

# **ACTIVE LEARNING INTELLECT MACHINE BASED ON VOICE RECOGNITION**

*Project report submitted in partial fulfillment of the requirements for the  
degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRONICS AND COMMUNICATION  
ENGINEERING**

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**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY  
WAKNAGHAT, SOLAN  
MAY, 2017**

## **DECLARATION BY THE STUDENTS**

We hereby declare that the work reported in the B-Tech thesis entitled “**ACTIVE LEARNING INTELLECT MACHINE BASED ON VOICE RECOGNITION**” submitted at **Jaypee University of Information Technology, Waznaghat, India**, is an authentic record of our work carried out under the supervision of **Prof. Dr. SUNIL VIDYA BHOOSHAN**. We have not submitted this work elsewhere for any other degree.

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## **SUPERVISOR'S CERTIFICATE**

This is to certify that the work reported in the B-Tech. thesis entitled “**ACTIVE LEARNING INTELLECT MACHINE BASED ON VOICE RECOGNITION**”, submitted by **DILPREET SINGH, ABHINAV GAUR, SAKSHI BANSAL** at **Jaypee University of Information Technology, Waknaghat, India** is a bonafide record of his /her original work carried out under my supervision. This work has not been submitted elsewhere for any other degree or diploma.

Supervisor:

**Prof. Dr. SUNIL VIDYA BHOOSHAN**  
**(Head of Department, ECE)**

DATE:

## ACKNOWLEDGEMENT

Before commencing this report, we express our gratitude and appreciation to every single person associated with our project. We express our gratitude to respected guide “*Prof. Sunil Vidya Bhooshan*” who provided us a life changing opportunity to work on this project, who helped us to increase our knowledge about robotics and machine learning and also who has been utmost benign, affable and reasonable towards us, who shared his wonderful practical skills and helped us in understanding various concepts.

Last but not least, we are grateful and indebted to our parents, teachers, mentor, friends and each single person who has in some way or the other helped me in making this treatise.

Thank you  
Jai Hind

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## ABSTRACT

Machines having the potential of learning different tasks like human being and perform what's desired from them would like the flexibility to remold gathered task data into their own illustration and spatial property. Different task data that has been no inheritable e.g. with Programming by application example by observant a personality's doesn't a-priori contain any bot-related data and actions, and is outlined within the space and action house of the human act.

The objective of this informing is to gift a summary of the machine learning techniques presently in use or in thought at applied math agencies worldwide.

Automatic identification and extraction of those algorithmic programs from pedantic digital documents would change automatic algorithm classification, searching, analysis and discovery. AN algorithmic program computer program, that identifies pseudo codes in pedantic documents and makes them searchable, has been enforced as an area of this suite.

Coming up with systems typically build the idea that wise world data is out there. Our approach makes a lot of realistic assumption that the initial data regarding the actions is incomplete, and uses experimentation as a learning mechanism once the missing data causes an execution failure. Previous work on learning experimentally has not self-addressed this issue.

In order for autonomous systems to act with their setting in an intelligent means, they need to tend the flexibility to adapt and learn incrementally and deliberately. It is just about not possible to plan and hand code all doubtless relevant domain data for advanced dynamic tasks.

So, our aware effort is to produce an insight and demonstration of machine learning to recollect things and supplying eminent facilities in creating our day to day life easier, easier and quicker .

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# CHAPTER 1

## INTRODUCTION

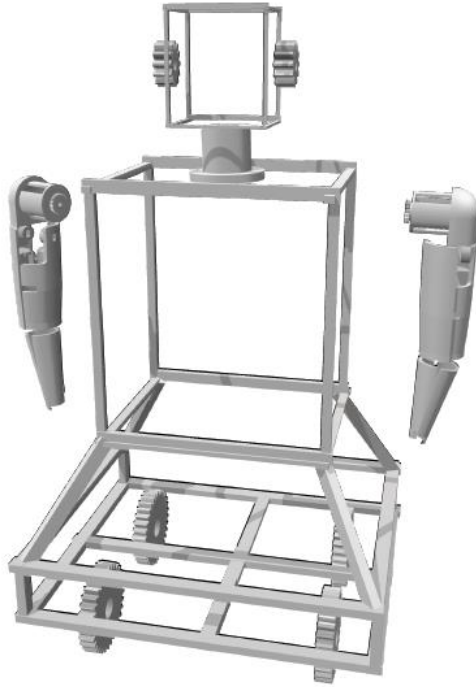
In today's world, nobody is that much free to stay connected with the outside world. One does not even have sufficient time to obtain daily updates of current affairs as well as social world. One does not even his/her personal things kept at different places. Given these problems in hand, we have come up with the solution by evolving a TALKABLE ROBOT which could prove to be a miracle in our busy life.

The proposed solution involves evolution of a ROBOT (based on Artificial Intelligence), working for us in two ways:

1. When asked, it can update us regularly about the outside world (e.g.: current affairs, messages, social life and many more).
2. When asked, it can tell us about the things that are present inside a room (e.g.: pen, book, I-card and many others).

We are focusing on **Artificial Intelligence (AI)** implementation of a device which is a talkable robot telling us about the updates and status of modern amenities like facebook, Whatsapp in addition to providing the correct date and time according to set GSM location and databases which will provide the basic information and know-how of the tasks to be accomplished by the robot.

We would be using Raspberry pi (version:3) for taking images and for other purposes. The topics regarding the implementation will be discussed deeply in the upcoming chapters. The basic system model is shown in **Fig1.1**.



**Fig1.1:** System Model

## **1.1 Internet of Things (IoT)**

Internet of Things (IoT) is new development of the web by which regular 'things' or objects have communication capabilities which allow them to send and receive data. It's expected to attach systems, devices, sensors which might communicate while not requiring machine-to-machine communication. IoT refers to a colossal type of devices like sensors that assist hearth fighters in rescue and search operations, heart beat and vital sign measurement devices, bio-chips deep-rooted in sheep. The web would connect 20 million devices by 2020. Fields such as cars, agriculture, security police investigation, building management, smart-homes, and health care are being employed with web of things. It is believed that with the use of IoT, there would be less energy consumption and restricted impact to the atmosphere.

The heap can revolutionize way of life by serving in things like managing airport's traveler flows, sensible homes, heating buildings, caring for the old peoples. Within the gifted world wherever we tend to live there are already devices that are connected to every alternative and facilitate in day to day aspects. However, imagine what the context are going to be when a number of years wherever

billions of devices are going to be connected to every alternative as well as cars, phones, jet planes, appliances, wearable gear etc.

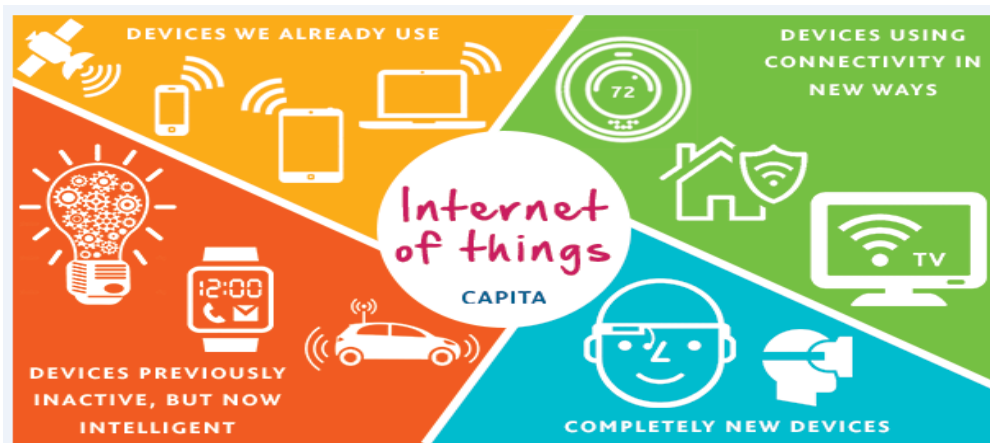


Fig 1.2: Internet of Things

## 1.2 Machine Learning

Machine learning can be termed as a type of computing which gives computer, the flexibility to find out while not being expressly programmable. Automatic learning basically focuses on the event of instruction that may taught themselves to develop a system and change once they come across to new information. The concept of machine learning is comparable to that of information mining. Each system searches through information to find some type of patterns. However, rather than extracting information for human comprehension -- as is that the case in data processing applications- Learning uses the valuable information to find patterns in information and regulate program actions consequently. Machine learning algorithms area unit usually categorized as being supervised or unsupervised. Supervised algorithms will apply to what has been learnt within the past to new information. Unsupervised algorithms will find inferences from datasheet. Facebook have newly developed feed system using machine learning to alter any of the member's feed. If any member often stops scrolling so as to browse or "like" a specific friend's posts, the News Feed could begin to indicate additional information of that friend's activity earlier within the feed. Behind the scenes, the code is solely victimized and is applied on math analysis.



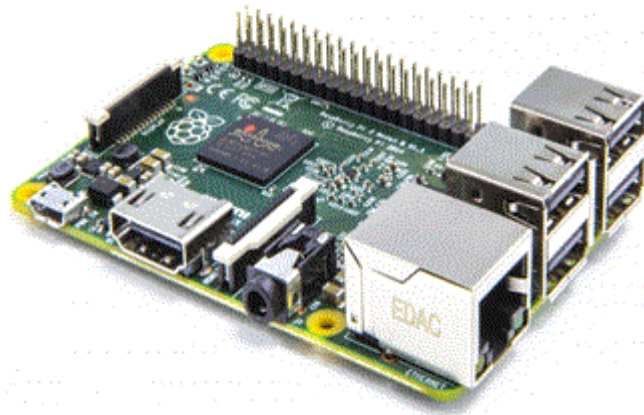
**Fig 1.3:** Machine Learning pictorial representation

### 1.3 Raspberry Pi 3

The R-Pi 3 can be termed as a kind of micro-controller that could be a credit card-sized single board computers developed within the U.K by the R-Pi Foundation for the promotion of the teaching of basic applied science in various faculties and developing nations. The initial model became additional in style than anticipated, outside of the target market; demon-ridden folks used it, and also the later models, for varied uses, like artificial intelligence and embedded systems. Accessories, like keyboard and mouse (not required for a few uses) and even a case, aren't enclosed, whereas planned for; they've been enclosed in unofficial bundles, and later in a political candidate bundle. It is the 3rd generation R-Pi. It have replaced the Raspberry pi a pair of Model B in beginning of March 2016. Compared to the Raspberry Pi a pair of it have:

- 1.2GHz quad-core, 16 bit ARMv8 mainframe
- Wi fi - Wireless computer network
- Bluetooth
- Bluetooth Low Energy (BLE)
- Raspberry Pi a pair of, it additionally has:
  - ✓ 1GB Random Access Memory
  - ✓ 4 USB ports
  - ✓ Ethernet port

- ✓ Combined three.5mm audio jack and composite video
- ✓ Camera interface (CSI)
- ✓ 40 GPIOs
- ✓ Full HDMI port
- ✓ Display interface (DSI)
- ✓ Micro Coyote State card slot



**Fig1.4:** Raspberry pi

### **1.3 Python Language**

The language for creating this project is Python. It could be a widely used all-purpose, high-level programming language(HLL). The style as well as philosophy of the language usually emphasize code readability, and the programmers to specify ideas in fewer lines of code that wouldn't be available and done in languages such as C or Perl. The language provides a massive field for programs on small and vast.

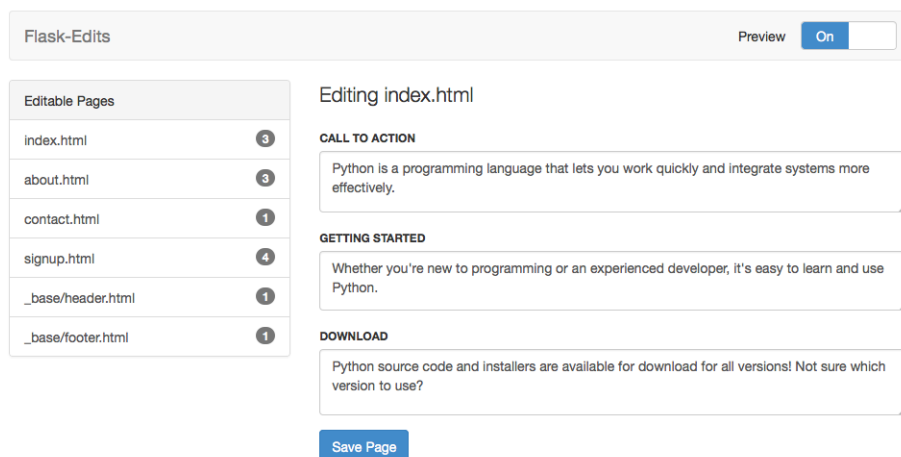


**Fig 1.5:** Python LOGO

Various python interpreters are out there to execute python codes. Exploitation third-party tools, Python code usually prepackaged into complete possible programs for some of the foremost common operational systems.

## 1.5 Server

The server that we have used in our project is Flask server. It is a free and open supply internet application framework. Flask is written in Python, which follows the model-view-controller (MVC) field of any study pattern. It is maintained with the help of Django software system Foundation (DSF), associate freelance organization established. Its main objective is make creation easy of complicated, website for databases. Flask emphasizes easy and "plug ability" of parts, speedy use, and also the method do not repeat yourself. It is employed throughout, even for functions like settings, files, and knowledge models. It provides associate optional body produce, read.



**Fig 1.6.:** Screenshot of the Flask admin interface.

The server can be termed as the program for main hub and client as well as the WWW as Hypertext Transfer Protocol (HTTP). It allows the website that forms pages and user interactive database.

Server-Client shows the relation between the backend and front end. The provider of a service or resource are called **servers** and service requester are called **clients**. The back end usually send some requests to the front end for the various processing. A main hub is a server running backend programs which allocate their resources with clients.



**Fig 1.7:**Server

Clients do not share any resources, although need a server's content or service function.

## **1.6 FLASK**

It is a tiny web based application written in Python and supported the Werkzeug toolkit and a Jinja-2 model engine. It is BSD approved.

The latest stable version of Flask is 0.12 as of Dec 2016. Applications that use the Not exclusively can Pinterest, LinkedIn use FLASK framework but jointly the community online page for Flask itself uses the FLASK Framework.

It is called a tiny low framework as a result of it does not want specific tools as well as libraries. It is not a data abstraction layer, kind validation, or the opposite components where pre-existing third-party libraries offering common functions. Flask supports extensions which can add application

choices as if they were enforced in Flask itself. Extensions exist for object-relational mappers, kind validations, transfer handling, various open authentication technologies furthermore as many common frameworks connected tools. Extensions unit updates lots of material compared to the core Flask program.



**Fig 1.8:** Flask logo

#### **Features of Flask:-**

- I. Have server for development and debugging.
- II. Consist of integrated support used for unit testing.
- III. Has restful request to be dispatched.
- IV. Utilizes Jinja3 tinplating.
- V. Is Unicode-based.
- VI. Has extensive documentation.
- VII. Is Google App Engine compatible.
- VIII. Have extensions available to enhance desired Features.



# CHAPTER 2

## LITERATURE SURVEY

### **Introduction:**

Literature survey is the survey we did for your project, which helps us in completing and telling us about new research fields. Here we are writing the abstract of all the research papers studied by us for this project. This Literature Survey proved to be helpful for us as we were able to have understanding of many unique things. This was interesting also.

### **2.1 Paper 1:**

#### **Learning Shape Prior Modelused for Matching Objects**

Ting teng Jiange, Frederic Jhurein and Cordelian Schmind  
LEARN teaming robotics, INRIAN, Gren-noble, Italy

### **ABSTRACT:**

The objective of this work isn't solely for finding out a form previous modelling for associate objects category however conjointly to boost form matching with the learned from previous. With the given pictures of instances for example, we would be learning a new form related to thing category additionally because the changes in non-affine and affine transformation on an individual basis supported the skinny plate spline (TPS) parameterization. not like previous ways, for learning, we have a tendency to represent shapes by vector fields rather than options that makes our learning approach general. throughout form matching, we have a tendency to inject the form previous data and create the matching result per the coaching examples. This could be achieved by relating extensions of the TPS-RPM formula that can search a closed type answer for the TPS transformation in accordance with the learned transformations. We have a tendency to check our approach by exploitation it to find

out from past models for all the 5 related categories within the ETHZ form categories. The obtained results shows how the educational accuracy is best as compared to previous work and also learning form previous models square measure useful for the purpose of object matching found in real application like that of classification of any object.

## **2.2 Paper 2:**

### **Object Detection Related to Contour Learning and Matching of Templates.**

Qinkunu Xiaoh, Xiojuan Hun and Song Gaon \Haiyund Wangu

*Department of Electronics and Information Engineering, Xi'anu Technological University,  
China\ R&D Centre\ R&D Centre , Singapore*

#### **ABSTARCT:**

A method of object sleuthing supporting learning of native contour and matching is to be projected. Firstly, the representative pictures square measure is achieved by the help of supervised bunch to be used as templates. The previous contour data of example is extracted and normalized because the example feature, at fixed time, codebook lexicon of native contour is constructed up. Secondly, supported codebook lexicon, victimization easy sliding-window mechanism and vote formula to pick out new candidate object windows, the ultimate object related window square measure is obtained from initial candidate windows supporting example feature matching. Experimental results verify that our projected approach is ready to systematically symbolize and accurately find the objects with greater performance as compared to the existing strategies.

## 2.3 Paper 3:

### A WELL-PLANNED LEARNING-RELATING GRAPH MATCHING OBTAINED FOR DYNAMIC MULTIPLE OBJECT TRACKING

DayaZhengu, HongkaieXioang\Yuan Zheeng

Department of Electronics and Electrical Engineering, Shanghai Jiaon Tongu University, Shanghai  
20240, P.R. China\Department of Electrical and Computer Engineering, The Ohio  
Columbus State University, OHIO 4321010 USA

#### ABSTRACT:

For exactly sighting dynamic targets and analyzing a record of the trajectories of similar targets to be looking over time, have become considerably more difficult and can utilize count-less applications in bio-medicine. During this paper, we tend to propose a completely unique structured learning based graph matching formula for tracking a variable variety of interacting objects assimilations in complex environment. Completely different are from previous approaches, the proposed technique will be taking full advantage of neighboring relationships for detecting edge feature within the structured graph. The target drawback can be considered structured node and edge-matching between graphs generated from consecutive frames. In essence, it is developed because of the more weighted bi-partite matching drawback that is to be solved by dynamic Hungarian formula. The parameters of structured graph matching model are mostly not inheritable during a random graduated learning step in numerous dynamic environments. The in depth experiments on dynamic cell and soccer sequences demonstrated that the ensuing approach can deal effectively with difficult target inter-actions.

## 2.4 Paper 4

### **Incremental Learning from a Single Seed Image for Object Detection**

Sehyulng Leea, Jongwon Lime, and Il Hong Suhe

2016 IEEE/RSJ International Conference of Intelligent Robotics and System  
(IROS) Congress Center Hamburg Sept 26 - Oct 1, 2016, Hamburg, Germany

#### **ABSTRACT:**

This research tends to propose a completely unique on-line multi-object learning and detection rule. From single seed pictures of the target objects, our rule detects these objects within the input sequence, and incrementally updates the databases with the detection results. fairly sized databases area unit maintained as graphs of the registered pictures, whereas new views of the objects area unit additional because the detection yield. The importance of the registered pictures is computed victimization our ranking rule, and redundant pictures area unit cropped from the information. The planned methodology totally utilizes graphical illustration to observe and acknowledge objects. A 3D model of a candidate object is made on-the-fly victimization the retrieved pictures, and ab initio undiscovered options area unit hallucinated for any matching and verification. This method will improve the performance of detectionas compared to the baseline rule. Object/Background feature classification with a object-likelihood maps effectively keep shire background options from being additional to the databases. The experimental results demonstrate that the planned rule with efficiency maintains the thing databases and achieves higher performance.

## 2.5 Paper 5

### **Stabilization of Novel Objects by Learning to Predict Tactile-Slip**

Filipee Veig, Herken van Hoofe, Jan Petersburg, Tucker Hramans

2016 IEEE/RSJ International Conference of Intelligent Robotics and Systems (IROS)

Congress Center Hamburg, Sept 29 - Oct 2, 2015. Hamburg, Germany

#### **ABSTRACT:**

Along with grasping and alternative in-hand manipulation tasks which can be maintaining a stable grip on the item is important for the task's outcome. Inherently connected to grip stability is that the formation of slip. Slip happens once the relation between the tip and therefore object is part lost, leading to immediate unsought changes of the objects state. Although many approaches for slip detection are projected in the literature, they regularly have faith in their previous information of the manipulated object. This previous information can also be inaccessible, looking at robot's operative in real-world situations usually should move with antecedently unseen objects.

In our work, we have a tendency to find the generalization capabilities to acknowledge supervision learning strategies, victimization among forest classifiers to prepare generalizable slip predictors. We have the tendency to enable these classifiers within the circuit of associating object stabilization controller. We have a tendency to prove that the controller would provide success with stabilize antecedently unknown objects by predicting and counteracting slip events.

## 2.7 Paper 6

### Origin of Surgical Robotics: From Space to the Operating Room

Arpad Takacs, Denes A. Nagy, Imre J. Rudras, Tamas Haidegger Antal Bejczy Center for Intelligent Robotics, Obuda University, Bocsilut 96/b, H-1034 Budapest, Hungary {arpad.takacs, denes.nagy, haidegger, rudas@irob.uni-obuda.h

#### ABSTRACT:

The speedy growth of tele-robotic system light-emitting diode to new applications on the far side of the nuclear and industrial domains. Medical robotics enables surgeons to perform medical operations from overseas, far from their patient. These systems permit nice flexibility, improved performance generally, and support the creation of ideal surgical conditions. The primary motive is an attempt to develop tele-surgical systems borrowing the thought from area analysis, wherever the requirement of novel robots emerged for invasive treatment, even underneath extreme things, like lightness.

Tele-surgical instruments on Earth appeared to be following identical idea, aiming 1st for military, then onward for civilian applications. Today, nearly 1.5 million patients to recieve tele-robotic treatment annually, in the whole world. Because the surgical AI domain start growing from the initial ideas, it have developed on 3 major concepts: tele-surgery, hand in glove controlled robots and automatic (image-guided) applications. These domains still change into application specific systems with the aim of reaching the specificity and flexibility of standard surgical instruments to be used.

## 2.8 Paper 7

### **Assistive Healthcare Robot for Patient and Disabled People**

P PramodKumar, Assistant Professor, Electronics and Communication Engineering, Nandhan Engineering College Tamilnadu, India. M Deepa kumar Electronics and Communication Engineering, Nandha Engineering College, Tamilnadu, India.

#### **ABSTRACT:**

The project is related to the care of the patients by automation like nursing behavior. This automation is mainly concerned with the creation of the system which is attainable for the older and disabled to stay receptive, safe and happy. Automation becomes a viable possibility for older and disabled World Health Organization (WHO) which is likely to remain within the comfort of their homes instead of moving to a health facility. Owing to automation, the person power that is needed to worry the patient is reduced. This method helps patients to take their pill at correct time. In this, the plate which is mechanically mobile consists of separate bowls. Each bowl has the tablets that are provided to the patients for every interval of your time. If the pill is taking time, then mechanically this method moves towards the patient and with the assistance of rotating plate the corresponding pill for that specific time is given to the patient. This method makes notification to the patient for taking tablets. The notification is within the kind of alarm. Just in case the patient is sleeping at the time of taking pill the alarm is employed to rouse the patient. Additionally, to the current, home appliances like, lights are often controlled by exploitation IR working man. GSM communication block is additionally introduced during this system for human action with outside world folks. With the assistance of GSM module mechanically notification is sent to the patient's neighbor within the kind of message. Owing to message the patient's neighbor able to grasp whether or not the patient has taken the pill or not. This automaton movement relies on the concept of line follower. A Line follower is an associate of degree electronic system that may sight and follow the road drawn on the ground. This automaton movement relies on the road follower idea. The {show|LCD|digitalshow|alphanumeric display} display is employed to display the automaton operations and its movements.

# **CHAPTER 3**

## **SYSTEM ARCHITECTURE AND DEVELOPMENT**

### **3.1 Introduction**

It is a typical machine which can walk and trace the objects around it in addition to the updates provided related to weather, time, social networking sites, etc.

Some of the salient features of the machine can be shown as below:

- Can move anywhere in the room.
- Can talk like a human.
- Can remember objects and thus enable the concerned person to find them easily and efficiently.
- Can save a lot of time.
- Can help in the development of advanced human assistant robots in future.

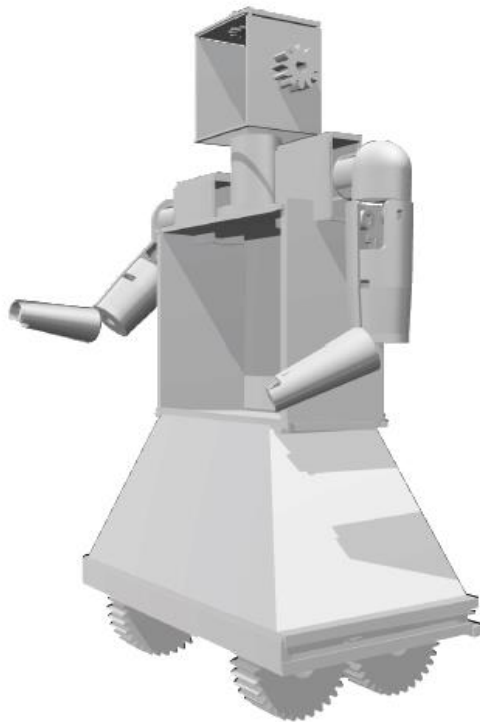
In context to this, we have decided to design a robot cum assistant which can purposely enable us to achieve the above mentioned desired targets.

The sole purpose of the designing is to give it a physical structure which can instigate us to develop future insights about the concerned developments.

Various modules are attached to it so as to have the proper functioning. Software's like 3-D builder, 3-D sketch up, eagle CAD are used to develop virtual copy of physical structure.



## 3.2 System Architecture



**Fig 3.1:** Machine Model

This model includes various components which will help it to act as a human.

### **1. *Raspberry pi***

It acts as the brain of our machine enabling to have speech to text and text to speech conversion. Also, it is used to run the motors and helps in movement of pi-cam for investigating the various objects in the room.

### **2. *Audio jack***

It is taking audio as input and convert it into electrical signal which is received by raspberry pi for further processing.

### **3. *Speakers***

All the electrical signals coming from raspberry pi are received by speaker which can convey the information to us.

### **4. *Circuit for machine movement***

The circuit implemented by us is directly taking a request from server with the help of flask framework and signal coming from raspberry pi is interfaced with motor driver IC: L293D.

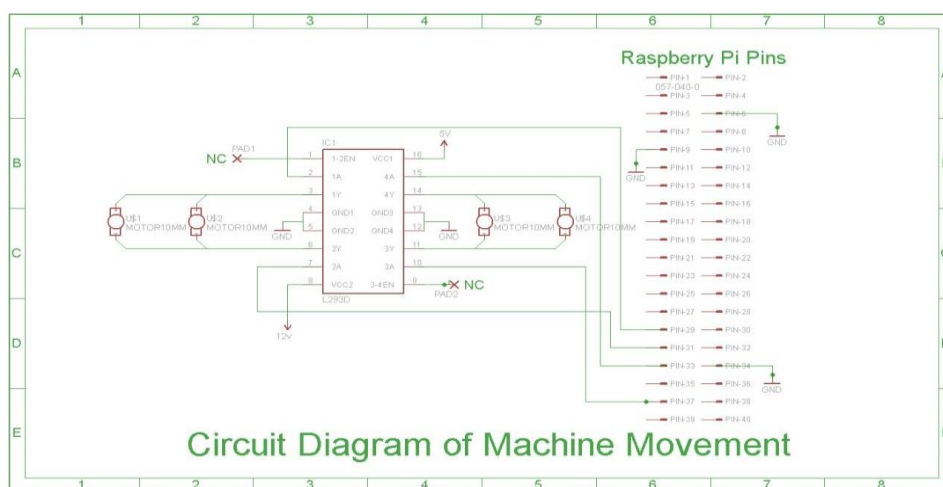
### 5. Shaft for Camera

It is connected to one of the motor and its rotation will enable the pi-cam to trace the concerned objects of the room.

### 6. Tyres

They are used to move the machine and help in the proper control regarding the directions intended for its movement.

## 3.3 Assembling Circuit Hardware Setup



**Fig 3.2:** Circuit Diagram of Machine Movement

If we look at the circuit diagram assembled on EAGLE, it is clear that the signal from server is sent to Raspberry Pi which is connected to motor driver IC in which a H-Bridge is formed where 4 motors are connected to enable the driving of the machine.

The circuit consists of the following parts:

1. Raspberry Pi
2. Motor Driver (L-293D)
3. DC Brush Motors (5)
4. Connecting Wires
5. Switches

### 3.3.1 Motors

We are using motor to rotate the camera. The camera is mounted on the motor. When the IR sensor, which is present in each direction get activated, it sends signal to motor and motor starts rotating the camera and the desired output is achieved.



**Fig 3.2:** Motor

A Motor is a electrical machine which is able to convert one form of energy to another like it is able to convert the electrical power into the mechanical work. And the opposite to it is Generator which converts the mechanical work into the electrical work. The rate by the interaction of an electrical motor's force field and winding currents to get force among the motors. In bound applications, like within the transportation business with traction motors, they'll operate in each driving and generating or braking modes to conjointly turn out power from energy.

Motors are found in different applications such as machine tools, Electric cars, fans, power tools, and Optical data reader. Tiny motors are utilized in watch. Another-purpose motors, with extremely suitable x, y or z dimension and classification, offer convenient mechanical power to be utilized in business.

The largest electrical motors are utilized in varied applications like ship propulsion. Electrical motors will be classified on the basis of electrical power supply sort, internal construction, application, form of motion output, and so on.

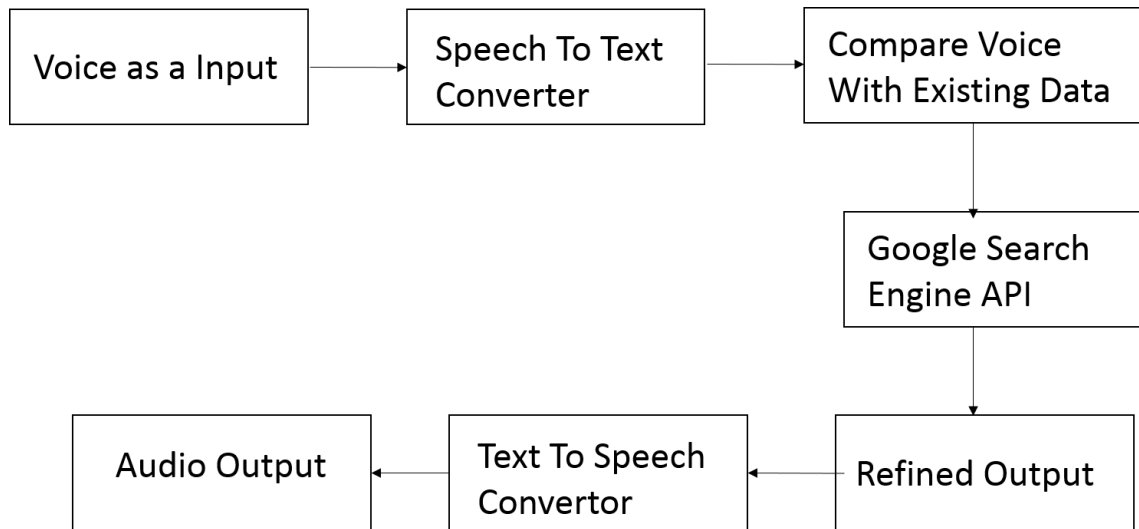
### 3.3.2 Battery:

A rechargeable battery or accumulator or electric cell could be a form of electrical battery which may be charged and as discharged (when used with a load). It can also be recharged persistently. On the other hand, a non-rechargeable or primary battery is equipped once it's absolutely charged, and is discarded once it gets discharged. It is composed of 1 or additional chemistry cells. It accumulates and stores energy through a reversible electro chemical action and then it's additionally referred to as “accumulator”. Reversible batteries are obtainable in many various shapes and sizes, starting from button cells to power unit systems connected to stabilize associate degree electrical distribution network, depending upon the requirements. varied completely different mixtures of conductor materials and electrolytes are used, consisting of lead acid, nickel metallic element, (Li-ion) Li particle, and (Li-ion polymer) Lithium particle compound. Reversible batteries generally cost more than disposable batteries, however have a far lower total value of possession. Rechargeable batteries are eco- friendly as compared to disposable batteries. They will be recharged inexpensively persistently before they will be replaced. Some reversible battery sorts are obtainable within the same sizes and voltages as disposable sorts, which may be used interchangeably with them.



Fig 3.4: Battery

### 3.4 Algorithm for voice Detection and Audio Output



**Fig 3.5:** Voice Recognition and Audio Output

This Algorithm explains how the voice signals, which are taken as input, are interpreted and responded by the Robot. The output, in turn, is in the form of Audio. The voice input is first converted to text by speech to text convertor and is then compared with the already present data in the database. The refined output is then converted from text to speech and is sent to speaker.

# CHAPTER 4

## SPEECH RECOGNITION SETUP

### 4.1 Hardware Requirements

Savvy is specifically designed for the RPi (Model B) and it also required a new hardware like a Wi-Fi module and microphone. We can do some different parts or specifications of hardware, but we cannot be absolutely sure that Savvy will be working on these parts. **Raspberry Pi Model 3**

- Microphone with USB
- 32GB Micro SD reader
- Ethernet Cable
- Mini-USB
- USB Cable
- Charging Adapter.
- Speaker

### 4.2 Assembly

Assembly of the components is very simple. We can start by inserting the Micro SD card, microphone, adapter, USB cable for 5V, LAN cable, and speakers for RPi. Universal Serial Bus charging adapter with 5v output is required to power Savvy.

### 4.3 Installation of Software

These are the steps to compile and code Raspberry pi for the project savvy.

#### ***Burn Raspbian Jessie image onto SD card***

First of all clear the SD card using formatting software available for windows. Raspberry pi image can be burn using SD universal boot loader and SD card adapter.

```
#sudo of disk -
```

Our address was '192.168.0.13', we are using universal SD boot loader to burn the image to SD Card.

```
#sd burn <device>
```

Remove the SD card and Plug it in the Raspberry pi.

### ***Configure Raspbian***

Raspbian is a operating system and will help to operate the system for the glance of the working and output. The IP addresses generally falls in the 192.168.0.2 to 192.168.0.255 range.

```
#ssh pi @192.168.0.13
```

Run command for the Raspberry pi configurations

```
#raspi-config # For Configuration
```

We are updating the Pi using following commands and install some useful tools.

```
#apt-get update
```

```
#apt-get upgrade
```

Open ALSA Mixer after opening the and plugging in the microphone :

```
#sudo vim /etc/alsa-mixer.conf
```

To setup input we have to change the following lines:

```
options usb-audio index= 1
```

and line will give you output as given.

```
options usb-audio index=0
```

Shell command :

```
#sudoalsa force-reloaded
```

After restarting the pi we can check audio:

```
#arecord new.wav
```

Connect headphones and see the output.

```
#aplay -D hw:1,0 new.wav
```

These lines is to be added in the end of the file `~/.bash_profile` .

```
#export LD_LIBRARY_PATH="/usr/local/lib"
```

And this to your `~/.bash_profile`:

```
export LD_LIBRARY_PATH
```

```
PATH=#PATH:/usr/local/lib/
```

```
export PATH
```

With that, we are ready to install Savvy.

### ***Install Savvy***

We can make our code in any file of the OS because it is an Linux and linux support python in any folder, you have to clone the Savvy source code:

```
#git clone http://github.com/Savvyproject/Savvy-clientSavvy
```

Some python liberaries are required to install the savvy completely:

```
#pip install --upgrade setup tools
```

```
#pip install -r Savvy/client/requirements.txt
```

Sometimes it may be necessary to make `Savvy.py` executable:

```
#chmod +x Savvy/Savvy.py
```

Savvy code is burned properly and now we can start download the other dependencies.

### ***Installing dependencies***

The STT is an engine which require. Savvy also require a

**Configuration section:**



We will configure the setup of savvy with STT according to your flavor. You can then come back to start and implement the STT according to the choice.

### ***Install Dependencies for Pocket Sphinx STT engine***

Note: Installing pocket sphinx and will take lot of time.

Savvy might use Pocket Sphinx for voice recognition. There are various STT provided.

1. Sphinxbase & pocketsphinx
2. OpenFST & Phonetisaurus
3. Espeak Engine
4. Serial Transfer data

```
#yaourt -S Savvy-tts-pocket sphinx
```

We need to install the setup for STT.

### ***Installing Pocket sphinx***

First, you need to install Pocket sphinx.

```
#sudo apt-get update
```

```
#sudo apt-get install pocket sphinx
```

### ***Building the Phonetisaurus FST model***

```
#https://www.dropbox.com/s/kfht75czdwucni1/g012b.tgz
```

```
#Link to download g012b.tgz file
```

```
#tar -xvf g014b2b.tgz
```

Build Phonetisaurus model:

```
#cd g014b2b/
```

```
#compile
```

```
#cd ..
```

Finally, rename the following folder for your convenience:

```
#mv ~/g014b2b ~/phonetisaurus
```

### ***Configuring Savvy :Profile Generation***

Savvy needs a configuration file that will be called “profile”. Savvy to perform tasks tasks accurately like report local weather conditions, send you text messages, and more, you need to first generate a user profile. In order to facilitate the process, we profile run and configuration already done with Savvy.

```
# cd ~/Savvy/client  
  
# python weather.py
```

The whole process is self-explanatory: fill in the requested information, or hit ‘Enter’ to defer at any step. **YML** file at. `~/.Savvy/profile1.yml`.

**Important:** *weather.py* will request your Gmail password. The password which we have generated will allow Savvy to report on the incoming emails *and* send us the text or email notifications.

### ***Choosing an STT engine***

We are required to select which type of Speech-To-Text (STT) engine Savvy should use. A STT engine is typically a kind of software that will take the recorded speech and transforms it into written text. If you say “hello”, but Savvy will understand “hollo”,

- **Pocket sphinx**: It is an open source designed by the CMU team. Pocket sphinx is a software which will be able to convert the voice data into text and we are using the same module in the android application which is easy to use.
- **Google STT**: It is also type of STT which is an internet driven that means it is controlled by the internet and we just need to activate it just by saying OK Google to the program.
- **AT&T STT**: It is a Speech decoder by the AT&T. Like Google Speech, it also take online setup i.e. internet and need and internet connection for running.

**NOTE:** *We are using Pocketshinx for STT engine.*

### **Configuring the Pocketsphinx STT engine**

Install the required software. Then, locate your FST model (g014b2b.fst) and your Hidden Markov Model directory (hub4j\_sc\_8k). adding path to already existing file profile.yml

```
pocketsphinx:  
  
fst_model:'../phonetisaurus/g014b2b.fst'#optional  
  
dir:'/usr/local/share/hmm/en_US/hub4wsj_sc_8k'
```

### **Choosing of a TTS engine**

TTS means text to speech engine and is opposite to Speech to text engine STT engine: It takes written text and transforms it into speech. Savvy supports many different TTS engines that differ by voice, intonation, “rootedness” and so on.

- **Espeak**: It is a small open source program for converting text to speech conversion for most of the platforms. Speech synthesizer is mostly done offline.
- **MaryTTS**: It is an Open source. We are required to set up your own Mary text to speech server and configure Savvy to use it. Since the main server is running on the machine which we are using, which is running Savvy, we are not required to have internet access.
- **Mac OS XTTS** does only work if you're running Savvy on a Mac. It uses the say command in Mac Operating System to synthesize speech.

**Note:** We are to use Espeak for Text to speech configuration

### **Configuring the eSpeak TTS engine**

Install the Espeak and give the output by adding the command in the file.

```
tts_engine:espeak
```

Further customization can also be possible by tuning the `voice`, `pitch_adjustment` and `words_per_minute` options in your `profile.yml`:

```
espeak-ts:
```

```
voice-setup:+ m5
```

```
Adjustment of Pitch: 100
```

```
Word length per minute: 260
```

## CHAPTER 5

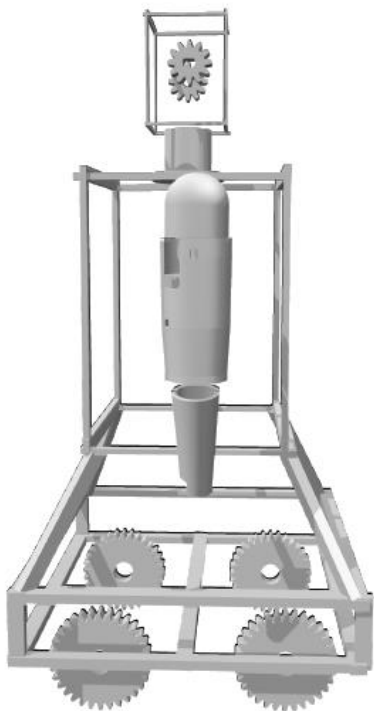
### ASSEMBLING

Assembling's actual meaning is to fit together the different components of a machine. It is a vital part to enable any machine getting the desired functionality as per our requirement. We can change the structure or assembled parts so as to alter the working and functionality.

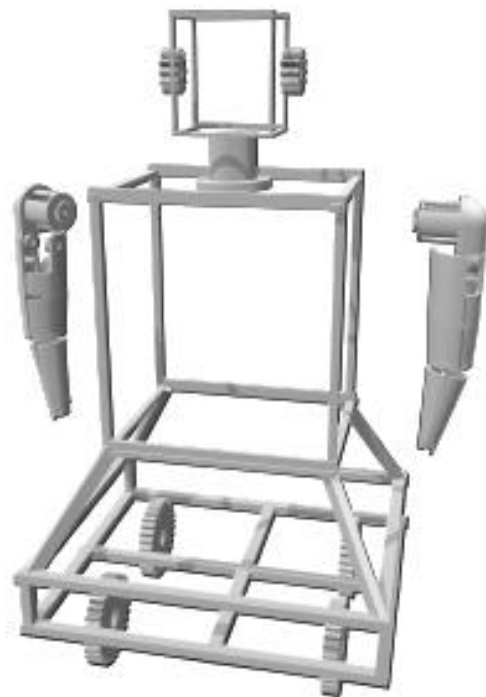
#### 5.1 Machine Model

We are reassembling the prototype like a full-fledged working human. So, we are putting all the essential body parts together to give our machine resemblance to a human.

In this chapter, we are about to explain all the body parts of our model that have been assembled together.



(a) Side View



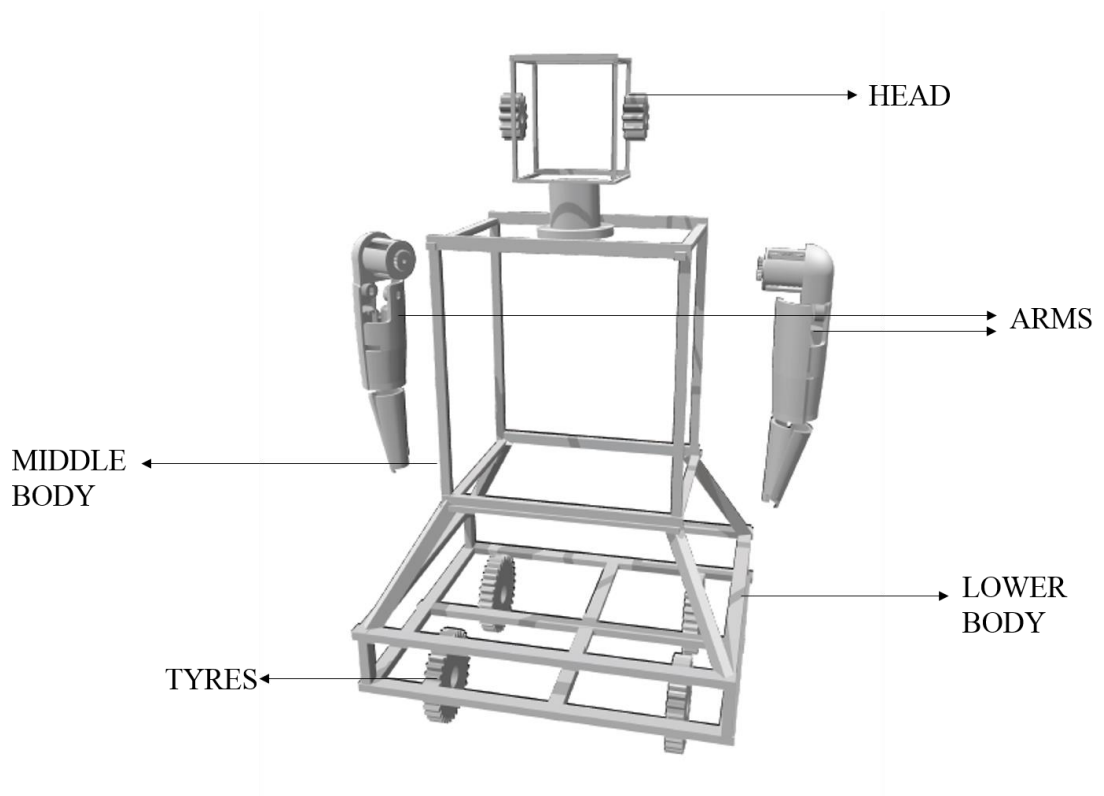
(b) Front View

**Fig 5.1:** The Model

**Fig 5.1(a)** depicts the Side-View of the model whereas **Fig 5.1(b)** shows the Front -View of the model. They are representing different angles of the machine.

## 5.2 Sub-Parts of Machine

We are about to explain the different components separately in the upcoming sections.

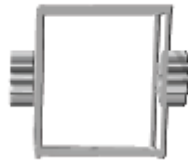


**Fig 5.2:** Parts of the Model

We have divided the model into various physical parts (shown in **Fig 5.2**) which are as follows:

## 1. HEAD

It is represented in the form of square as square shape is easy to demonstrate as well as design. There is a pi camera on the head used for scanning the area. The images, which are scanned, are fed into the database and can be retrieved as per the requirement. Head is the main component of the body through which we can interact and communicate.



**Fig 5.3:** Head of the Machine

## 2. ARMS

Each arm consists of a gear and two motors (DC Motor and Servo Motor). DC motor is used in lower arm and is of 100 rpm while Servo Motor is used in upper arm and has a torque of 10 kg/cm. Arms are used to express feelings and gestures. They are also used to carry things from one place to another.



**Fig 5.4:** Arms of the Machine

## 3. MIDDLE BODY

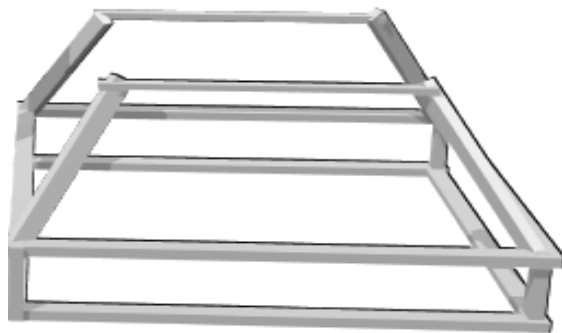
It connects the upper body and the lower body. All the processors are present in this section of the model. Arms of the machine originate from the Middle body. It consists of a Microcontroller which is Arduino Uno Rev 3, we have used three Arduino to control the arms and neck. This section also consists of a processor known as Raspberry-Pi which is the main processor and is acting like a hub to control all the major actions.



**Fig 5.5:** Middle Body of the Machine

#### **4. LOWER BODY**

The lower body is providing a support to the machine to stand erect. Tyres are also originating from this section of the machine. It consists of the circuitry which is responsible to control the rotors and tyres. The shape is such that the surface area is sufficient so as to accommodate tyres at a sufficient distance and maintain the balance.



**Fig 5.6:** Lower Body of the Machine

#### **5. TYRES**

They work the same way as done by the legs in the human body. They are helping the machine in locomotion. We have used four tyres so as to balance the weight and motion



of the Bot. Tyres are controlled with the help of DC Motor which is of 100 rpm and a motor driver (L293-D).



**Fig 5.7:** Tyres of the Machine

### **5.2.1 Hardware components**

The assembly of the whole circuitry can be shown by the help of flow-chart as well as explained as follows. Main components to be used are:

- **Bluetooth Module**

It is used to communicate between different parts of the machine and is mainly used for narrow range communication.

- **Arduino Uno**

It is basically used to send serial data to the Raspberry-pi. It is a microcontroller having 14 digital input/output pins (in which 6 pins can be used as PWM outputs). We are using it for the sake of simplicity to convert digital signals into analog signals. It helps in making small modules of a complete project.

- **Raspberry pi**

It is like central unit of the project which control the whole machine and enable it to perform the specified tasks. It is acting like a brain for the entire system. It is controlling the other three Arduino used in the machine. Its basic task is the data analysis.

- **Speakers**

They are live wires of the device through which the device can communicate. It is also used to acknowledge whether the input data has been understood and executed or not. We are calling our Robot as ‘Talking Robot’ as it is able to comprehend and respond with the help of speakers. After successful execution of the input commands, the output is also given through them.

- **Processor**

In this project, it is used to provide three specific features:

- Temperature.
- Humidity.
- Moisture.

### 5.3 Voice Detection and analysis

Voice Recognition Set-Up (explained in Chapter-4) is used to convert human voice (i.e. in the form of signals) to the voice recognized by the computer.

The input is taken with the help of speaker and is sent to Bluetooth Module which directs it to micro-controller for further processing. The micro-controller used is Arduino which is further connected to main hub i.e. Raspberry-Pi. Data Analysis is done with the help of Pi and hence the desired output is obtained.

We can describe the complete process with the help of flow-chart as follows:

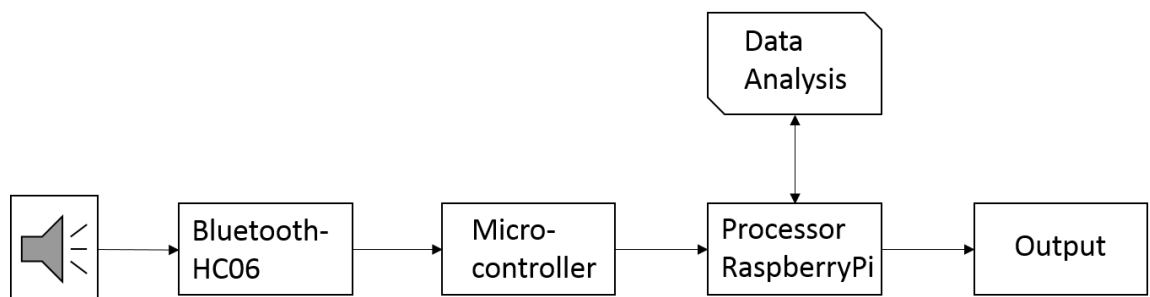


Fig 5.8: Block Diagram 1

## 5.4 System Model for Home Safety Monitoring

In our project, we are using a sensor (gas sensor) which senses the level of gas in the kitchen. It sends the information to the processor (Raspberry-Pi). The processor is connected to the server which in turn informs the user about the level of gas in their home. The user in turn can be alarmed, if in case if there is a gas leakage in their home when they are not present.

The following flow-chart depicts the System Model for Home Safety Monitoring.

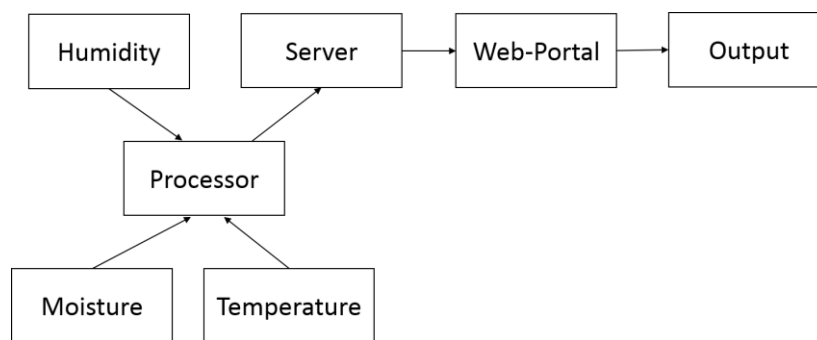


Fig 5.9: Block Diagram 2

## 5.5 Software Application

The front end of the project can be shown with the help of the following diagram:

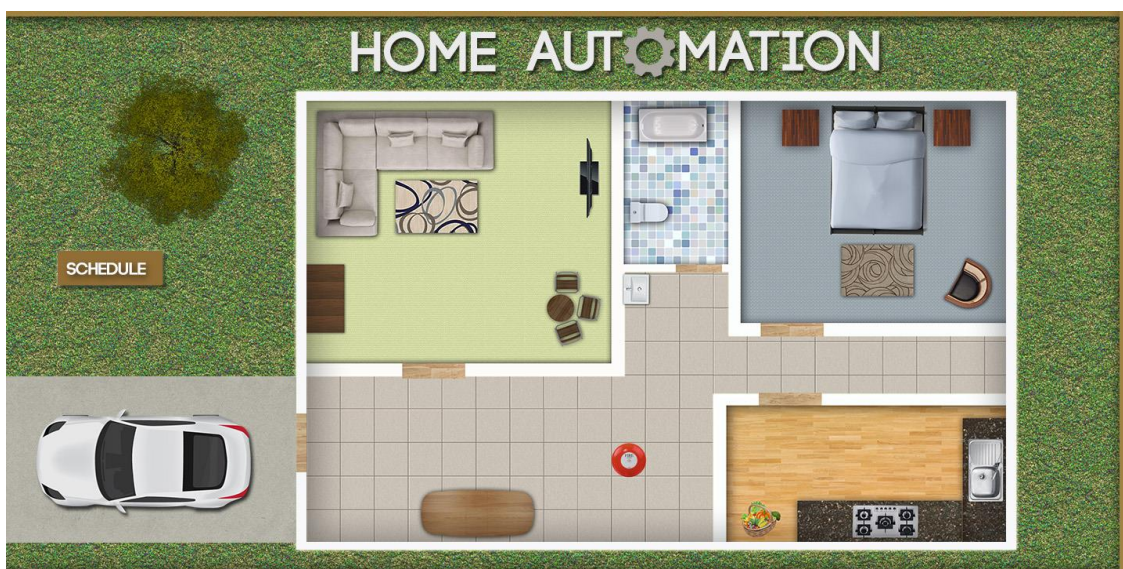


Fig 5.10: Front End of the Project

The figure shows all the areas in a home where we can get control of the various electrical components. It shows different rooms and electrical components like lights, fans, air-conditioner in them. When we are outside home, we can easily have control on our home using the web and the front-end (made for this purpose). We can also come to know about the leakage of the gas as there is a gas sensor for detection. We have been able to design the front end with the help of Web Portal which has been explained as follows:

### **Web Portal**

It can be referred to as a Web page as World Wide Web (WWW). It can also be described as a local HTML home page including CSS, JS and may be running on a Web browser. It is the front end of a project which can be used to ask the device about what we are intending for manually.

## **CHAPTER 6**

### **CONCLUSION**

We have been successful in making a project where we can have control on our homes when we are **INSIDE** as well as **OUTSIDE**. We are able to have control with the help of a full-fledged Machine which can perform the following tasks:

#### **INSIDE HOME:**

- I. We have a 'Talking Robot' which is providing us a helping hand when we are inside home. All we have to do is to tell the Robot what has to be done. The Robot understands the tasks and gives the required outputs.
- II. If we want to update anything on **TWITTER**, we can ask our Robot to do so. There is no need to run to every room for switching on or turning off the lights. We have to give commands to the Robot and our work is done within the span of blink of an eye.
- III. If we want to know the daily schedule, there is no need to write a Memo. Our Robot is the perfect reminder. It tells us all that we have lined up for the day.
- IV. The Robot automatically checks the levels of gas and turns off the gas valve when the level has risen above a threshold limit. There is no need to run and open or close the main doors of the house, we just have to tell the Robot to do so.

#### **OUTSIDE HOME:**

- I. Often a person forgets to turn off lights, fans, air conditioners and various other electrical components. It may also happen that one forgets to lock the main door. There is no need to run back to home.
- II. We have been successful in making a **FRONT-END** of the project where we can control everything (as explained in points above) with the help of the web portal made for this purpose. All that is required is **INTERNET** connection.

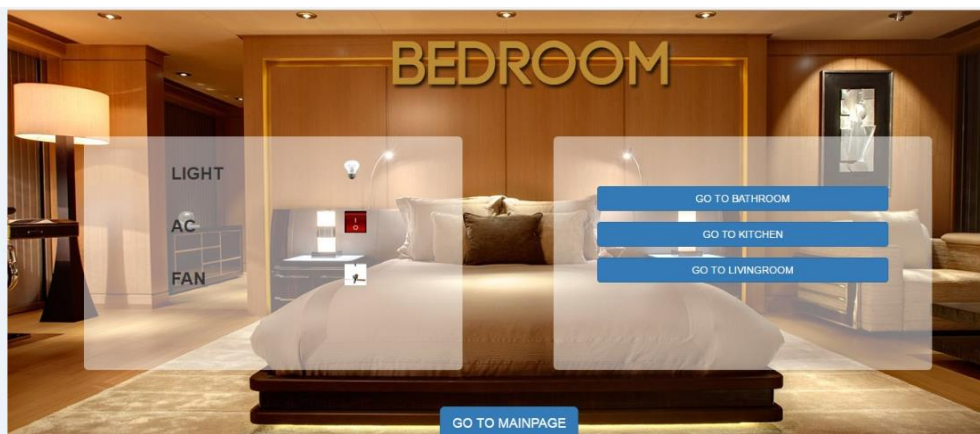
We can easily depict the final results with the help of pictorial representations as follows:

This figure shows the front page of the web-portal which describes a personalized home automation system where we can perform various tasks which can be opted with the click of a button.



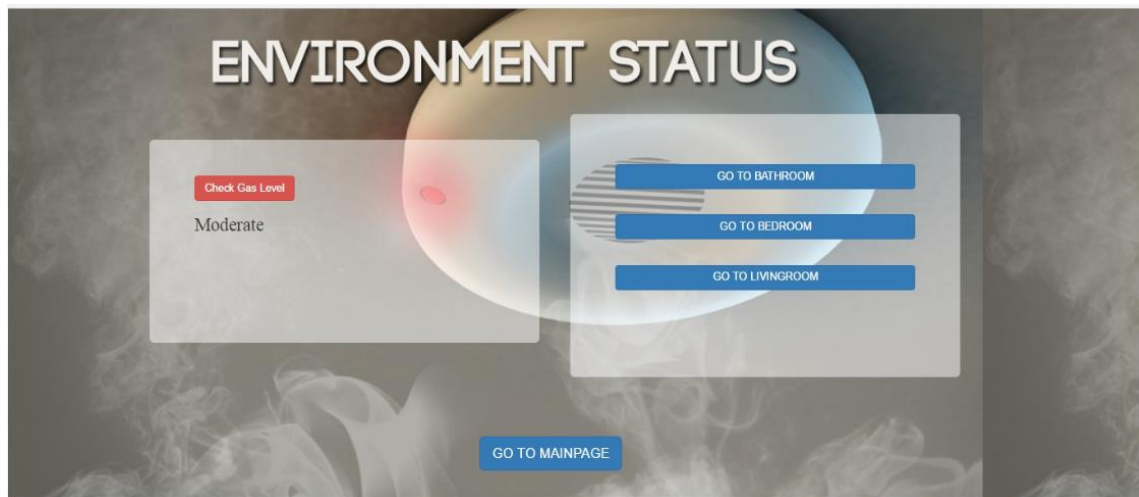
**Fig 6.1:** Pictorial Description 1

The figure on the next page describes a well-versed bed-room in which we can easily on or off light, ac, or fan according to our requirement whether we are in the room or not. We can also to bathroom, kitchen, or living-room as per our requirement. All this can be done just with the click of the button and hence can be controlled even with the help of mobile phone.



**Fig 6.2:** Pictorial Description 2

The figure below depicts the environmental status of the room, i.e. gas level and tell the owner to take the required action if the level of gas is high in the kitchen.



**Fig 6.3:** Pictorial Description 3

The figure shown below describes the living room in which we can alter light, ac, fan, or television with just one click.



**Fig 6.4:** Pictorial Description 4



**Fig 6.5:** Pictorial Description 5

This figure shows the blue-print of the Home Monitoring System. The model shows various places in the house along with electrical components which can be controlled with the help of our Robot.

The figure below depicts the prototype of the working model of the Robot which describes the physical model during the construction phase of device.





**Fig 6.6:** Pictorial Description 6

All these descriptions are vital to show the front-end of the result as well as to get an idea about the functioning of the whole project by the means of pictorial representations.

## APPENDIX - A

### PYTHON CODE:

```
import time
from flask import Flask, render template
import RPi.GPIO as GPIO

app = Flask(__name__)
GPIO.setmode(GPIO.BOARD)
pin1 = 29
pin2 = 31
pin3 = 33
pin4 = 37
GPIO.setup(pin1, GPIO.OUT)
GPIO.setup(pin2, GPIO.OUT)
GPIO.setup(pin3, GPIO.OUT)
GPIO.setup(pin4, GPIO.OUT)

@app.route("/")
@app.route("/<state>")
def Bot_move(state=None):
    if state == 'Forward':
        GPIO.output(pin1, GPIO.HIGH)
        GPIO.output(pin2, GPIO.LOW)
        GPIO.output(pin3, GPIO.HIGH)
        GPIO.output(pin4, GPIO.LOW)
        time.sleep(1)
        GPIO.output(pin1, GPIO.LOW)
        GPIO.output(pin2, GPIO.LOW)
        GPIO.output(pin3, GPIO.LOW)
        GPIO.output(pin4, GPIO.LOW)
    if state == 'Back':
        GPIO.output(pin1, GPIO.LOW)
```

```

GPIO.output(pin2,GPIO.HIGH)
GPIO.output(pin3,GPIO.LOW)
GPIO.output(pin4,GPIO.HIGH)
time.sleep(1)
GPIO.output(pin1,GPIO.LOW)
GPIO.output(pin2,GPIO.LOW)
GPIO.output(pin3,GPIO.LOW)
GPIO.output(pin4,GPIO.LOW)
    if state == 'Right':
GPIO.output(pin1,GPIO.HIGH)
GPIO.output(pin2,GPIO.LOW)
GPIO.output(pin3,GPIO.LOW)
GPIO.output(pin4,GPIO.HIGH)
time.sleep(1)
GPIO.output(pin1,GPIO.LOW)
GPIO.output(pin2,GPIO.LOW)
GPIO.output(pin3,GPIO.LOW)
GPIO.output(pin4,GPIO.LOW)
    if state == 'Left':
GPIO.output(pin1,GPIO.LOW)
GPIO.output(pin2,GPIO.HIGH)
GPIO.output(pin3,GPIO.HIGH)
GPIO.output(pin4,GPIO.LOW)
time.sleep(1)
GPIO.output(pin1,GPIO.LOW)
GPIO.output(pin2,GPIO.LOW)
GPIO.output(pin3,GPIO.LOW)
GPIO.output(pin4,GPIO.LOW)
template_data = {
'title' : state,
    }
return render_template('main.html', **template_data)
if __name__ == "__main__":

```

```
app.run(host='0.0.0.0', port=80)
```

### **Python Serial Programming code:**

```
import serial
import os,time
import RPi.GPIO as GPIO
import sys
from twython import Twython

GPIO.setmode(GPIO.BOARD)
CONSUMER_KEY = '1Od5JSKdpaZqXVyNgFgQ7VqvO'
CONSUMER_SECRET =
'6YQwS1J465SpfP7A1zqgRkDQxsjMerGZ1TIBc06w4EibfTQxFO'
ACCESS_KEY = '1591669830-
aDNQ9JKzWGIIyi1t8CMaG2gWodqeyOxxYFXAwU'
ACCESS_SECRET = 'rCAhw5dwQwEg7EdlKWizGHfId1X7QfIfvo2l4zCRBc51n'

api =
Twython(CONSUMER_KEY,CONSUMER_SECRET,ACCESS_KEY,ACCESS_SEC
RET)

GPIO.setup(29, GPIO.OUT)
GPIO.output(29, GPIO.LOW)
GPIO.setup(7, GPIO.OUT)
GPIO.output(7, GPIO.LOW)
GPIO.setup(16, GPIO.OUT)
GPIO.output(16, GPIO.LOW)

def robot(text):
    os.system("espeak ' " + text + " '")

ser = serial.Serial('/dev/ttyACM0',9600)
#print ser
#assert False
ctr=0
while True:
    #print ser.readline()
    ctr+=1
    #if ctr==1:
    #continue
```

```

x = str(ser.readline())
x=x[:-2]
#print len(x),x
# t+=1
#print "value of x is %s"%x
#print x=="LOW"
#print x=="MID"
print x
if (x=="*hello"):
    robot("Hello Sir! What Can I do for you sir")
elif(x=="*what is the day today"):
    robot("Its Saturday")
elif (x=="*increase temperature by 1 degrees"):
    robot("Yes Sir! I am trying to maintain the temperature")
elif (x == "*living room lights on"):
    robot("Yes sir! Turning the Living Room Light on")
    GPIO.output(33,GPIO.HIGH)
    robot("Done Sir! You can check")
elif (x == "*living room lights off"):
    GPIO.output(33,GPIO.LOW)
    robot("Yes Sir! Turning the Lights OFF")
elif (x == "*bedroom lights on"):
    robot("Yes Sir! Turning The bedroom lights on")
    GPIO.output(16,GPIO.HIGH)
    robot("Done sir ! You can check")
elif (x == "*bedroom lights off"):
    GPIO.output(16,GPIO.LOW)
    robot("Turning the Bed room Lights OFF")
elif (x == "*kitchen lights on"):
    GPIO.output(29,GPIO.HIGH)
    robot("Turning the Kitchen Lights ON")
elif (x == "*kitchen lights off"):
    GPIO.output(29,GPIO.LOW)
    robot("Turning the Lights OFF")
elif (x == "LOW"):
    print "Low Blow"
elif x=="MID":
    print "In middle of legs"
elif x=="HIGH":
    print "Dude you're high"
elif x == "*all off" or x == "*all of":

```

```

        robot("Shutting down everything")
        GPIO.output(29,GPIO.LOW)
        GPIO.output(7,GPIO.LOW)
        GPIO.output(16,GPIO.LOW)
        robot("Good Bye Sir!")
elif x=="*Twitter":
    robot("What do you wish to tweet")
    print "I'm here"
    x=str(ser.readline())
    x=x[:-2]
    print "Waited for it"

    api.update_status(status="."+x+".")
    print x
    robot("Yes sir, tweeted it")
else:
    print "Wrong Input"
#     break
#robot("Hello Sir! What I can do for you sir")
# print (x)

```

## APPENDIX B: LINKS

Document Name and Version	Description	Link
<b>Buy Raspberry pi</b>	<u>Cost Vary from 3,000 - 3500/-</u>	<a href="http://in.element14.com/raspberry-pi/raspberrypi-2-modb-1gb/sbc-raspberry-pi-2-model-b-1gb/dp/2461030">http://in.element14.com/raspberry-pi/raspberrypi-2-modb-1gb/sbc-raspberry-pi-2-model-b-1gb/dp/2461030</a>
<b>Buy Pi cam</b>	<u>Cost vary from 1300-1700/-</u>	<a href="http://www.amazon.in/OEM-rev-1-3-raspberry-camera/dp/B00LO4CJDW">http://www.amazon.in/OEM-rev-1-3-raspberry-camera/dp/B00LO4CJDW</a>
<b>Buy 12V buy</b>	<u>Cost vary from 100-200 /-</u>	<a href="http://www.amazon.in/Taravision-TR-01-Adaptor-Supply-100-240V/dp/B00YMI083K?tag=googinhydr18418-21&amp;tag=googinkenshoo-21&amp;ascsubtag=16bc701a-78f9-453b-9699-a9eed864227a">http://www.amazon.in/Taravision-TR-01-Adaptor-Supply-100-240V/dp/B00YMI083K?tag=googinhydr18418-21&amp;tag=googinkenshoo-21&amp;ascsubtag=16bc701a-78f9-453b-9699-a9eed864227a</a>
<b>Pi camera Installation Tutorial</b>	<u>Helpful if the user is connecting it first time</u>	<a href="http://www.modmypi.com/blog/installing-the-raspberry-pi-camera-board">http://www.modmypi.com/blog/installing-the-raspberry-pi-camera-board</a>
<b>Buy GSM 900A</b>	<u>Cost Vary from 900-1200/-</u>	<a href="http://www.flipkart.com/hitron-gsm-gprs-sim-900a-modem-antena/p/itme5dxz3vfpcqzk?pid=ETYE5DXZF3C6VGAN&amp;otracker=reco_pp_same_toy_learningtoy_3&amp;ppid=ETYE3FSUYNG5ACJF">http://www.flipkart.com/hitron-gsm-gprs-sim-900a-modem-antena/p/itme5dxz3vfpcqzk?pid=ETYE5DXZF3C6VGAN&amp;otracker=reco_pp_same_toy_learningtoy_3&amp;ppid=ETYE3FSUYNG5ACJF</a>
<b>Savvy</b>	<u>Documentation of Savvy</u>	<a href="http://Savvyproject.github.io/documentation/faq/">http://Savvyproject.github.io/documentation/faq/</a>

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