# A Minor Project Report on

# " I-SCROLL "

## Submitted to


**Rajiv Gandhi Proudyogiki Vishwavidhyalaya, Bhopal**
**Towards Partial Fulfillment for the Award of**
**Bachelor of Engineering**
**(Computer Science and Engineering)**

**Submitted By:**

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**January-June 2019**

# Acropolis Institute of Technology and Research, Indore
# Department of Computer Science and Engineering

## RECOMMENDATION

The Project entitled **" I-Scroll "** submitted by **Naman Jain (0827CS161140), Riya Sahu (0827CS161191), Moinuddin Kazi (0827CS161131)** is satisfactory on account of the bonafide work done under our supervision and is recommended towards partial fulfilment for the award of **Bachelors of Engineering** (Computer Science and Engineering) degree by **Rajiv Gandhi Proudyogiki Vishwavidyalaya**, Bhopal.

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## Department of Computer Science and Engineering

## CERTIFICATE

The project entitled **" I-Scroll "** submitted by **Naman Jain (0827CS161140), Riya Sahu (0827CS161191), Moinuddin Kazi (0827CS161131)** has been examined by us and is hereby approved for the award of degree **Bachelor of Engineering** in **Computer Science and Engineering** discipline, for which it has been submitted. It understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein, but approve the project only for the purpose for which it has been submitted.

**Internal Examiner** **External Examiner**

Date: Date:

# Acropolis Institute of Technology and Research, Indore

## Department of Computer Science and Engineering

### PROJECT APPROVAL SHEET

The project entitled **" I-Scroll "** submitted by **Naman Jain (0827CS161140), Riya Sahu (0827CS161191), Moinuddin Kazi (0827CS161131)** is approved as partial fulfilment for the award of the **Bachelor of Engineering (Computer Science and Engineering)** degree by **Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P).**

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## Department of Computer Science and Engineering

### STUDENT DECLARATION

We the student of Bachelors of Engineering (Computer Science and Engineering), hereby declare that the work presented in this project synopsis entitled " **I-Scroll** " submitted towards completion of Minor Project in 6th semester of B.E. (Computer Science and Engineering) at Acropolis Institute of Technology & Research, Indore, is an authentic record of our own work. Due acknowledge have been made in the text to all other material used. The project was done in full compliance with the requirement and constraints of the prescribed curriculum.

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# ACKNOWLEDGEMENT

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| | | |
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# ABSTRACT

## Title of the Project: I-Scroll

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Technological advances are being made to assist humans in performing ordinary tasks in everyday settings. A key issue is the interaction with our computers. Human Machine Interface or HMI is a system comprising of hardware and software that helps in communication and exchange of information between the user (human operator) and the machine. We normally use LED Indicators, Switches, Touch Screens and LCD Displays as a part of HMI devices. Another way to communicate with machines like Robots or Computers is with the help of Hand Gestures. Recently Gesture controlled Laptops or computers are getting very famous. This technique is called Leap motion which enables us to control certain functions on our computers or laptops by simply waving our hand in front of it. It is very cool and fun to do it, but these laptops are really priced very high. So in this project let us try building our own Gesture control Laptop/Computer by combining the Power of Arduino and Python.

# TABLE OF CONTENTS


**1. INTRODUCTION ..... 10**

**1.1 PROJECT OVERVIEW ..... 10**

**2. PROJECT ORGANIZATION ..... 10**

**2.1 SOFTWARE PROCESS MODEL ..... 10**

**2.2 ROLES AND RESPONSIBILITIES ..... 11**

**2.2.1 ADMIN ROLES..... 11**

**2.2.2 USER ROLES ..... 11**

**2.3 TOOLS AND TECHNIQUES ..... 11**

**3. PROJECT MANAGEMENT PLAN ..... 12**

**3.1 TASKS ..... 12**

**3.2 INFORMATION GATHERING..... 12**

**3.3 RESOURCES NEEDED ..... 12**

**3.4 DEPENDENCIES AND CONSTRAINTS ..... 12**

**3.5 RISKS AND CONTINGENCIES ..... 13**

**4. GANTT CHART ..... 13**

**5. SPECIFIC REQUIREMENTS ..... 14**

**5.1 EXTERNAL INTERFACE REQUIREMENTS ..... 14**

**5.1.1 USER INTERFACES ..... 14**

**5.1.2 SOFTWARE INTERFACES..... 14**

**5.2 SOFTWARE FUNCTIONAL REQUIREMENT..... 16**

**5.3 SOFTWARE NON-FUNCTIONAL REQUIREMENTS..... 16**

**5.3.1 RELIABILITY ..... 16**

**5.3.2 AVAILABILITY..... 16**

**5.3.3 SECURITY ..... 16**

**5.3.4 MAINTAINABILITY ..... 16**

**5.3.5 PORTABILITY ..... 16**

**5.3.6 PERFORMANCE ..... 17**

**6. SOFTWARE DESIGN DESCRIPTION …….. 17**
**6.1 DESIGN OVERVIEW …….. 17**
**6.1.1 DATA FLOW DIAGRAM……...17**
**6.1.2 USE CASE DIAGRAM ……... 18**
**6.1.3 ACTIVITY DIAGRAM ……...19**
**6.1.4 SEQUENCE DIAGRAM ……19**
**6.2 CONCEPT BEHIND THE PROJECT ……...20**
**7. INTRODUCTION TO TESTING PHASE ……...20**
**7.1 SYSTEM OVERVIEW ……..21**
**7.2 TEST APPROACH ……21**
**7.3 TESTING OBJECTIVES ……..22**
**8. SCREENSHOTS OF OUR PROJECT ……22**
**9. TEST PLAN ……23**
**9.1 FEATURES TO BE TESTED ……...23**
**10. ARDUINO PROGRAMMING ……24**
**11. TEST CASES ……27**
**11.1 UNIT TESTING ……...28**
**11.2 FUNCTIONAL TESTING ……..28**
**11.3 SYSTEM TESTING ……....28**
**11.4 INTEGRATION TESTING ……29**
**11.5 VALIDATION TESTING ……...29**
**11.6 TOP DOWN INTEGRATION …….. 30**
**11.7 BOTTOM UP INTEGRATION ……..30**
**12. CONCLUSION AND FUTURE SCOPE ……...31**
**13. REFERENCES ……32**
**14. BIBLIOGRAPHY ……...…….32**
**15. LIST OF FIGURES ……33**

# 1. INTRODUCTION

## 1.1 PROJECT OVERVIEW

Human Machine Interface or HMI is a system comprising of hardware and software that helps in communication and exchange of information between the user (human operator) and the machine.

We normally use LED Indicators, Switches, Touch Screens and LCD Displays as a part of HMI devices. Another way to communicate with machines like Robots or Computers is with the help of Hand Gestures.In this project, we have implemented a simple Arduino based hand gesture control where you can control few functions of your web browser like switching between tabs, scrolling up and down in web pages, shift between tasks (applications), play or pause a video and increase or decrease the volume (in VLC Player) with the help of hand gestures.

# 2. PROJECT ORGANIZATION

## 2.1 SOFTWARE PROCESS MODEL

The spiral model is a risk-driven process model generator for software projects. Based on the unique risk patterns of a given project, the spiral model guides a team to adopt elements of one or more process models, such as incremental, waterfall, or evolutionary prototyping. The spiral model combines the idea of iterative development with the systematic, controlled aspects of the waterfall model. This Spiral model is a combination of iterative development process model and sequential linear development model i.e. the waterfall model with a very high emphasis on risk analysis. It allows incremental releases of the product or incremental refinement through each iteration around the spiral.

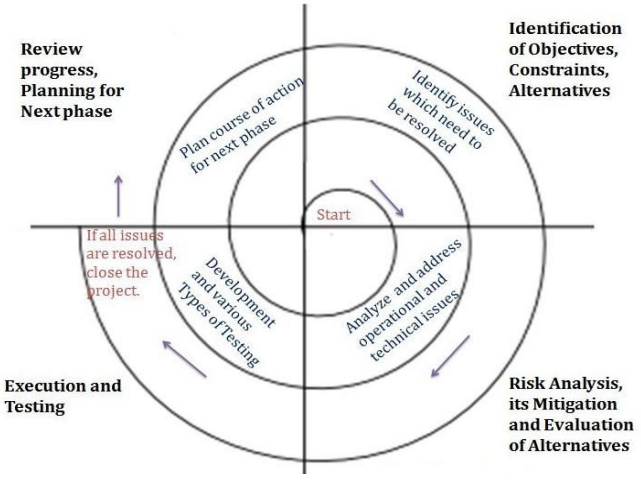


**Figure 2.1 : Spiral Model**

## 2.2 ROLES AND RESPONSIBILITIES

### 2.2.1 ADMIN ROLES

a) Add the modules into the machine.
b) Installing Software which will work upon all these modules.
c) Installing hardware requirements.
d) Eliminating operational errors.
e) Maintenance.

### 2.2.2 USER ROLES

a) By placing hands at proper distance and performing specified actions, user can perform certain tasks and can control their monitor screen.
b) User can use either one or both sensors to perform relevant actions.

## 2.3 TOOLS AND TECHNIQUES

The software tools used in our project are as follows:

a) Pycharm Community Edition (Python IDE)
b) Python serial and pyautogui library
c) Arduino IDE
d) Hardware - Arduino uno, Ultrasonic sensors, Jumper wires

# 3. PROJECT MANAGEMENT PLAN

## 3.1 TASKS

The major tasks are:

a) Installing required software.
b) Installing required hardware
c) Circuit connection.
d) Connection of arduino with python code using serial library.
e) Coding for sensors to work accordingly.

## 3.2 INFORMATION GATHERING

a) Proper circuit connection and sensor technology.

b) Embedding python with arduino.

## 3.3 RESOURCES NEEDED

**HARDWARE**

a) Arduino uno microcontroller

b) Ultrasonic sensors

c) Few connecting wires

d) A laptop or a computer

**SOFTWARE**

a) Pycharm Community Edition (Python IDE)

b) Python serial and pyautogui library

c) Arduino IDE

d) Operating System: That supports python

## 3.4 DEPENDENCIES AND CONSTRAINT

**DEPENDENCIES**

a) The system needs an ultrasonic sensor for gesture detection.

b) Arduino board is needed to perform specified actions.

c) Operating system should support python.

**CONSTRAINTS**

a) It can only perform limited functionalities.

b) It is not able to replace mouse completely.

### 3.5 RISKS AND CONTINGENCIES

a) Improper functioning of Ultrasonic sensors

b) Improper functioning of arduino board

c) Improper connections

d) Inaccurate hand distance

e) Wrong hand gesture

## 4. GANTT CHART

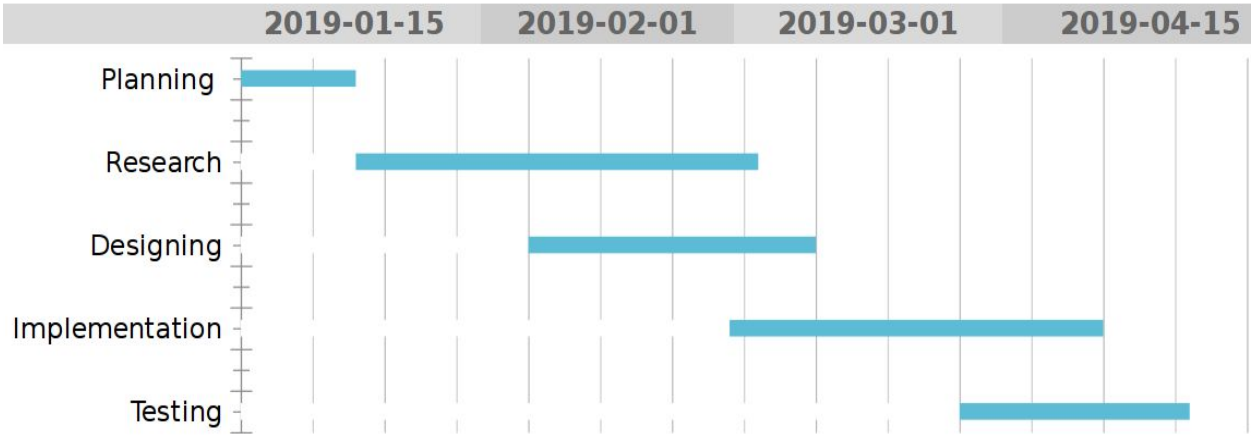


**Figure 4: Gantt Chart**

# 5. SPECIFIC REQUIREMENTS

## 5.1 EXTERNAL INTERFACE REQUIREMENTS

### 5.1.1 USER INTERFACE

There are no user interfaces. After running the python program on pycharm ide, both sensors starts working and we can control screen with our hand gestures.

### 5.1.2 SOFTWARE INTERFACES

#### a) Python 3.5

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

The Python interpreter and the extensive standard library are freely available in source or binary form for all major platforms from the Python Web site, https://www.python.org/, and may be freely distributed.


**Figure 5.1.2 (a): Python Logo**

#### b) Pycharm Community Edition

PyCharm is an integrated development environment (IDE) used in computer programming, specifically for the Python language. It is developed by the Czech company JetBrains. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django.

PyCharm is cross-platform, with Windows, macOS and Linux versions. The Community Edition is released under the Apache License, and there is also Professional Edition with extra features, released under a proprietary license.


**Figure 5.1.2 (b): Pycharm community edition logo**

### c) Arduino IDE

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.This environment supports both C and C++ languages.


**Figure 5.1.2 (c): Arduino IDE logo**

## 5.2 FUNCTIONAL REQUIREMENTS

a) **Browsing Gesture** - The software shall allow the user to use the "Browsing Gesture Mode". In this mode, user's hand will only be recognized for commands including previous page, next page, scroll up and scroll down.

b) **Hand Location** - Upon detection, the system will be able to compute the location of the hand or any object using simple trigonometry math.

c) **Hand Calibration** - Depending on user's preferences, the system will perform adjustments according to user's dominant hand.

## 5.3 NON-FUNCTIONAL REQUIREMENTS

Constraints on the service or functions offered by the system such as timing constraints, constraints on development process, standards etc.

### 5.3.1 RELIABILITY

High Reliability is the measure of how a product behaves in varying circumstances and our project is reliable because there are less chances of errors and exceptions and works well in varying circumstances. Regardless of the brightness level in user's operating environment, our project will always detect user's hands.

### 5.3.3 SECURITY

Security is the ability of the software to remain protected from unauthorized access. This algorithm is well secured using multiple levels of security constraints.

### 5.3.4 MAINTAINABILITY

Maintainability of system is done by developer. Developer will take care about all the gesture sensing methodologies and he will be responsible for working of sensors properly.

### 5.3.5 PORTABILITY

This project works on python (IOT), the pycharm software is 100% portable to all operating platforms that support python. Therefore, this software should not depend on the different operating systems.

### 5.3.6 PERFORMANCE

Performance requirement is concerned with the speed of operations of functions and their accuracy. This software will minimize the number of calculations needed to perform image processing and hand gesture detection.

# 6. SOFTWARE DESIGN DESCRIPTION

A software design description (a.k.a. software design document or SDD) is a written description of a software product, that a software designer writes in order to give a software development team overall guidance to the architecture of the software project. An SDD usually accompanies an architecture diagram with pointers to detailed feature specifications of smaller pieces of the design. Practically, the description is required to coordinate a large team under a single vision, needs to be a stable reference, and outline all parts of the software and how they will work.

## 6.1 DESIGN OVERVIEW

### 6.1.1 DATA FLOW DIAGRAM

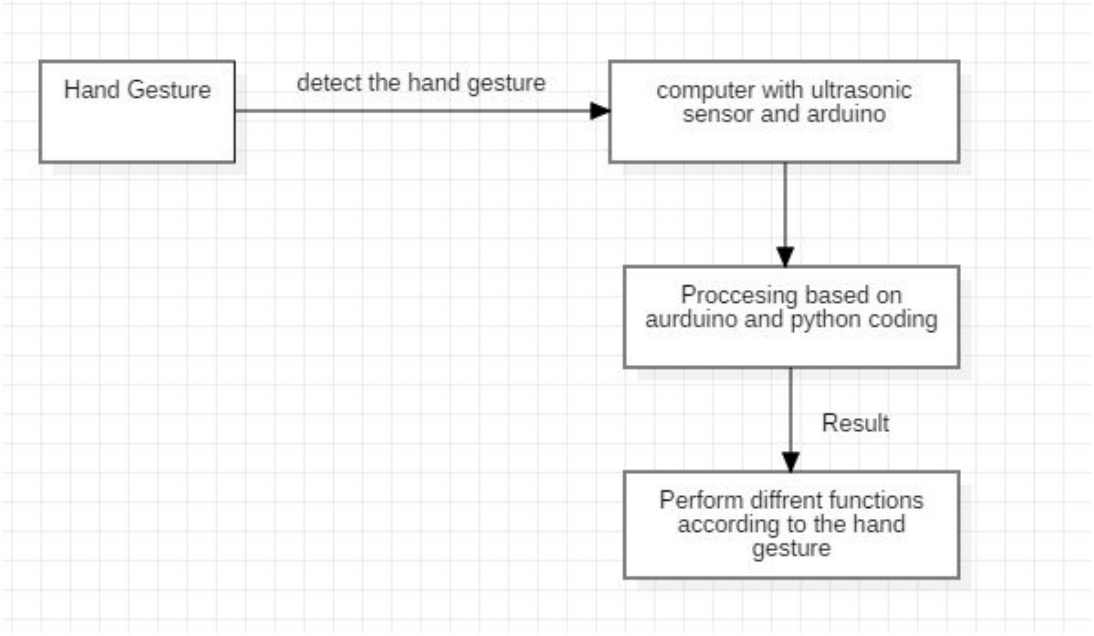


**Figure 6.1.1: Data Flow Diagram**

### 6.1.2 USE CASE DIAGRAM

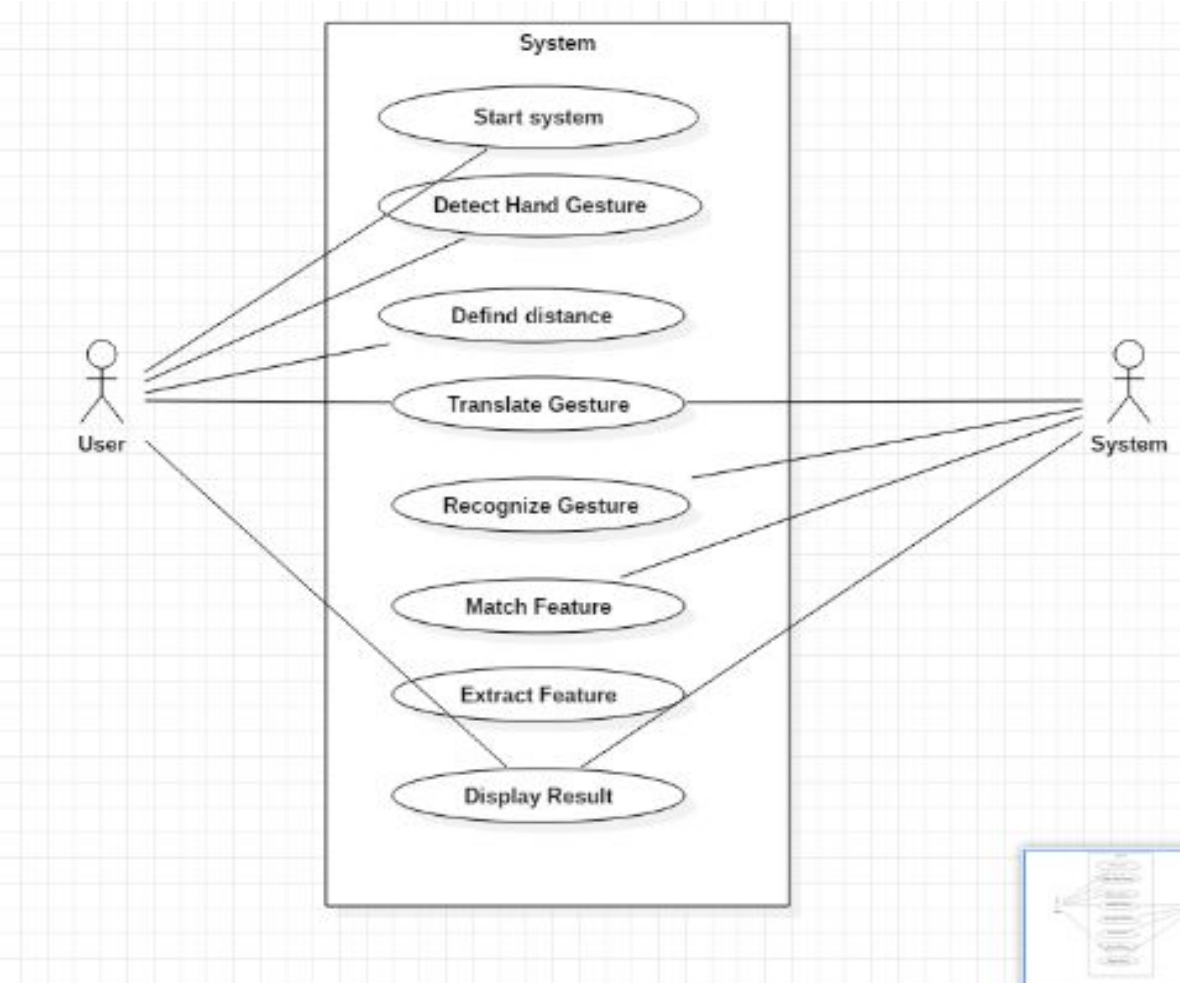


**Figure 6.1.2: Use Case Diagram**

### 6.1.3 ACTIVITY DIAGRAM

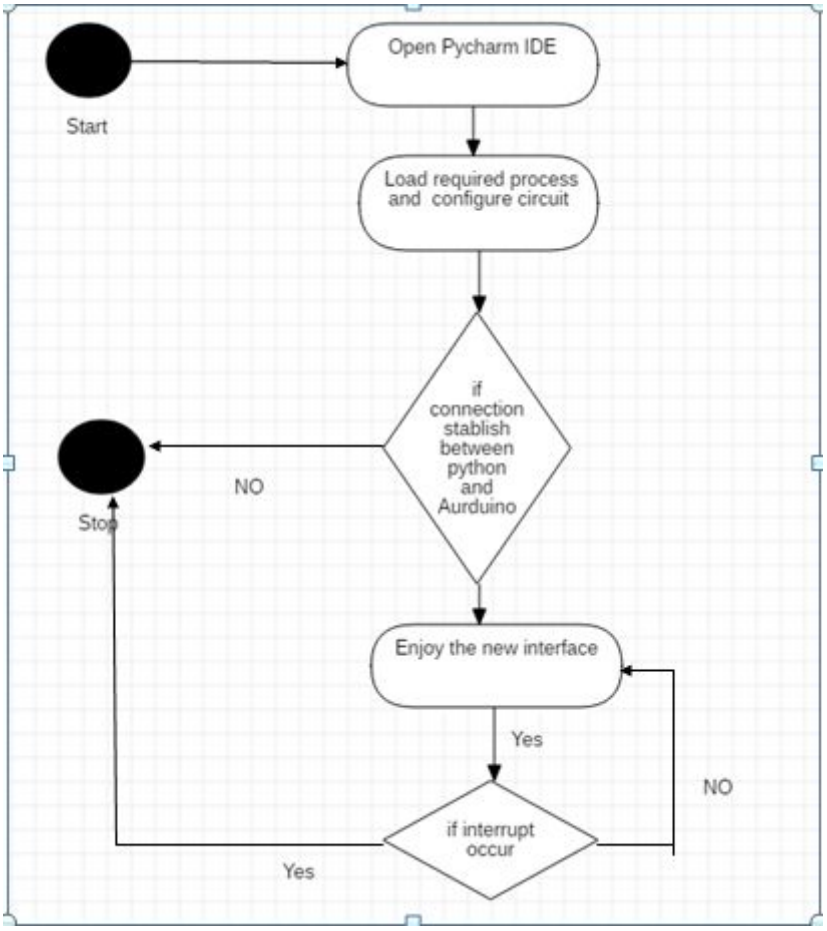


**Figure 6.1.3: Activity Diagram**

### 6.1.4 SEQUENCE DIAGRAM

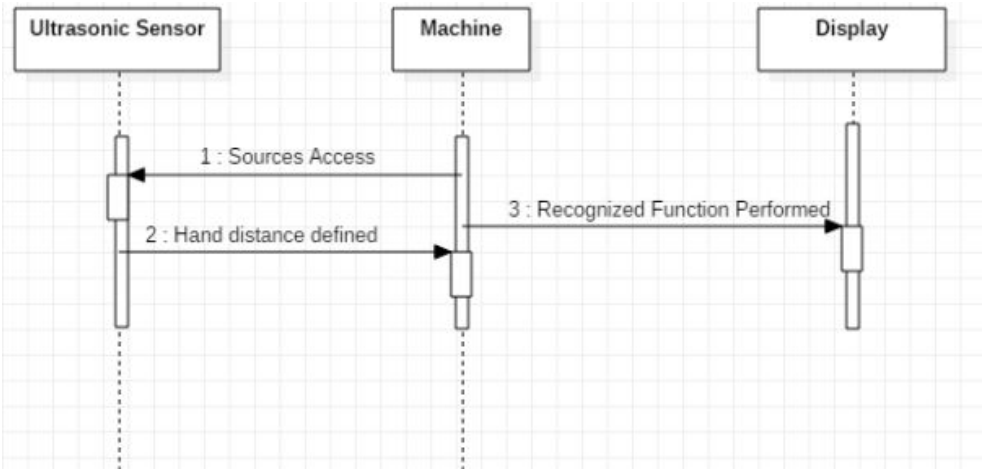


**Figure 6.1.4: Sequence Diagram**

## 6.2 CONCEPT BEHIND THE PROJECT

The concept behind the project is very simple. We will place two Ultrasonic (US) sensors on top of our monitor and will read the distance between the monitor and our hand using Arduino, based on this value of distance we will perform certain actions. To perform actions on our computer we use Python pyautogui library. The commands from Arduino are sent to the computer through serial port (USB). This data will be then read by python which is running on the computer and based on the read data an action will be performed.

To control the PC with Hand Gestures, just connect the two Ultrasonic sensors with Arduino. We know US sensor work with 5V and hence they are powered by the on board Voltage regulator of Arduino. The Arduino can be connected to the PC/Laptop for powering the module and also for Serial communication. Once the connections are done place them on your monitor as shown below. I have used a double sided tape to stick it on my monitor but you can use your own creativity. After securing it in a place we can proceed with the Programming.

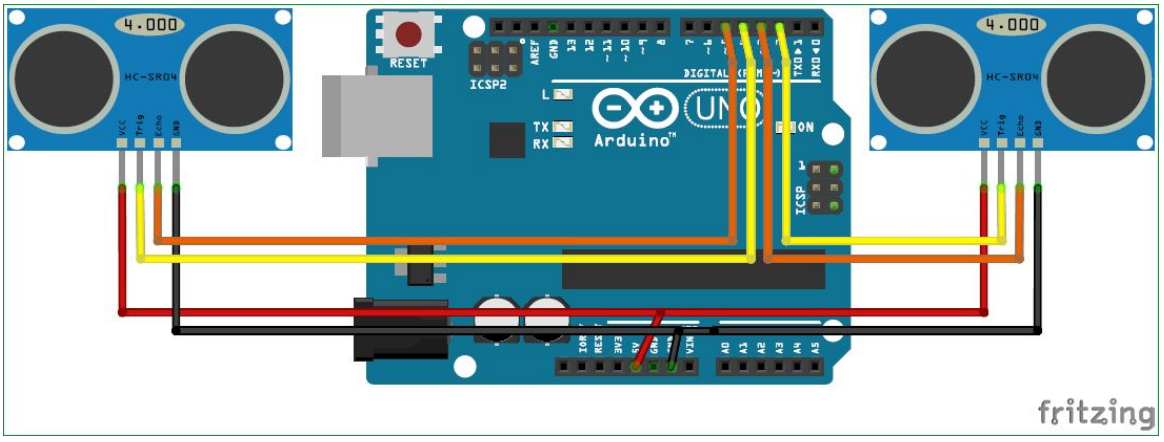


**Figure 6.2: Circuit diagram**

# 7. INTRODUCTION TO TESTING PHASE

Testing documentation involves the documentation of artefacts that should be developed before or during the testing of Software. Documentation for software testing helps in estimating the testing effort required, test coverage, requirement tracking/tracing, etc. This section describes some of the commonly used documented artefacts related to software testing. Testing allows you to ensure your application works the way you think it does, especially as your codebase changes over time. If you have good tests, you can refactor and rewrite code with confidence. Tests are also the most concrete form of documentation of expected behaviour, since other developers can figure out how to use your code by reading the tests.

## 7.1 SYSTEM OVERVIEW

Current project works in python and is based on the concept of IOT. Python language is one of the most flexible languages and can be used for various purposes. Python has gained huge popularity base of this. Python does contain special libraries for connecting physical devices using serial library and also provide automation to various tasks with the help of pyautogui library. The language is great to use when working with machine learning algorithms or IOT projects and has easy syntax relatively. For beginners, this is the best language to use and to start with.

## 7.2 TEST APPROACH

Various software-testing strategies have been proposed so far. All provide a template for testing. Things that are common and important in these strategies are: Testing begins at the module level and works "outward": tests which are carried out are done at the module level where major functionality is tested and then it works towards the integration of entire system. Different testing techniques are appropriate at different point of time: Under different circumstances, different testing methodologies are to be used which will be the decisive factor for software robustness and scalability. The developer of the software conducts testing and if the project is big then there is a testing team: All programmers should test and verify that their results are according to the specification given to them while coding. In cases where programs are big enough or collective effort is involved for coding, responsibilities for testing lies with the team as a whole.

A test approach is the test strategy implementation of a project, defines how testing would be carried out. Test approach has two techniques:

**Proactive -** An approach in which the test design process is initiated as early as possible in order to find and fix the defects before the build is created.

**Reactive -** An approach in which the testing is not started until after design and coding are completed.

There are many strategies, a project can adopt depending on the context and some of them are:

a) Dynamic and heuristic approaches.

b) Consultative approaches.

c) Model-based approach that uses statistical information about failure rates.

e) Methodical approach, which is based on failures.

f) Standard-compliant approach specified by industry-specific standards.

## 7.3 TESTING OBJECTIVE

Testing should systematically uncover different classes of errors in a minimum amount of time and with a minimum amount of effort. A secondary benefit of testing is that it demonstrates that the software appears to be working as stated in the specifications. The data collected through testing can also provide an indication of the software's reliability and quality. But, testing cannot show the absence of defect -- it can only show that software defects are present.

Objectives of testing are : -

a) Finding defects which may get created by the programmer while developing the algorithm.
b) Gaining confidence in and providing information about the level of quality.
c) To prevent defects.
d) To make sure that the end result meets the business and user requirements.
e) To ensure that it satisfies the BRS that is Business Requirement Specification and SRS that is System Requirement Specifications.
f) To gain the confidence of the customers by providing them a quality product.

# 8. SOME SCREENSHOTS OF OUR PROJECT

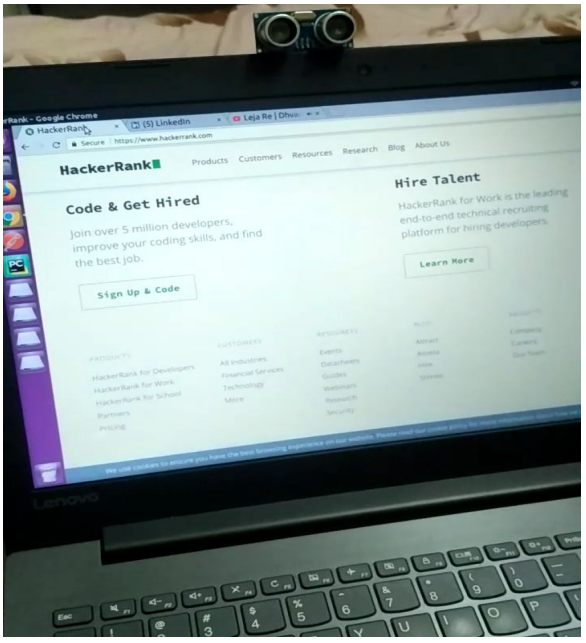


**figure 8(a): screenshot 1**

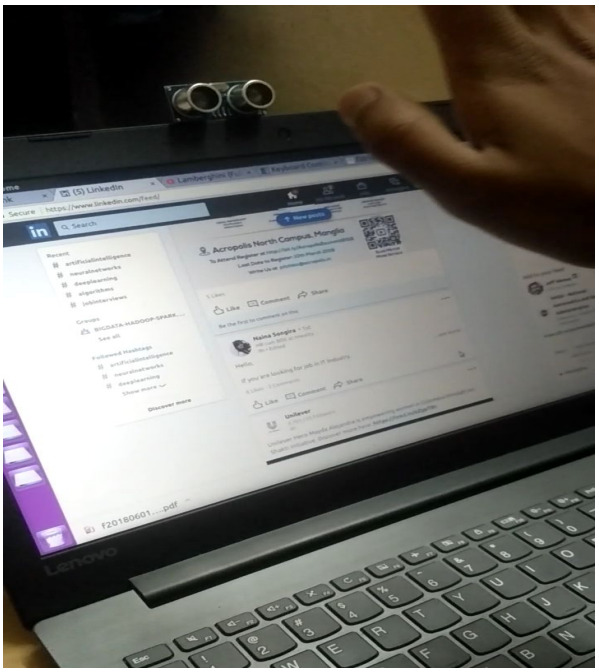

**figure 8(b): screenshot 2**

# 9. TEST PLAN

A Software Test Plan is a document describing the testing scope and activities. It is the basis for formally testing any software/product in a project. It identifies amongst others test items, the features to be tested, the testing tasks, who will do each task, degree of tester independence, the test environment, the test design techniques and entry and exit criteria to be used, and the rationale for their choice and any risks requiring contingency planning.

## 9.1 FEATURES TO BE TESTED

Features are changes that add new functionality or significantly modify existing functionality. They are designed to be useful, effective, and attracting. Though, users are inventive and use the functionality unexpected ways. Also the application is complex and all pieces have to cooperate with each other. Any change might have surprising side effects in the related parts. Finally, developers are just humans and they might simply forget to implement a piece.

Feature testing should catch the above mentioned problems and make sure that users will be happy with the new stuff. Features to be tested:-

a) Dataset working : if dataset is properly loaded or not.
b) Hand detection : if the Hand are detected or not.
c) Hand recognition : if the Hand after detection perform specific task or not.

# 10. ARDUINO PROGRAMMING

The arduino should be programmed to read the distance of hand from the US sensor.By reading the value of distance we can arrive at certain actions to be controlled with gestures.For this project we used 6 actions.

**Action 1**:When both the hands are placed up before the sensor at a particular far distance then the video in VLC player should play/pause.

**Action 2**:When right hand is placed up before the sensor at a particular far distance then the video should fast forward one step.

**Action 3**:When left hand is placed up before the sensor at a particular far distance then the video should rewind one step.

**Action 4**:When right hand is placed up before the sensor at a particular near distance and then if moved towards the sensor the video should fast forward and if moved away the video should rewind.

**Action 5**:When left hand is placed up before the sensor at a particular near distance and then if moved towards the sensor the volume of video should increase and if moved away the volume should Decrease.

We start with defining the IO pins as shown below. The two US sensors are connected to Digital pins 2, 3, 4 and 5 and are powered by +5v pin. The trigger pins are output pin and Echo pins are input pins.The serial communication between arduino and python takes places at a baud rate of 9600.

```
const int trigger1 = 2; //Trigger pin of 1st Sensor

const int echo1 = 3; //Echo pin of 1st Sensor

const int trigger2 = 4; //Trigger pin of 2nd Sensor

const int echo2 = 5;//Echo pin of 2nd Sensor

void setup() {

Serial.begin(9600);

pinMode(trigger1, OUTPUT);

pinMode(echo1, INPUT);

pinMode(trigger2, OUTPUT);
```

```
pinMode(echo2, INPUT);
}
```

We need to calculate the distance between the Sensor and the hand each time before concluding on any action. So we have to do it many times, which means this code should be used as a function. We have written a function named *calculate_distance()* which will return us the distance between the sensor and the hand.

```
/*###Function to calculate distance###*/
void calculate_distance(int trigger, int echo)
{
digitalWrite(trigger, LOW);
delayMicroseconds(2);
digitalWrite(trigger, HIGH);
delayMicroseconds(10);
digitalWrite(trigger, LOW);
time_taken = pulseIn(echo, HIGH);
dist= time_taken*0.034/2;
if (dist>50)
dist = 50;
}
```

Inside our main loop we check for the value of distance and perform the actions mentioned above. Before that we use two variables distL and distR which gets updated with current distance value.

```
calculate_distance(trigger1, echo1);
distL =dist; //get distance of left sensor
calculate_distance(trigger2, echo2);
distR =dist; //get distance of right sensor
```

Since we know the distance between both the sensors, we can now compare it with predefined values and arrive at certain actions. For example if both the hands are placed at a

distance of 40 mc then we play/pause the video. Here the word **“Play/Pause”** will be sent out through serial port

```
if ((distL >40 && distR>40) && (distL <50 && distR<50)) //Detect both hands

{ Serial.println("Play/Pause"); delay (500);}
```

If the Right hand alone is placed before the module then we fast forward the video by one step and if it is left hand we rewind by one step. Based on the action, here the word **“Rewind” or “Forward”** will be sent out through serial port

```
if ((distL >40 && distL<50) && (distR ==50)) //Detect Left Hand

{Serial.println("Rewind"); delay (500);}

if ((distR >40 && distR<50) && (distL ==50)) //Detect Right Hand

{Serial.println("Forward"); delay (500);}
```

For detailed control of volume and track we use a different methodology so as to prevent false triggers. To **control the volume** we have to place the left hand approx. At a distance of 15 cm , then you can either move it towards the sensor to decrease the volume of move it away from the sensor to increase the volume. The code for the same is shown below. Based on the action, here the word “V up” or “V down” will be sent out through serial port

```
//Lock Left - Control Mode

if (distL>=13 && distL<=17)

{ delay(100); //Hand Hold Time

  calculate_distance(trigger1,echo1);

  distL =dist;

  if (distL>=13 && distL<=17)

  {  Serial.println("Left Locked");

    while(distL<=40)

    {  calculate_distance(trigger1,echo1);
```

```
distL =dist;
if (distL<10) //Hand pushed in
{ Serial.println ("Vup"); delay (300);}
if (distL>20) //Hand pulled out
{ Serial.println ("Vdown"); delay (300);}
}}}
```

We can use the same method for the right side sensor also, to **control the track of the video**. That is if we move the right hand towards the sensor it will fast forward the movie and if you move it away from the sensor it will rewind the movie. Based on the action, here the word "Rewind" or "Forward" will be sent out through serial port

You can now read over the **complete code for this gesture controlled PC given at the end of the page** and try understating it as an whole and then copy it to your Arduino IDE.

# 11. TEST CASES

| Case Number | Test Case | Description | Test Result |
|---|---|---|---|
| T-001 | Test Functionality | Module loading | Successful |
| T-002 | Source Arduino board | Check if working or not | Successful |
| T-003 | Hand Detection | A box enclosing the Hand in front of Ultrasonic sensor. | Successful |
| T-004 | Hand Recognition | Perform specific task after hand recognition. | Successful |

**Table 11: Test Cases**

## 11.1 UNIT TESTING

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

## 11.2 FUNCTIONAL TESTING

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.
Functional Testing is a testing technique that is used to test the features of the system or Software, should cover all the scenarios including failure paths and boundary cases. React forces us to build everything as "components."

## 11.3 SYSTEM TESTING

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

System Testing (ST) is a black box testing technique performed to evaluate the complete system the system's compliance against specified requirements. In System testing, the functionalities of the system are tested from an end-to-end perspective.

System Testing is usually carried out by a team that is independent of the development team in order to measure the quality of the system unbiased. It includes both functional and Non-Functional testing.

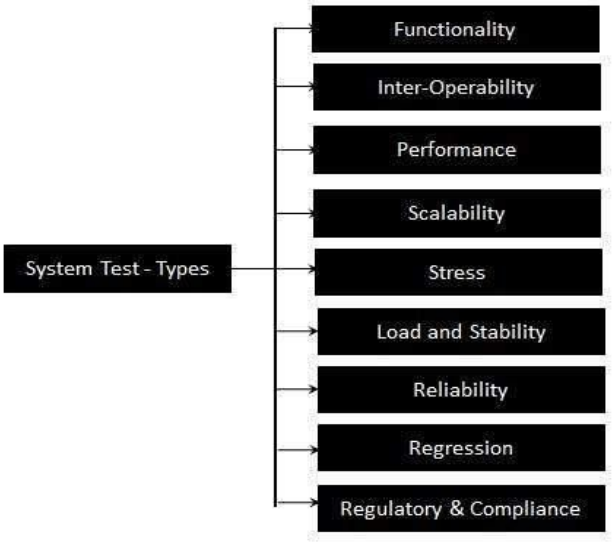


**Figure 11.3 (a): System Testing Types**

## 11.4 INTEGRATION TESTING

Integration testing is testing in which a group of components are combined to produce output. Also, the interaction between software and hardware is tested in integration testing if software and hardware components have any relation. It may fall under both white box testing and black box testing.

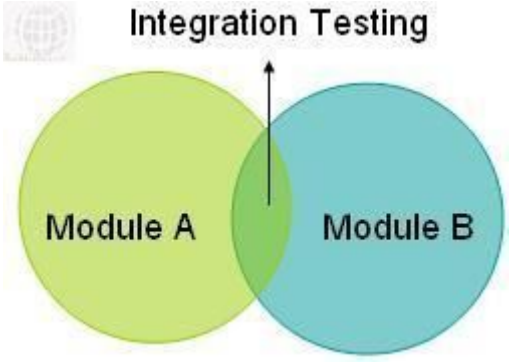


**Figure 11.4 (a): Integration Testing**

## 11.5 VALIDATION TESTING

The process of evaluating software during the development process or at the end of the development process to determine whether it satisfies specified business requirements. Validation Testing ensures that the product actually meets the client's needs. It can also be defined as to demonstrate that the product fulfils its intended use when deployed on appropriate environment. It answers to the question, Are we building the right product?

Validation testing can be best demonstrated using V-Model. The Software/product under test is evaluated during this type of testing.

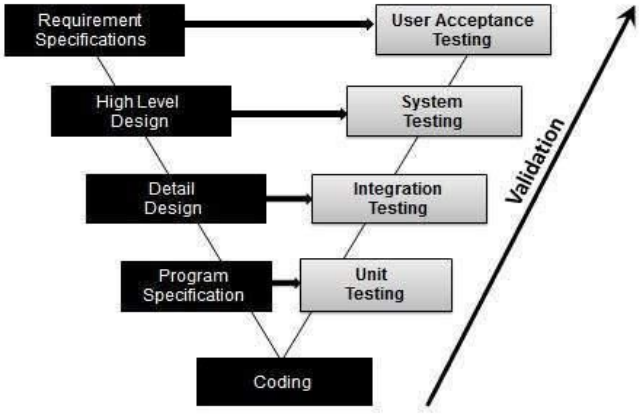


**Figure 11.5 (a): Validation Testing**

## 11.6 TOP DOWN INTEGRATION

Top-down integration testing is an integration testing technique used in order to simulate the behaviour of the lower-level modules that are not yet integrated. Stubs are the modules that act as temporary replacement for a called module and give the same output as that of the actual product.

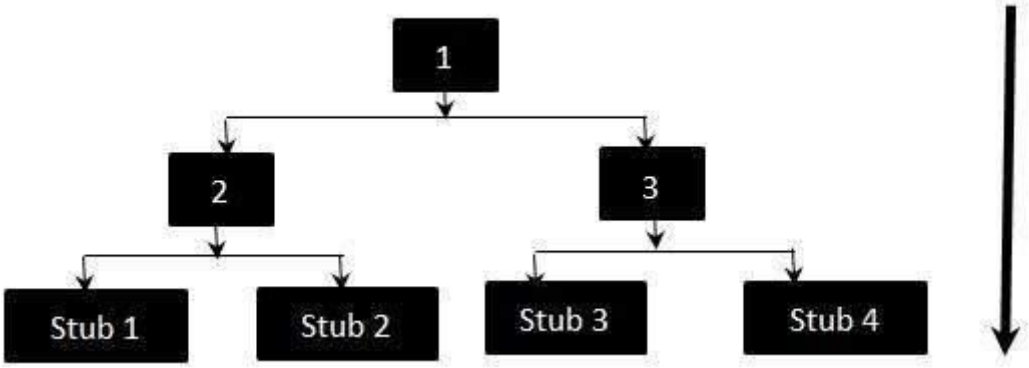


**Figure 11.6 (a): Top Down Integration**

The above diagrams clearly states that Modules 1, 2 and 3 are available for integration, whereas, below modules are still under development that cannot be integrated at this point of time. Hence, Stubs are used to test the modules.

## 11.7 BOTTOM UP INTEGRATION

Each component at lower hierarchy is tested individually and then the components that rely upon these components are tested.

**Bottom up Integration - Flow Diagram**

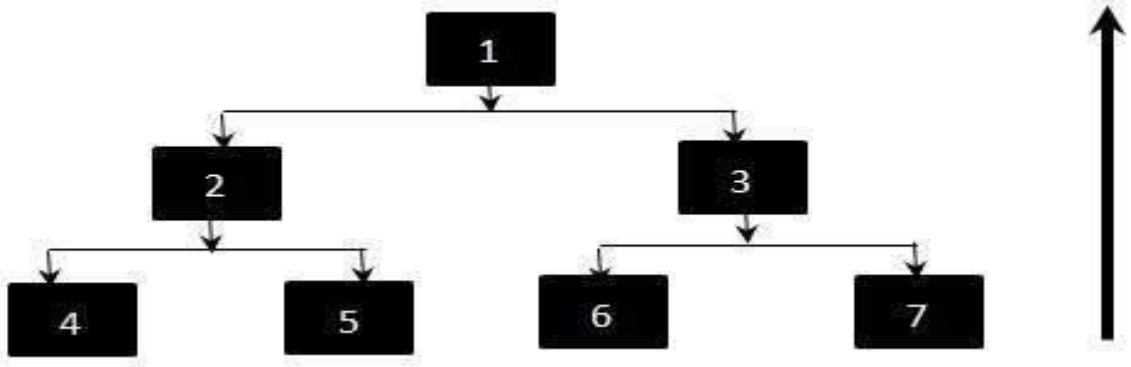


**Figure 11.7 (a): Bottom Up Testing**

# 12. CONCLUSION AND FUTURE SCOPE

## 12.1 CONCLUSION

Using arduino, ultrasonic sensors and python we were able to control computer with hand gestures.

The ultrasonic sensors are used to detect the distance of the hands from the sensors or in effect computer screen since the sensors are mounted on top of the monitor. The ultrasonic sensors have a Transmitter and a receiver. The transmitter transmits ultrasonic waves and the receiver receives the waves after they are reflected back from an encountered obstacle in the path of the wave. The obstacles for our purpose are hands.The arduino Uno board runs the program used to calculate the distance between the sensors and the hands. The python program uses these distances to perform the defined operations on the VLC media player. The defined operations are Forward, rewind, Fast Forward, Fast rewind, volume up, and volume down. This is done using the PYserial and PYautoGUI libraries. These are used to establish serial communication with arduino Uno board. By executing the Python program and playing a video in VLC, we were able to control the playback using hand gestures which was the aim of our project.

## 12.2 FUTURE SCOPE

For the purpose of our project we wanted to control the playback of a video in VLC player. We were able to perform the actions of forwarding, rewinding, fast forwarding, fast rewinding, and controlling the volume. We could also control the Web @rowser using hand gestures by adding a few lines of codes. Gestures can be enabled for a lot of programs by changing the codes and we could control a lot of different types of programs simply by using hand gestures.The entire HMI system could be better integrated with the computer if the sizes of the components was even smaller. Currently hand gestures used for controlling Laptop is done by using Leap Motions. The Leap Motion controller is a small USB peripheral device which is designed to be placed on a physical desktop, facing upward. It can also be mounted onto a virtual reality headset. Using two monochromatic IR cameras and three infrared LEDs, the device observes a roughly hemispherical area, to a distance of about - meter. The LEDs generate pattern-less IR light and the cameras generate almost 200 frames per second of reflected data. This is then sent through a USB cable to the host computer, where it is analyzed by the Leap Motion software using “complex math” in a way that has not been disclosed by the company, in some way synthesizing 3D position data by comparing the 2D frames generated by the two cameras. In a 2013 study, the overall average accuracy of the controller was shown to be .7 millimeters.

The smaller observation area and higher resolution of the device differentiates the product from the Kinect, which is more suitable for whole-body tracking in a space the size of a

living room. In a demonstration to CNET, the controller was shown to perform tasks such as navigating a website, using pinch-to-zoom gestures on maps, high-precision drawing, and manipulating complex 3D data visualizations.Leap Motion initially distributed thousands of units to developers who are interested in creating applications for the device. The Leap Motion controller was first shipped in Puly 2013.In February 2016, Leap Motion released a major beta update to its core software. Dubbed Orion, the software is designed for hand tracking in virtual reality.

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# 15. LIST OF FIGURES


| LIST OF FIGURES | | |
|---|---|---|
| **Figure Number** | **Figure Name** | **Page Number** |
| Figure 2.1 | Spiral Model | 11 |
| Figure 4 | Gantt Chart | 14 |
| Figure 5.1.2(a) | Python logo | 15 |
| Figure 5.1.2(b) | Pycharm logo | 16 |
| Figure 5.1.2(c) | Arduino IDE logo | 16 |
| Figure 6.1.1 | Data Flow Diagram | 18 |
| Figure 6.1.2 | Use Case Diagram | 19 |
| Figure 6.1.3 | Activity Diagram | 20 |
| Figure 6.1.4 | Sequence Diagram | 20 |
| Figure 6.2 | Circuit Diagram | 21 |
| Figure 8(a) | screenshot (a) | 24 |
| Figure 8(b) | screenshot (b) | 24 |
| Figure 11.3 (a) | System Testing Types | 29 |
| Figure 11.4 (a) | Integration Testing | 30 |
| Figure 11.5 (a) | Validation Testing | 30 |
| Figure 11.6 (a) | Top Down Integration Testing | 31 |
| Figure 11.7 (a) | Bottom Up Integration Testing | 31 |