	https://patentscope.wipo.int	https://worldwide.espacenet.com	https://scholar.google.com	https://worldwide.espacenet.com
Keywords used for Search	Gesture AND Home	Hand Gestures	"SIXTH SENSE TECHNOLOGY"	Gyroscope
Search String used	Gesturer Recognition for Home	Hand Gestures	"SIXTH SENSE TECHNOLOGY"	Gyroscope
Number of Results/Hits Getting	3	25	254	10000

Part 2: Basic Data of Patented Invention/Bibliographic Data				
	Patent 1	Patent 2	Patent 3	Patent 4
Title of Invention	INTELLIGENT HOME APPLIANCE CONTROL SYSTEM BASED ON HUMAN GESTURES	METHOD AND DEVICE FOR USE IN HAND GESTURE RECOGNITION	SIXTH SENSE TECHNOLOGY	THREE-DIMENSIONAL KINETIC GENERATOR
Patent No.	CN108983622 (A)	US2019188460(A1)	13485405	US2019319553 (A1)
Date of Application	06/07/2018	20/06/2019	29/04/2013	17/10/2019
Name of Inventor/s	WANG PEIQING	ZHANG ZHIWEI,TANG CHEN,ZHU MINGMING,YE PING ,WANG JIN	S.PRADEEP KUMAR, O. PANDITHURAI	MARC OEDONEZ

Part 3: Technical Part of Patented Invention				
	Patent 1	Patent 2	Patent 3	Patent 4
Limitation of Prior Technology/Art	It was used pyroelectric infrared sensor on body.	This idea is based on image processing so it's require camera.	This idea is based on image processing so it's require wearable camera.	Not helpful to find speed of motion
Brief about Invention	A pyroelectric infrared sensor is disposed in the module, and the pyroelectric infrared sensor detects the real-time detection in the sensing area, and converts the detected sensing signal into corresponding information, and the microcontroller is based on red pyroelectric infrared. The signal detected by the sensor determines whether the human body enters or leaves.	The method includes: acquiring a depth map of a hand in a current image; estimating first positions of joints of the hand according to the depth map; creating a 3D point cloud of the hand according to the depth map of the hand; matching the first position of the joints of the hand and a stored 3D hand model to find gesture.	Sixth Sense technology bridges the gap between the physical world and the digital world, bringing intangible, digital information out into the tangible world, and allowing us to interact with this information via natural hand gestures.	One or more rings with a plurality of gears attached thereto can: be connected such that the gyroscope drives the gears. Two magnets are further connected to the gyroscope such a core wrapped in coils is within the magnetic field between the two magnets, wherein movement of the spheres in relation to the magnets induces an electric current in the coils and an electrical lead provides an output for electric current in the coils.
How much this invention is related with your Project?	Idea is related to our projects for find person in which room.	The invention is useful for finding degree and axis for different gestures.	This patent is related to our project in many ways.	Using this patent we know how to work with Gyroscope to get data.
Key Learning Points	According to the system and method, how Gyro and accelerometer is used is useful.	Acquiring a depth map of a hand.	Sixth Sense technology is implemented in 'Sixth Sense /WUW using gesture recognition, augmented reality, computer vision and radio frequency identification	Learn how to interact with Axis in 3D using Gyroscope.

Part 1: Patent Search Technique Used				
	Patent 5	Patent 6	Patent 7	Patent 8
Patent Search Database used	https://patentscope.wipo.int	https://worldwide.espacenet.com	https://patentscope.wipo.int	https://patentscope.wipo.int
Keywords used for Search	Accelerometer AND Gesture	Hand Gestures	Watch AND Gesture	Microcontroller AND Home
Search String used	Accelerometer AND Gesture	Hand Gestures	Watch AND Gesture	Microcontroller AND Home
Number of Results/ Hits Getting	6	126	11	1

Part 2: Basic Data of Patented Invention/Bibliographic Data				
	Patent 5	Patent 6	Patent 7	Patent 8
Title of Invention	METHOD AND SYSTEM FOR DETECTING LINEAR SWIPE GESTURE USING ACCELEROMETER	HIGH RESOLUTION TRACKING AND RESPONSE TO HAND GESTURES THROUGH THREE DIMENSIONS	SMART WATCH GESTURE INPUT METHOD AND SMART WATCH	MICROCONTROLLER OF SMART HOME CONTROL PLATFORM
Patent No.	CN107430417 (A)	US10261595 (B1)	WO2017005023	CN108427355 (A)
Date of Application	07/01/2016	16/04/2019	12/01/2017	03/05/2018
Name of Inventor/s	MIDHOLT MAGNUS, THORN OLA	KIN KENRICK CHENG-KUO	HUANG, YANFENG	YUE JINGFENG

Part 3: Technical Part of Patented Invention				
	Patent 5	Patent 6	Patent 7	Patent 8
Limitation of Prior	It was only for linear gestures.	Getting plenty of data some are related to our	This idea is only use for operate watch instead of voice.	It is not gestured based controlled.

Technol ogy/Art		project but not much.		
Brief about Invention	A device and method detect user input for an electronic device based on linear acceleration and/or linear acceleration rate of the electronic device through this detected gesture for controlling the electronic device.	A system includes an electronic display configured to display one or more simulated objects in accordance with display instructions, an imaging sensor configured to capture images of a user's hands, and a console. The console is configured to receive the captured images from the imaging sensor, extract joint information of the user's hands from the captured images, and determine one or more poses based on the extracted joint information.	Collecting user's gesture data and gesture duration. Identifying a gesture of the user according to a correspondence relationship of the text information corresponding to each gesture data stored in advance, and converting the corresponding text into a corresponding text. Output the text corresponding to the gesture.	The technical device of the present invention is a microcontroller for a smart home control platform, comprising a main chip, an Ethernet transceiver module, and a crystal oscillator module, wherein the data transmission port of the main chip is connected to an Ethernet transceiver module, and the main chip is The power input end is connected to the output end of the power conversion module, the input end of the power conversion module is connected to the power source, the clock pulse input end of the main chip is connected to the output end of the crystal oscillator module, and the write end of the main chip is connected with the JTAG interface.
How much this invention is related with your Project?	The base of our project is totally related to this invention.	Types of hand gestures position is useful from this invention.	Almost about 50% of our project is related to this patented invention	We will use this type of mechanism after fetching proper operation from gestures.
Key Learning Points	How to detects sliding gestures using accelerometer.	Generate a simulated directional pad adjacent to the	Recognize gesture and using past record	Connection of different device with microcontroller in home.

		user's thumb in a simulated environment.	finding proper output.	
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Table 2.1 & 2.2 Prior art search

Summary of Papers

Patent 1: A pyroelectric infrared sensor is disposed in the module, and the pyroelectric infrared sensor detects the real-time detection in the sensing area, and converts the detected sensing signal into corresponding information, and the microcontroller is based on red pyroelectric infrared The signal detected by the sensor determines whether the human body enters or leaves.

Patent 2: The method includes: acquiring a depth map of a hand in a current image; estimating first positions of joints of the hand according to the depth map; creating a 3D point cloud of the hand according to the depth map of the hand; matching the first position of the joints of the hand and a stored 3D hand model to find gesture.

Patent 3: Sixth Sense technology bridges the gap between the physical world and the digital world, bringing intangible, digital information out into the tangible world, and allowing us to interact with this information via natural hand gestures.

Patent 4: One or more rings with a plurality of gears attached thereto can: be connected such that the gyroscope drives the gears. Two magnets are further connected to the gyroscope such a core wrapped in coils is within the magnetic field between the two magnets, wherein movement of the spheres in relation to the magnets induces an electric current in the coils and an electrical lead provides an output for electric current in the coils.

Patent 5: A device and method detect user input for an electronic device based on linear acceleration and/or linear acceleration rate of the electronic device through this detected gesture for controlling the electronic device.

Patent 6: A system includes an electronic display configured to display one or more simulated objects in accordance with display instructions, an imaging sensor configured to capture images of a user's hands, and a console. The console is configured to receive the captured images from the imaging sensor, extract joint information of the user's hands from he captured images, and determine one or more poses based on the extracted joint information.

Patent 7: Collecting user's gesture data and gesture duration. Identifying a gesture of the user according to a correspondence relationship of the text information corresponding to each gesture data stored in advance, and converting the corresponding text into a corresponding text. Output the text corresponding to the gesture

Patent 8: The technical device of the present invention is a microcontroller for a smart home control platform, comprising a main chip, an Ethernet transceiver module, and a crystal oscillator

module, wherein the data transmission port of the main chip is connected to an Ethernet transceiver module, and the main chip is The power input end is connected to the output end of the power conversion module, the input end of the power conversion module is connected to the power source, the clock pulse input send of the main chip is connected to the output end of the crystal oscillator module, and the write end of the main chip is connected with the JTAG interface.

Chp.2- Observations

2.1 A-E-I-O-U Frame Work

The A E I O U framework is very useful, and the most basic sheet required for design engineering.

A-Activity

E- Environment

I-Interaction

O-Object

U- User

It involves observation of the domain selected area with a group of four, each taking their individual observations at same time. The task was performed by each member and we had to go to our selected area for many times.

In these activities we all group member had to use our observation skills to perform the ask of completing the AEIOU sheet. The frame work of our group is as follows:

AEIOU Summary:		Group ID:	Date:	Version:
		Domain Name:		
Environment: Serene atmosphere Little dusty Lightful Clean floor Joyful Crazy Ventilation Day	Interaction: Neighbour – Owner – Helping Hand Vendor – Owner – Services Electrician – Owner – Electrical Services Watchman – Owner/Guest – Security Plumber – Owner – Water Services Delivery Boy – Owner – Give Products Milkman – Owner – Selling milk	Objects: Light – Giving Light Sofa – Resting Door – Protection Chair – Resting Kitchen Stuff – Preparing Food Window – Ventilation Fan/AC – Cooling Room		
Activities: Study Washing clothes Watching TV Taking lunch Family gathering Cloth wearing Sleeping Entering into home Cooking Playing indoor games Bathing Opening Refrigerator		Users: Owner – Earning Money Servant – House hold work Mother – Cooking/Managing other activities Pet animal – Hobby Child – Study/playing Elder Member – Retirement Enjoy Tenants – Financial purpose Guest – Relationship Watchman – Protect home		

Fig:2.1 AEIOU Canvas

Chp.3 – Canvases/Framework

3.1 Mind Map

A **mind map** is a diagram used to visually organize information. A mind map is hierarchical and shows relationships among pieces of the whole. It is often created around a single concept, drawn as an image in the centre of a blank page, to which associated representations of ideas such as images, words and parts of words are added. Major ideas are connected directly to the central concept, and other ideas branch out from those major ideas.

Mind mapping is a creative and logical means of note-taking and note-making that literally maps out your ideas. All mind maps have some things in common. They have a natural organizational structure that radiates from centre use line, symbols, words, colour and images according to simple, brain friendly concepts. Mind mapping converts long list of information into a colourful, memorable and highly organized diagram that works in line with your brain's natural way of doing things.



Fig:3.1 Mind map

3.2 Empathy Map

This canvas is about one particular user and the experience of that user about our domain that is shopping mall. It also includes activities, stakeholders and describes the sad and happy stories related to the user about the real you.

USER OWNER	STAKEHOLDERS NEIGHBOUR MILKMAN BANK DELIVERY BOY WATCHMAN VENDORS
ACTIVITIES STUDY WASHING CLOTHES SLEEPING WATCHING TV OPENING REFRIGERATOR TAKING LUNCH CLOTH WEARING BATHING FAMILY GATHERING ENTERING INTO HOME PLAYING INDOOR GAMES COOKING	
STORY BOARDING HAPPY OWNER OF THE HOUSE IS HAPPY AND JOYOUS BECAUSE HE IS TRANSFERING FROM HIS OLD HOUSE WHICH WAS SMALL COMPARED TO HIS NEW HOME. HIS FAMILY IS EXCITED TO LIVE IN NEW HOME AS IT IS BIG AND HAVE GOOD SURROUNDING COMPARED TO THEIR OLD HOME.	
HAPPY OWNER ALSO FEELS SELF-SATISFIED AND HAPPY BECAUSE GOVERNMENT HELP HIM BUY HIS NEW HOUSE BY GIVING HIM HOME-LOAN. HE IS ALSO GREATFUL TO GOVERNMENT BECAUSE HE GOT LOAN OF SUCH LESS INTREST ON BASE OF SUBSIDY THOUGH HE WISHES HE HAD ENOUGH MONEY TO BUY HIS HOUSE ON HIS OWN.	
SAD OWNER IS WORRIED ABOUT THE HEALTH OF HIS PARENTS. AS HIS PARENT ARE OLD THEY ARE NOT FAMILIER WITH USING TECHNOLOGY LIKE PHONE. HE IS WORRIED THAT WHEN FAMILY WAS FAR FROM HOUSE AND IN CASE OF ANY MEDICAL EMERGENCIES, HIS PARENTS WOULD BE HELPLESS. HE WISHES HE CAN DO SOMETHING ABOUT THAT ISSUE.	
SAD OWNER ALSO FEELS SAD THAT HIS WIFE HAS TO WORK A LOT HARDER IN ORDER TO CLEAR NEW HOME. AS THE NEW HOME IS BIG IT TAKES A LOT OF TIME, PEOPLE AND ENERGY TO CLEAN THE HOUSE. ALSO IN CASE OF ANY FESTIVAL, DECORATING WHOLE HOUSE IS A BIT DIFFICULT. HE WISHES HE CAN HELP CLEANING AND DECORATING HOUSE.	

Fig:3.2 Empathy Canvas

3.3 Ideation Canvas

Ideation is the process of creating new ideas. Ideation is often the most exciting stage in a Design Thinking project, because during Ideation, the aim is to generate a large quantity of ideas that the team can then filter and cut down into the best, most practical or most innovative ones in order to inspire new and better design solutions and products.

Ideation is the mode of the design process in which you concentrate on idea generation. Mentally it represents a process of 'going wide' in terms of concepts and outcomes. Ideation provides both the fuel and also the source material for building prototypes and getting innovative solutions into the hands of your users.

In this canvas we have mentioned about different users, activities, situation with context to the location and the possible props related to it.

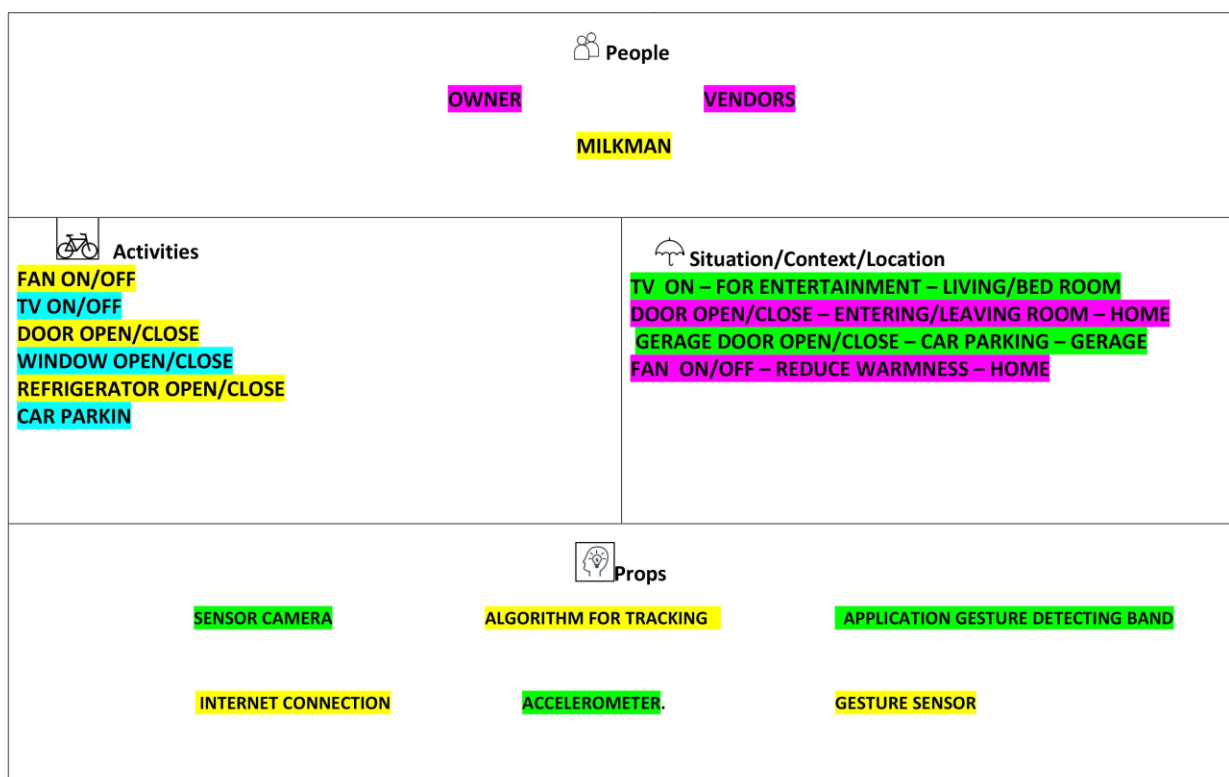


Fig:3.3 Ideation Canvas

3.4 LNM Canvas

Learning Needs Matrix will help students to identify the learning requirements at an early stage along with prioritization of specific learning along with defined time duration/ time allocation for each learning priority.

Identification will be focused on listing out both

- (I) the learning, which is included in some subject of the formal syllabus of your branch and
- (ii) the learning, which is required for solving the Design problem and which may not be included in the formal syllabi of the other subjects.

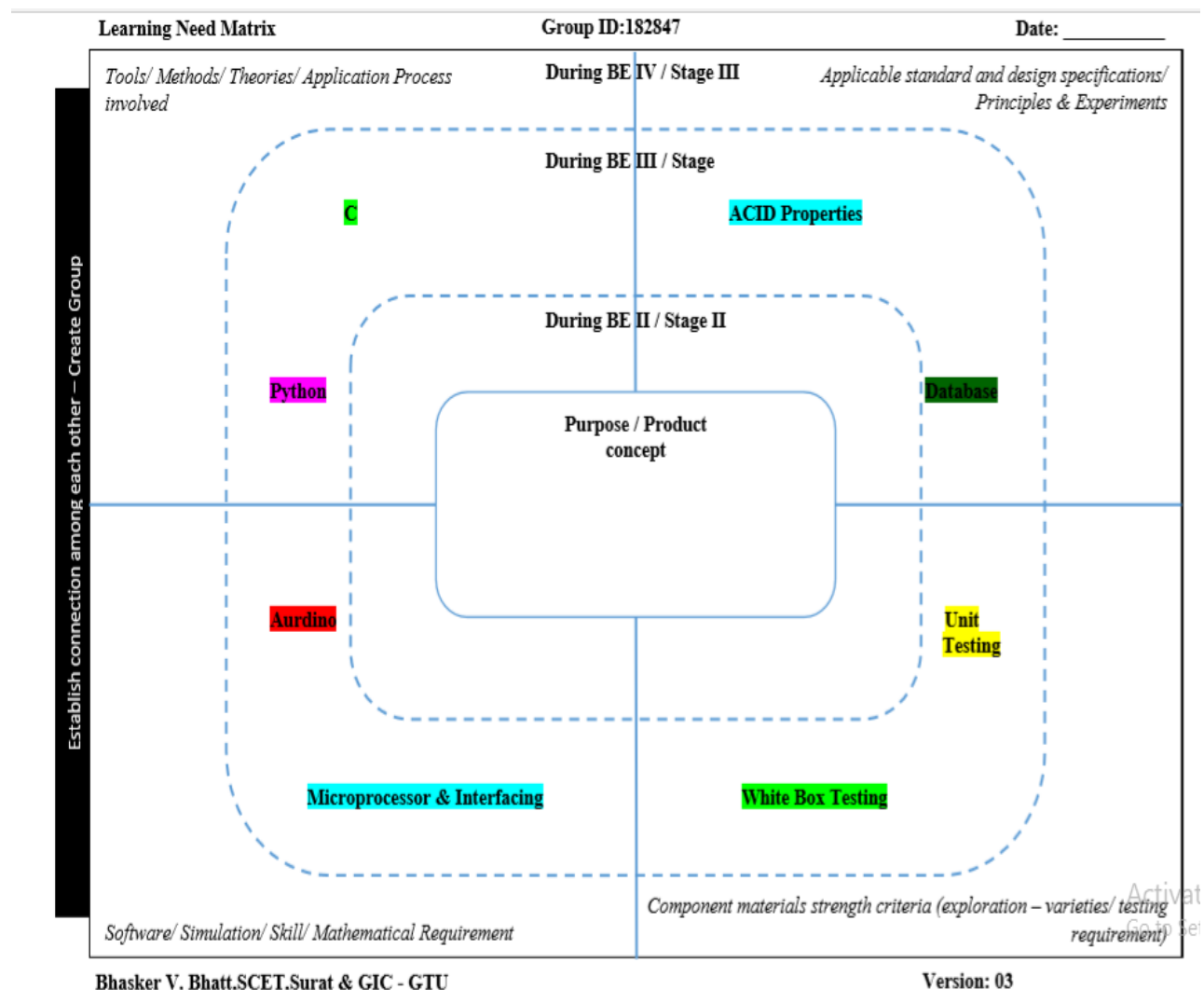


Fig: 3.4 LNM Canvas

3.5 Product Development Canvas

Product development typically refers to all of the stages involved in bringing a product from concept or idea, through market release and beyond. In other words, product development incorporates a product's entire journey.

Now arrive the important part of design process. We have to design a product based on a key solution. A key solution accordingly to our understanding was a solution which solves a key problem. Out of many possible solutions for multiple problems that were listed down in the Ideation phase, we recognized some problems that if solved would be very useful to everyone.

In this canvas, we mentioned purpose of our domain, product function and features, product experience, components.

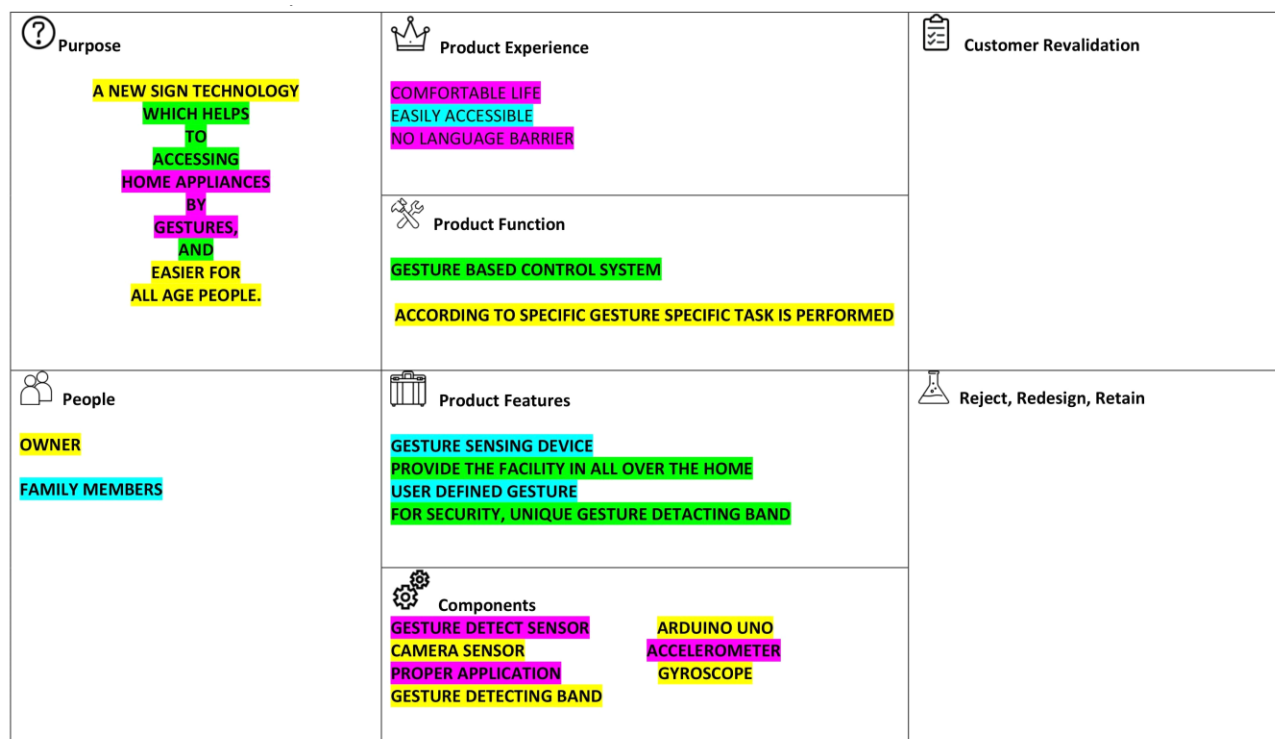


Fig:3.5 PDC Canvas

3.6 Feedback Analysis

Feedback is the process of allowing customers to give transparent details about their experiences with a product or service. Feedback is very important as It points out aspects of your product that need improvement. We know that our product's every feature and application has been thought through and discussed by our team members thousands of times. Unfortunately, that is why we might not see its imperfections. So, feedback is very useful for the improvement of the product.



After completing the whole activity, we also tried to take reviews and feedback of different people by explaining them our final product. After getting to know about our product all of them gave different ideas and suggestions to make our project a better one. This helped to make our work a successful one. Some reviews of our project are:

- 1) It operates by any age person effectively.
- 2) Increase comfort full of life.
- 3) Easily accessible.
- 4) It is easy to set comfortable gestures for user, to what they won't for operates any electronic devices.
- 5) Accessible from any place of house (The device which is operate it should be in this place) is big advantage of this system

Chp.4 – Predesign Calculations

Ergonomics	
Physical: no Cognitive: no Organizational: no	
AESTHETICS	
Colour: Black/White/Ross Gold Size: 1.5 inches x 1.5 inches x 0.5 inches Style: No Appearance: Like wrist Watch Form/Shape: Round /Square	
Design for Cost	
Design for (Manufacturing cost -Labour, material and overhead cost):	
Arduino Uno x3	1200/-
10k ohm Preset x2,IR sensor	550/-
Wire	
7805 & 7812 volt	200/-
12v Relay	200/-
433MHz RF Transmitter Receiver Wireless Module	150/-
Gesture sensor (PAJ 7620)	700/-
TOTAL	3000/-
Delivery cost: No Cost of operation and maintenance: 750/-	
Design for Environment:	
A powerful Micro Controller is needed to make the system runs faster.	

Chp.5 – Prototype Model

This project consists of two parts:

- 1) Wearable gesture recognizing device
- 2) Home automation

- 1) The Actual Working of Wearable gesture recognizing device

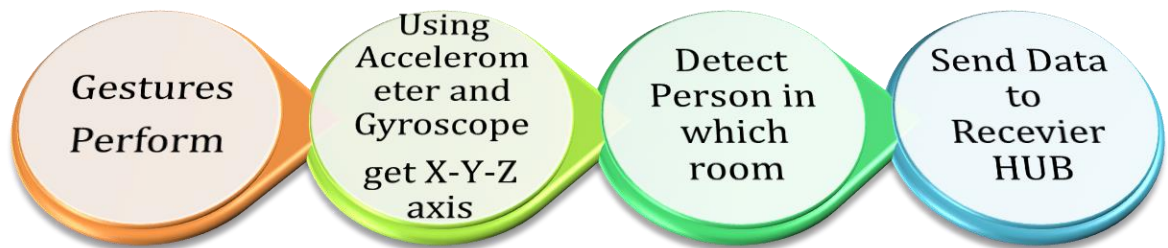


Fig:5.1

2) The Flow of Automation

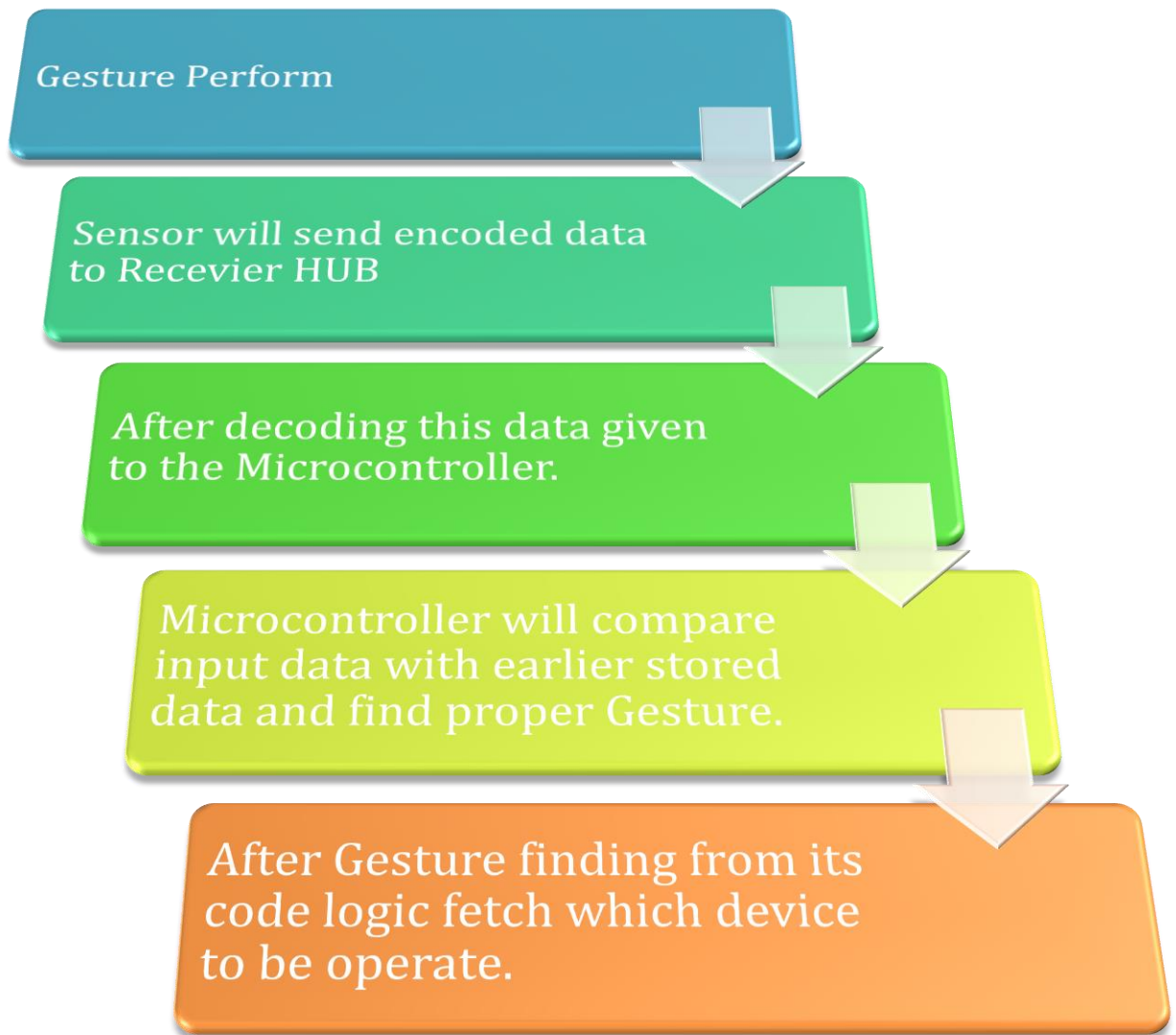


Fig:5.2

- We define some register data of gesture, refer to the following table.

Gesture	Register Data	Register Address	If Yes	If Not
Up	data==GES_UP_FLAG	0x43	Gesture detected	No gesture detected
Down	data==GES_DOWN_FLAG	0x43	Gesture detected	No gesture detected
Left	data==GES_LEFT_FLAG	0x43	Gesture detected	No gesture detected
Right	data==GES_RIGHT_FLAG	0x43	Gesture detected	No gesture detected
Forward	data==GES_FORWARD_FLAG	0x43	Gesture detected	No gesture detected
Backward	data==GES_BACKWARD_FLAG	0x43	Gesture detected	No gesture detected
Clockwise	data==GES_CLOCKWISE_FLAG	0x43	Gesture detected	No gesture detected
Count Clockwise	data==GES_COUNT_CLOCKWISE_FLAG	0x43	Gesture detected	No gesture detected
Wave	data==GES_WAVE_FLAG	0x44	Gesture detected	No gesture detected

Table: 5.1

Code:

```
#include <Wire.h>
#include "paj7620.h"

#define GES_REACTION_TIME      800
#define GES_QUIT_TIME          1000

void setup()
{
    uint8_t error = 0;

    Serial.begin(9600);
    Serial.println("\nPAJ7620U2 TEST DEMO: Recognize 15 gestures.");

    error = paj7620Init();           // initialize Paj7620 registers
```

```
    if (error)
    {
        Serial.print("INIT ERROR, CODE:");
        Serial.println(error);
    }
    else
    {
        Serial.println("INIT OK");
    }
    Serial.println("Please input your gestures:");
}

void loop()
{
    uint8_t data = 0, data1 = 0, error;

    error = paj7620ReadReg(0x43, 1, &data);
    if (!error)
    {
        switch (data)
        {
            case GES_RIGHT_FLAG:
                delay(GES_REACTION_TIME);
                paj7620ReadReg(0x43, 1, &data);
                if(data == GES_LEFT_FLAG)
                {
                    Serial.println("Right-Left");
                }
                else if(data == GES_FORWARD_FLAG)
                {
                    Serial.println("Forward");
                    delay(GES_QUIT_TIME);
                }
                else if(data == GES_BACKWARD_FLAG)
                {
                    Serial.println("Backward");
                    delay(GES_QUIT_TIME);
                }
                else
                {
                    Serial.println("Right");
                }
                break;
            case GES_LEFT_FLAG:
                delay(GES_REACTION_TIME);
                paj7620ReadReg(0x43, 1, &data);
```



```
        if(data == GES_RIGHT_FLAG)
        {
            Serial.println("Left-Right");
        }
        else if(data == GES_FORWARD_FLAG)
        {
            Serial.println("Forward");
            delay(GES_QUIT_TIME);
        }
        else if(data == GES_BACKWARD_FLAG)
        {
            Serial.println("Backward");
            delay(GES_QUIT_TIME);
        }
        else
        {
            Serial.println("Left");
        }
        break;
        break;
    case GES_UP_FLAG:
        delay(GES_REACTION_TIME);
        paj7620ReadReg(0x43, 1, &data);
        if(data == GES_DOWN_FLAG)
        {
            Serial.println("Up-Down");
        }
        else if(data == GES_FORWARD_FLAG)
        {
            Serial.println("Forward");
            delay(GES_QUIT_TIME);
        }
        else if(data == GES_BACKWARD_FLAG)
        {
            Serial.println("Backward");
            delay(GES_QUIT_TIME);
        }
        else
        {
            Serial.println("Up");
        }
        break;
    case GES_DOWN_FLAG:
        delay(GES_REACTION_TIME);
        paj7620ReadReg(0x43, 1, &data);
        if(data == GES_UP_FLAG)
```

```
        {
            Serial.println("Down-Up");
        }
        else if(data == GES_FORWARD_FLAG)
        {
            Serial.println("Forward");
            delay(GES_QUIT_TIME);
        }
        else if(data == GES_BACKWARD_FLAG)
        {
            Serial.println("Backward");
            delay(GES_QUIT_TIME);
        }
        else
        {
            Serial.println("Down");
        }
        break;
    case GES_FORWARD_FLAG:
        delay(GES_REACTION_TIME);
        paj7620ReadReg(0x43, 1, &data);
        if(data == GES_BACKWARD_FLAG)
        {
            Serial.println("Forward-Backward");
            delay(GES_QUIT_TIME);
        }
        else
        {
            Serial.println("Forward");
            delay(GES_QUIT_TIME);
        }
        break;
    case GES_BACKWARD_FLAG:
        delay(GES_REACTION_TIME);
        paj7620ReadReg(0x43, 1, &data);
        if(data == GES_FORWARD_FLAG)
        {
            Serial.println("Backward-Forward");
            delay(GES_QUIT_TIME);
        }
        else
        {
            Serial.println("Backward");
            delay(GES_QUIT_TIME);
        }
        break;
```

```
        case GES_CLOCKWISE_FLAG:
            Serial.println("Clockwise");
            break;
        case GES_COUNT_CLOCKWISE_FLAG:
            Serial.println("anti-clockwise");
            break;
        default:
            paj7620ReadReg(0x44, 1, &data1);
            if (data1 == GES_WAVE_FLAG)
            {
                Serial.println("wave");
            }
            break;
    }
}
delay(100);
}
```

Chp.6 – Conclusion

On analysing various problems faced mainly by residential people is for on\off switch one has to go near to switch board, but by using gesture based smart home. So by proper hand movement one can easily do any operation and this will give full comfortness of any electronic device. This will give easier life to the user.

Future Scope:

Our idea will be helpful for increase the comfortness of normal lifestyle. It also applies the advance technology in real life. That project will solve many problems of different group age people. That kind of technology may be useful in any other fields like health sector, government sector, transportation sector and many more. This gesture control may be replaced with mind vibes. We can think in that field which can allow us to use that kind of facilities by only thinking of that action. That all are assumption but science also research on that field also, so we can be able to develop that kind of equipment that done this idea in possible

Chp.7 – Continuous Evaluation Sheet**GUJARAT TECHNOLOGICAL UNIVERSITY***Centre for Industrial Design (Open Design School)***DESIGN ENGINEERING****CONTINUOUS ASSESSMENT CARD**

COLLEGE NAME: SARVAJANIK COLLEGE OF ENGINEERING AND TECHNOLOGY	
COLLEGE CODE: 042	
SUBJECT NAME: DESIGN ENGINEERING	
SUBJECT CODE: 215001	SEMESTER: 5 th
BRANCH: COMPUTER	ACADEMIC YEAR: 2019-20

TEAM NAME: GREST-O-HOME		TEAM ID: 182847
PROJECT TITLE/DOMAIN: GREST-O-HOME		
SR. NO.	TEAM MEMBER'S NAME	ENROLLMENT NO.
1	CHANDALIYA KARTIK K.	170420107015
2	SHINGALA SAHIL A.	170420107051
3	CHELANI NEVIL	170420107014
4	KAKLOTAR ANVI R.	170420107020
INTERNAL GUIDE NAME: PROF. FAGUN VANKAWALA		
INTERNAL GUIDE SIGN: <i>[Signature]</i>		

Head of Department

College Seal

MONTHLY ASSESSMENT - I (Observation, Empathy and Define Phase)

(DATE : __/__/__)

1. Why students/team have taken above mentioned domain? (Please specify the reason)

(Note: For more content or information, one may attach additional pages to this card.)

⇒ Gesture is a global language for world. So, Instead of voice, we used gesture for Automation and that will be useful for all kind of people of world

2. How frequently student team has gone for observation on field, mention with date, place, time etc.? Which are the key observations that they have noticed?

⇒ Our project is based on Home. So, we put the observation which will noticed in daily basis. And key observation that we used static Control for our Appliances

3. A. How many interactions/interviews team members have done?

⇒ Our group member frequently Interact with their residential Area and Houses for this Application

- B. Who are the user and various stakeholders on domain? Describe their persona (Name, age, occupation/education, roles and responsibility etc.)

⇒ The member of house are the stake holder of this domain like Child, young or older any age or any occupation will be allowed one requirement that they have to wear our device

- C. List out the questions asked by team while having observation and interview?

① How many electrical device you used in Home.
 ② If we provide this kind of Automation that will helpful for you or not?
 ③ Is it better than voice Automation?

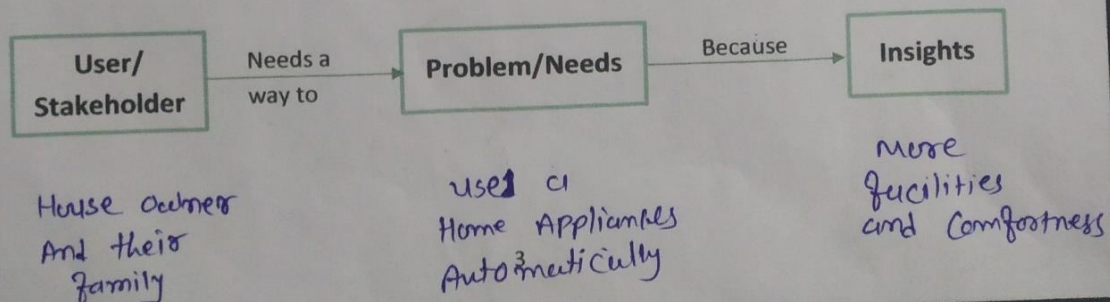
4. What is something special/random/unusual (i.e. activity, environment, interaction, object or user) team have observed at the domain? Please elaborate the conditions with photographs if available.

=> we observed that right now, most of people working on only gesture system or Home Automation. so, we combine that both domain and work combinly on it.
 => But our system has wearable device so, Access of that system, main condition is to wear that device only and create shapes which define by Admin

5. Enlist any five major problems observed by your team in the respective domain. Mention any one for which you have empathize user the most and which might become your problem statement. Give reasons of selection of particular problem/issue based on empathy.

① Voice Automation is now a day not that much globally Accepted. ② Automation is also not that much familiar. so, we choice gesture As a replacement of voice. so that gesture can easily recognized by people and in voice we have problem of Accent and all that but in gesture that limitation will overcome. And that will help to speed the Automation in global manner.

6. Define your "PROBLEM DEFINITION" for the project as per below format. Which might be refine till end of Ideation phase if you wish.



SUGESTIONS BY INTERNAL GUIDE:

AEIOU CANVAS SUGGESTIONS: -

EMPATHY CANVAS SUGGESTIONS: -

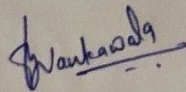
MIND MAPPING SUGGESTIONS: -

GENERAL SUGESTIONS: -

Overall Mark (Out of 05): 05

GUIDE SIGNATURE:

Date: 2/12/2011



MONTHLY ASSESSMENT – II (Ideation and Product Development Phase)

(DATE : __/__/__)

1. Explain briefly Ideation thought process and efforts of your team to reach ideas for listed problems.

Ideation is the process of creating new ideas. In this we identify people related to our domain & their activities, situations with context to the location and the possible props related to it.

2. Enlist any five effective ideas to address the probable listed problems with reason.

- ① Gesture based - because it's universal language.
- ② Home automation - over access of mobile.
- ③ Voice control - speech recognition problem
- ④ App web control - always necessary to use internet

3. Explain the most effective possible solution proposed for the problem.

The most effective possible solution is Gesture based home automation, because first gestures is a universal language and also it is familiar to all age people and also efficient.

4. Explain the features, functions and working principles/technology/pattern of your proposed solution.

Gesture recognition system with Micro Controller.
 Features:- access from all over home, unique gesture available, user defined.
 Functions:- According to specific gesture specific task is performed.

5. Enlist major advantages and disadvantages (atleast three) of the proposed solution.

advantages:

- ① Better uses than voice
- ② User friendly
- ③ Provide Comfortness
- ④ No limitation of Accent
- ⑤ Language Independent

disadvantages

- ① Must to wear device
- ② some time difficult to detect Right crestrae

6. Briefly mention refinement on PDC based on User/Stakeholder's feedback on your concept.

SUGGESTIONS BY GUIDE:

IDEATION CANVAS SUGGESTIONS: -
PRODUCT DEVELOPMENT CANVAS SUGGESTIONS: -
LEARNING NEEDS MATRIX SUGGESTIONS (in case of 4 th sem and onwards): -
GENERAL SUGGESTIONS: -
Overall Mark, considering assessment I (Out of 05): 05

GUIDE SIGNATURE:

Date: 21/2/2019

[Signature]

MONTHLY ASSESSMENT -III (Detail Design, Prototype and Test phase)

(This assessment shall be done by another guide of department or interdepartmentally along with guide)

(DATE : __/__/__)

1. Which theoretical subjects/concepts are involved with your project? How it is useful to your project?

Microprocessor Interfacing. It involved.
In our project, ~~to~~ Because our project
is based on micro-controller

2. Which software/design tool/Skills you have learned/applied during the project? Explain the features of it.

⇒ we work on micro-controller so, we
learned different micro-controller like
~~8086~~, 8086, Arduino, Raspberry pi, MCU 6050.
Also learn the C# language for the
programming in micro-controller and basic
of python for Raspberry pi. Also
learn connection of device And ML for
gesture Recognize system.

3. Explain the prototype/model prepared by the student/team.

⇒ our team prepare one model prototype for
the Application. which used PIR 7620 sensor
which can detect the motion of the any
object and then we prepare the code
for the controller and apply it
in give prototype. It run on the arduino

4. What are the materials, technology, things have utilized to make the prototype/model?

For making prototype we used Gyroscope & accelerometer based system. we use PAJ7620 sensor to implement our prototype.

5. How many Iterations have you done to reach final solution? Explain modification/revise parameters/characteristics for each iteration.

First we use separate gyroscope & accelerometer based system but not give accurate output then we use combinly both and get proper solutions.

6. What is the scope of the project? How you are planning to implement it in future?

Future scope is vast for our project we used as our startup in Indian industry for selling our product in resident sector of India.

SUGESTIONS BY EVALUATOR:

PROTOTYPE/MODEL SUGGESTIONS:

GENERAL SUGESTIONS:

Overall Mark, considering assessment I & II (Out of 10):

Department/Interdepartmental Evaluator name and sign:

Guide sign:

Date:

Handwritten signature

Chp.8 – References

<https://medium.com/@smarthomeguru/introduction-to-home-automation-6bdd0a4783c>

<https://www.epo.org/learning-events/materials/inventors-handbook/novelty/prior-art.html>

["https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&q=gyroscope%2Band%2Baccelerometer%2Bfor%2Bgesture&oq=%23d%3Dgs_qabs&p&u=%23p%3Dh7ghxSPFDsQJ"&](https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&q=gyroscope%2Band%2Baccelerometer%2Bfor%2Bgesture&oq=%23d%3Dgs_qabs&p&u=%23p%3Dh7ghxSPFDsQJ)

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<https://patents.google.com/patent/CN102789218A/en?q=Zigbee+smart+home+system>