VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590018

Project Report

On

INSTANT BRAILLE KEYPAD

Submitted in partial fulfillment of the requirements for the award degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION

Submitted by

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2021-2022

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CERTIFICATE

This is to certified that the project work entitled "INSTANT BRAILLE KEYPAD" is a bonafide work carried out by **HARSHITHA V GOWDA(1AM18EC027), VEDAPRIYA M N(1AM18EC044), POOJA N(1AM18EC063) AND PRABHA D N(1AM18EC064)** in partial fulfillment for theaward of **Bachelor of Engineering** in **Electronics and Communication** of the **Visvesvaraya Technological University**, Belagavi during the year 2021-22. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

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DECLARATION

We, the students of VIII semester B.E in Electronics and Communication Engineering, AMC Engineering College, Bengaluru, hereby declare that the project work entitled **"INSTANT BRAILLE KEYPAD"** submitted to the **Visvesvaraya Technological University** during the academic year 2021-22, is a record of an original work done by us under the guidance of **Ms. Ramya R**, Assistant Professor, Department of Electronics and Communication Engineering, AMC Engineering college, Bengaluru. This project work is submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Engineering in **Electronics and Communication Engineering**. The results embodied in this report have not been submitted to any other universityor institute for the award of any degree.

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ACKNOWLEDGMENT

We feel pleasure in expressing our deep sense of gratitude to founder Chairman **Dr. K.R Paramahamsa** for providing us with a great infrastructure and well-furnished lab for successful completion of our project.

We express our deepest thanks to our principal **Dr. Girisha C** and AMC Engineering College, Bangalore for allowing us to carry out the industrial training and supporting us throughout & giving us all the support we need to carry on the idea as our final year project.

We express our special thanks to **Dr. T. Kavitha**, HOD, Department of ECE, for her support and encouragement and suggestions given to us in the course of our project work.

We express our sincere thanks to our guide **Ms. Ramya R** for taking part in useful decisions, guidance and necessary steps for the project and progressing it to our final year project. We choose this moment to acknowledge her contribution gratefully.

We would like to thank our beloved parents for their blessings, constant support and encouragement.

Last but not the least, I wish to thank all our dear friends for their cooperation, teaching & non-teaching staff of the Department of Electronics and Communication Engineering, for their support, patience and endurance shown during the preparation of this project report.

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ABSTRACT

This work aims to assist the visually impaired people for reading a text material and detect objects in their surroundings. The input is taken in the form of an image captured from the web camera. The image is then processed either for the purpose of text reading or for object detection based on user choice. The Raspberry Pi acts as the processing of the entire process. The text reading is supported by software named OCR; other dependencies required for the process include Tesseract Library. The object detection is another aspect of the project which is implemented using a TensorFlow object detection API. It is able to detect various objects in its surrounding and provide text feedback about the same through braille keypad. In this project a raspberry pi board connected to a embedded camera module is used, using which a picture of the page is taken automatically. Braille is a system of reading and writing by touch used by the blind. It consists of arrangements of dots which make up letters of the alphabet, numbers, and punctuation marks. The basic Braille symbol, called the Braille cell, consists of six dots arranged in the formation of a rectangle, three dots high and two across. Other symbols consist of only some of these six dots. The six dots are commonly referred to by number according to their position in the cell. There are no different symbols for capital letters in Braille. Capitalization is accomplished by placing a dot 6 in the cell just before the letter that is capitalized. The first ten letters of the alphabet are used to make numbers.

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CHAPTER 1

INTRODUCTION

As per World Health Organization (WHO), out of the 6737.5 million of world population, 39.365 million people are blind, 246.024 million people are suffering from low vision, and 285.389 million people are visually impaired. New growing development in computer vision, portable computer and digital camera make it practical to verify or check these individuals by camera-based product that merges existing OCR system with computer vision. A Braille Display is a touch sensation device that takes a pdf or normal text (.txt) file from a computer which is converted from image that has been captured and generates Braille dots for the people who have weak eyesight. Several types of actuators are employed by different types of Braille display devices. With the help of plunger movement in the coil, devices like solenoid prints out Braille.

Braille is a system that enables blind and visually impaired people to read and write through touch. It was devised by Louis Braille in 1821 and consists of raised dots arranged in "cells." A cell is made up of six dots that fit under the fingertips, arranged in two columns of three dots each. Each cell represents a letter, a word, a combination of letters, a numeral or a punctuation mark. The number and arrangement of these dots distinguish one character from another. The pattern of raised bumps or dots can be read with the fingers by blinds.

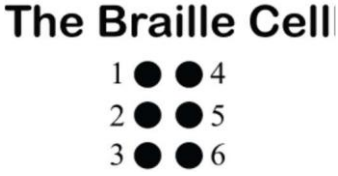

Fig no:1.1

The first ten letters of the alphabet are formed using the top four dots (1, 2, 4, 5). Adding a dot 3 makes the next ten letters and adding a dot 6 to that makes the last six letters (except "w"

because it was not used very much in the French language at the time that Louis Braille devised this system). Punctuation is represented by its own unique set of dots, most often found in the lower part of the cell. In addition to the alphabet, the Braille Code includes many contractions, which are Braille cells that can stand for a combination of letters or entire words. Literary Braille numbers are formed by placing the Braille number sign (dots 3, 4, 5, and 6) before the Braille letters "a" through "j". There is also a code used for math and science notations called Nemeth.

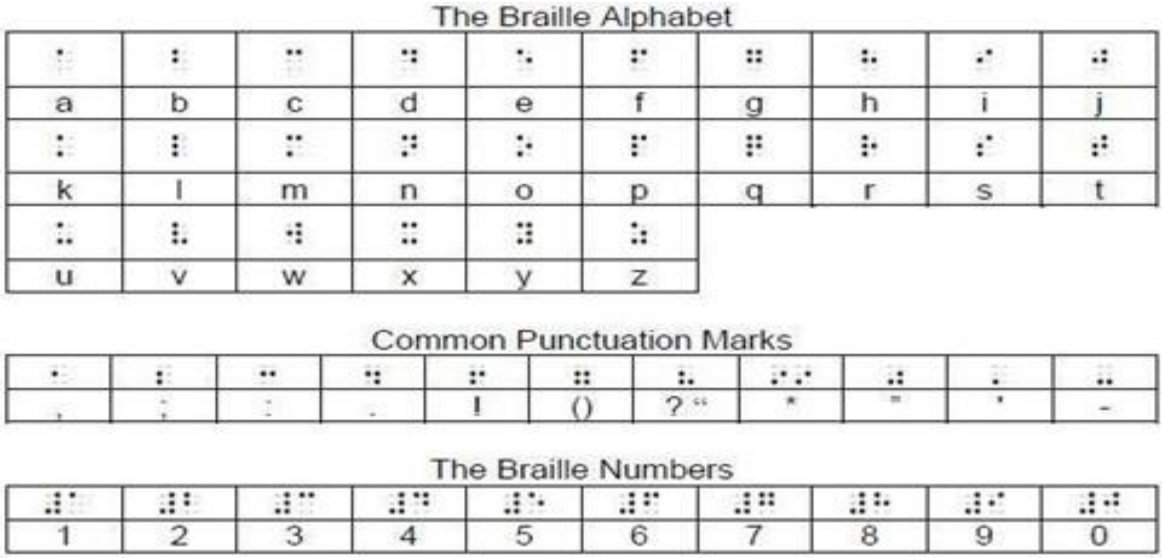

Fig no:1.2

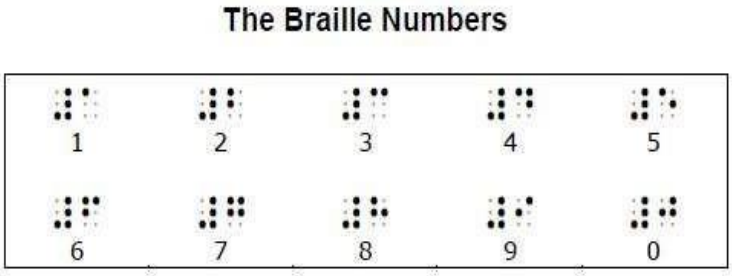

Fig no:1.3

1.1 MOTIVATION

Braille is vital for communication and education purposes for blind and visually challenged people. They face difficulties in interacting and gaining full advantage of computers.

Recently, and with the fast evolution in technology, researchers proposed to give the blinds the ability to take advantage of these advancements. Accordingly, designers and engineers started working on projects that relate input and output devices to the computers in order for the

blind individual to have full control of the hi-tech machines. However, investments in these kinds of hardware presented complexity in the design, in addition to the high cost imposed by the devices used. In order to overcome the above said challenges our idea is to design a portable device called "Braille Display". The project's objective is to design and develop a Braille System output device for the visually impaired individuals that enable them to interact and communicate.

1.2 OBJECTIVE AND SCOPE

This project uses an algorithm which enables the user to convert the text that we normally have in our day-to-day usage into Braille Script and thus gives impetus for the visually impaired to read that text. The Product that we will create will be very intuitive and simplistic in design that will enable the end user to feel familiar and at home with the product. This project was conceived keeping in mind the day-to-day struggles in usage of laptops faced by the visually impaired people.

Braille Display is a device which helps the visually impaired to read a text file or access the internet. Braille is a tactile writing language of raised dots. It is developed for hap-tics perception, a combination of the sense of touch, movement and finger pressure. This product has got a plate which has holes. The text from the file or internet is converted to Braille and the keys present below the holes would pop up and down the hole based on the characters on the screen. These keys form a pattern of Braille alphabets which helps the visually impaired to read the text.

According to a recent survey by a national organization for ophthalmologists India accounts for 20% of the total blind population of the world, with 7.8 million visually impaired out of the 39 million across the globe. India is now home to the world's largest number of blind people. 285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision. About 65 % of all people who are visually impaired are aged 50 and older, while this age group comprises about 20 % of the world's population. Thus, creating a low cost, intuitive text to braille converter is the main purpose of this paper.

1.3 PROBLEM STATEMENT

Previous implementation was image to voice. The Implementation which we are doing is image to braille conversion Means Image to text and text to braille. The speech recognition system is highly complicated to work on as everyone needs to wisp the exact language and also that it keeps the visually impaired away from the common users.

For enhancing the interaction with the computers by the visually impaired there were many systems that were created like E touch, speech recognition interacting system etc. Several companies today market computer programs that allow a blind person to use a standard computer. These computer programs are called "**speech recognizers**". A speech recognizer is itself a standard Windows computer application, but its job is to run alongside the other programs running on a computer and makes the blind person to speak out to enter the text on the screen.

1.3 ORGANISATION OF THE REPORT

Chapter 1 includes a complete introduction to instant braille keypad such as braille alphabet, braille numbers and matrix and motivation of the project, objectives and scopes, and problem statement. Chapter 2 includes the literature survey which gives information about the previous researches carried out related to our project and changes that we have done in our project. Chapter 3 includes design of block diagram and description and hardware and software detailed components specifications and there using in the project. The hardware components are raspberry pi, camera module, resistor, led, power supply, uln2003 driver, solenoid pull up motors, farad capacitor, Zener diode. The software are open cv, tesseract ocr, python, VNC viewer. Chapter 4 includes methodology of the project and sequence diagram of the braille keypad and flow chart of the project. Chapter 5 includes implementation of the braille keypad and its working. Conclusion and future enhancement of the project and also the references of the project. In appendix it includes the source code of the project.

CHAPTER 2

LITERATURE SURVEY

2.1 OVERVIEW

A literature survey or a literature review in a project report is that section which shows the various analyses and research made in the field of your interest and the results already published, taking into account the various parameters of the project and the extent of the project. It is the most important part of your report as it gives you a direction in the area of your research. It helps you set a goal for your analysis – thus giving you your problem statement.

Literature survey is for the most part done with a specific end goal to break down the foundation of the present venture which discovers imperfection in the current framework and aids on which unsolved issues we can work out. Along these lines, the accompanying points represent the foundation of the venture as well as reveal the issues and which encourages to purpose arrangements and work on the current issues. An assortment of examination has been done on fault resilience for application. Taking after segment investigates diverse references that examine around a few subjects identified with fault tolerance.

2.2 RELATED WORK

[1]. "Enhanced Braille Display", Sangeeta Kumari, Akshay Akole, Pallavi Angnani, Yash Bhamare, Zaid Naikwadi. 2020 International Conference for Emerging Technology.

Here we are implementing enhanced Braille system that helps blind people to read text or content. We scanned image form camera, processed that image-by-image processing techniques and same will be converted into text using OCR. The detected text will be given to raspberry pi which recognize every character and convert it into Braille code. With the help of solenoid, we are displaying that Braille code on Braille.

Braille, a tactile system of writing used by the visually impaired or blind people was invented by Louis Braille in the early 19th century. It is the only medium of communication for

the blind people worldwide along with speech. In this system patterns of raised dots were used to inscribe the characters on paper. It therefore helps visually-impaired people to read and write using single touch instead of vision. Its characters are six- dot cells, with two columns and 3 rows. Any of the dots may be raised above the paper plain thus giving 64 possible characters. In this project, the camera will start capturing the images and sends it to Raspberry Pi. As soon as the images are received by Pi, it identifies each English characters, numbers and symbols in the image. Once the model gets the character it is mapped to each Braille alphabets, numbers and symbols. Upon mapping each character, its appropriate signal is sent to solenoids and with the help of these solenoids the Braille Code is displayed on the Braille Keypad.

[2]. "Tracing the effectiveness of braille reading patterns in individuals with blindness: Handedness and error analysis", Vassilios Papadimitriou and Vassilios Argyropoulos. British Journal of Visual Impairment**.**

The main objective of the present study was to investigate the potential effects of handedness on braille reading patterns during braille text reading. Thirty-two Greek students (from Grades 3 to 12) with visual impairments, who used systematically the braille code as reading medium, participated in this study. Handedness was assessed through a modified version of the Edinburgh Handedness Inventory, while their reading level was estimated via a standardized test. In turn, participants read 18 texts, which were chosen randomly from their textbooks. Results indicated that handedness affected braille readers' selected reading patterns during text reading.

A variety of reading patterns were recorded and the selected data were correlated with tactile reading strategies in terms of dominant hands and fingers. It seems that readers who selected one-hand braille reading patterns performed significantly more errors with the index of their dominant hand, whereas those who chose to read with both hands faced more difficulties toward the effective collaboration of the indices of their hands. Finally, the findings of the present study are discussed in relation to educational practice, relevant theory, and subsequent research.

[3]. "Development of a Braille Display using Piezoelectric Linear Motors", Hyun-Cheol Cho,Byeong-Sang Kim, Jung-Jun Park, Jae-Bok Song. SICE-ICASE International Joint

Conference: Bexco, Busan, Korea: October 2006

In this paper, the details of the proposed braille cell consisting of six piezoelectric linear motors are discussed. The electrical circuit to drive the motors is also introduced. Various tests have been conducted for seven visually impaired people. These tests for the prototype braille display system show that it can deliver the braille information which can be well recognized by visually impaired people. The refreshable Braille displays for visually impaired people should be portable and capable of real-time display. To this end, the actuators used to move Braille dots should be small and lightweight. So far various actuators such as solenoids, piezoelectric materials, electroactive polymers have been suggested, but these actuators have not been very successful for various reasons. In this research, piezoelectric linear motors were adopted for this purpose.

These actuators can provide the response time fast enough to offer real-time display, and are small and lightweight enough to be employed for a portable device. In this paper, the details of the proposed Braille cell consisting of six piezoelectric linear motors are discussed. The electrical circuit to drive the motors is also introduced. Various tests have been conducted for seven visually impaired people. These tests for the prototype Braille display system show that it can deliver the Braille information which can be well recognized by visually impaired.

[4]. "Automatic system for text to Braille conversion",Adrian Moise et.al, 2017 in 9th International Conference on Electronics, Computers an Artificial Intelligence (ECAI). DOI: 10.1109/ECAI.2017.8166391

The authors of this paper present the development of an automatic system used to convert computer written text to the Braille language. The system uses a microcontroller connected to a special device that can be read by blind persons. For this system, a software-based concept to implementing Finite State Machines (FSM) has been developed. Experimental results are shown and discussed.

[5]. "Development of a text to braille interpreter for printed documents through optical image processing",Joshua L.Dela Cruz, Jonaida Angela D.Ebreo, Reniel Allan John P.Inovejas in 2017IEEE 9th International Conference on Humanoid, Nanotechnology, Information

Technology, Communication and Control, Environment and Management (HNICEM). DOI: 10.1109/HNICEM.2017.8269523

This paper presents the development of an optical text to braille converter device for aiding visually impaired individuals to read printed materials. This is a solution for the lag or even failure of translating or printing the braille version of everyday reading materials. The system utilized optical character recognition engine in which an image of the text to be translated into braille is captured.

The digitized texts are then transferred electronically in a braille haptic device. This device is piezoelectric based haptic system which is composed of several haptic pins arranged in a way to resemble the braille writing system. Several experiments were conducted to determine the performance of the system. The overall system reliability obtained was 95.68%. The system is also capable of processing speed of 1 word in 2 seconds. The system performs at its best with a letter sized page reading material within the range of 15 to 20 cm from the camera, with the camera positioned at 0 degrees.

[6].“INNOVATIVE TOOL FOR DEAF, DUMB AND BLIND PEOPLE”, Pooja Dongare ,Omkar Kandal Gaonkar, Rohan Kanse , Sarvesh Kukyan. International Journal of Technical Research and Applications e-ISSN: 2320-8163.

This project aims to lower the barrier in communication. It is based on the need of developing an electronic device that can translate sign language into speech in order to make the communication take place between the mute communities with the general public possible. A wireless data glove is used which is normal cloth driving gloves fitted with flex sensors along the length of each finger. Mute people can use the gloves to perform hand gesture and it will be converted into speech so that normal people can understand their expression gesture in a sign language is a particular movement of the hands with a specific shape made out of them. Also it can be used to control appliances using hand gesture.

Sign language is a useful tool to ease the communication between the deaf or mute community and the normal people. yet there is a communication barrier between these

communities with the normal people. This project aims to lower the communication gap between the deaf or mute community and the normal world. This project was meant to be a prototype to check the feasibility of recognizing sign language using sensor gloves. With this project the deaf or mute people can use the gloves to perform sign language and it will be converted into speech so that normal people can easily understand. The main feature of this project is that the gesture recognizer is a standalone system, which is applicable n daily life.

[7]. "Braille Pad for Visually Impaired People", Amruta Patil, Divyarani More, Shruti Gurav. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 07 Issue: 02 | Feb 2020

As we know how important telecommunication is in our life, and mobile phone is used for that purpose. There comes limitation on it as people having visual inability and can't access them. So, we are designing one device through which these people can access the mobile phone and read SMS from the cell, plus can read the documents, books which are saved in external SD card. We are going to use braille system as a basis.

Braille is not a language but it is a code through which people having low vision can learn any language. We are going to interface GSM module and SD card module to the microcontroller so they can access data from that. In future the system has scope to read and access emails, newspaper etc. With some modification we can also help these peoples to access home appliances. And this system truly becomes more efficient, smaller in size and cost minimum system.

[8]. "An Electronic Design of a Low-cost Braille Typewriter", C. Moore and I. Murray. Seventh Australian and New Zealand Intelligent Information Systems Conference, 18-21 November 2001, Perth, Western Australia

This paper documents a new design for a Braille Typewriter. Comprising of a majority of electrical components, the design aims to produce a product that fills the gap in the range of Braille's available. A low cost and robust design will provide the blind with an affordable and reliable alternative to the Perkins and Mountbatten Braille's.

Braille is an important language used by the blind to read and write. It is vital for communication and educational purposes. In Western Australia alone there are an estimated 22,500 vision impaired persons (Australian Bureau of Statistics, 1993) who cannot read standard print, many of whom rely on embossed Braille for their written communications. Although there is an important market in the western world, a far greater rate of blindness occurs in third world countries. Literacy levels amongst sight impaired people in developing nations could be aided by supplying equipment such as these Braille's. Braille's are needed for everyday communication and therefore importance lies on the option to have a light weight, transportable unit accessible at all times. This paper proposes a relatively inexpensive, light weight, reliable and easily maintained Braille.

[9]. "VISION- Wearable Speech Based Feedback System for the Visually Impaired using Computer Vision", Leo Abraham, Nikita Sara Mathew, Liza George Shebin Sam Sajan. Proceedings of the Fourth International Conference on Trends in Electronics and Informatics (ICOEI 2020) IEEE Xplore Part Number: CFP20J32-ART; ISBN: 978-1-7281-5518-0

This project proposes (1) identifying walkable spaces, (2) text recognition and text-to-speech, (3) identify and locate specific types of objects; and walking navigation which can be incorporated into this project as a future scope. This is implemented with the YOLO algorithm for object detection, which uses the COCO dataset. Our project will help a blind person to walk easily by finding the path, detect obstacles in front of them and thus avoid it. It will help them read texts as well, which is done using OCR which uses python and an API for the text recognition. Thereafter, gtts is used to convert text to speech, which is the final output for the users. Keywords—Wearable device, computer vision, object detection, visually impaired, text recognition, camera module, audio jack, Raspberry Pi.

Deficiencies in the visual system may contribute to visual impairment which can lead to blindness in the worst cases, which may prohibit individuals from performing many days today tasks, including learning, work, and even walking. According to the World Health Organization around 38 million people worldwide suffer from blindness, while the other 110 million have other types of defects.

This paper presents a synopsis of enabling a real-world experience through a wearable speech-based feedback system. The idea of a wearable device that includes a Raspberry Pi 4 and camera module to provide feedback to signal obstacles to the users and also identify and read out texts is proposed. When a text is placed in front of the camera module, the text is first recognized and then read out to the user. Similarly, objects present in front of the user are identified and communicated to the person who is wearing the device. In a study conducted, it was found that visually impaired people had difficulty in identifying whether there are any hindrances in front of them or what textual content is present in front of them and hence our project.

[10]. "An Implementation of an Intelligent Assistance System for Visually Impaired/Blind People", Liang-Bi Chen, Senior Member, IEEE, Jian-Ping Su, Ming-Che Chen, Wan-Jung Chang, Member, IEEE, Ching-Hsiang Yang, and Cheng-You Sie. Department of Electronic Engineering, Southern Taiwan University of Science and Technology, Tainan, Taiwan ‡ Artificial Intelligence over Internet of Things Applied Research Center (AIoT Center), Southern Taiwan University of Science and Technology, Tainan, Taiwan.

In this paper, we propose an intelligent assistance system for visually impaired/blind people, which is composed of wearable smart glasses, an intelligent walking stick, mobile devices application, and on-line information platform. When visually impaired/blind people wear the proposed smart glasses and holding the proposed intelligent walking stick, thus the obstacles can be detected. If a visually impaired/blind person is fall down, then the related information (GPS, fall down, etc.) will be recorded and uploaded to the on-line information platform. Related information can also be viewed by the proposed mobile devices application.

In this paper, we have proposed intelligent assistance system, which is paired a wearable smart glass and an intelligent walking stick for visually impaired/blind people. For the further works, we will try to integrate deep learning techniques for recognizing front images (such as traffic signs) and to develop intelligent walking guiding related functions.

[11]. "Numerical Braille Module for Learning Simple Mathematical Operations", Mohamad Safiddin Mohd Tahir, Noor Hazrin Hany Mohamad Hanif, Hazlina Md. Yusuf. 2019

7th International Conference on Mechatronics Engineering (ICOM).

Individuals with a good understanding of mathematics have better chances to do well in their life. However, it is an extremely challenging task for people with visual disabilities to learn and execute simple mathematical operations. Although there are many mathematical learning products in the current market, most of them are expensive, with smooth input keys, liquid crystal display and audio outputs which limit the learning process of numerical braille code. In this paper, we present a numerical braille module which aimed to help people with visual challenges to learn simple mathematical operations. This module comprises 12 miniature solenoids that were controlled by an Arduino Uno microcontroller with a numeric keypad that serves as an input unit.

The verification of input and output signals was conducted to ensure that all the inputs are correctly stored in Arduino board memory to perform a correct operation and raised the correct solenoids to produce a braille code pattern. Three operations were tested, which are addition, subtraction and multiplication. The developed numerical braille module was capable of performing simple calculations tasks and raised correct solenoid output accordingly. The outcome of this work provides an optimistic prospect of attracting the visually impaired to learn and perform mathematical operations.

A 100% correct in the calculation of every simple operation which is addition, subtraction, and multiplication shows that the development of a numerical braille module with braille emboss keypad and refreshable braille controlled by microcontroller has been successful. The module is light in weight and compact to make it portable and can be used anywhere and anytime. Aside from that, the product is low cost compared to the other product that is currently available on the market.

CHAPTER 3

EXISTING AND PROPOSED METHODS

3.1 EXISTING SYSTEM

- For enhancing the interaction with the computers by the visually impaired there were many systems that were created like E touch , speech recognition interacting system etc.
- Several companies today market computer programs that allow a blind person to use a standard computer.
- These computer programs are called "**speech recognizers**". A speech recognizer is itself a standard Windows computer application, but its job is to run alongside the other programs running on a computer and makes the blind person to speak out to enter the text on the screen**.**

3.2 PROPOSED SYSTEM

The proposed text-to-braille conversion system overcomes certain limitations of the existing text-to-braille conversion system. It is based on detecting the texts from any book, document or magazine through the images captured using a camera. The Raspberry Pi microcontroller can be programmed using Python. The Raspberry Pi microcontroller supports camera interface and more than 40 individually programmable GPIO pins.

We use 18 of the available GPIO pins to activate the 18 braille pins electromechanically. The 3 Braille Units each consisting of 6 pins are raised electromechanically, i.e., like how a solenoid is raised or lowered due to the electromagnetic effect caused due to current flow.

The concept of Braille keypad arises from the wooden dice. It is used to enter the text message in the form of characters, alphabets etc. only for the blind peoples having the specific standard pattern for each character or alphabet. Group of six raised dots or bumpy dots represent the particular letter. Braille keypad is consisting of 3x2 matrixes by which we can display 64 different characters.

All the six dots are arranged in the form of rectangular array design. Each character has standard symbolic pattern respective to its Braille keypad. This electronics Braille keypad has Ok, Send, and Space button. Ok button used to fix that particular character and ready to accept next character. Space button used to give space between the characters. Send button used to transmit typed text message.

In recent days the Electronic Braille note takers portable devices are available in the marketplaces with Braille keyboards the Braille readers can use to enter information. The text stored in these devices can be read with a built-in Braille display.

3.3 BLOCK DIAGRAM

The main block diagram as shown in figure 3.1 consist of Raspberry pi, braille keypad, power supply, camera module, uln2003 drivers and SD card.

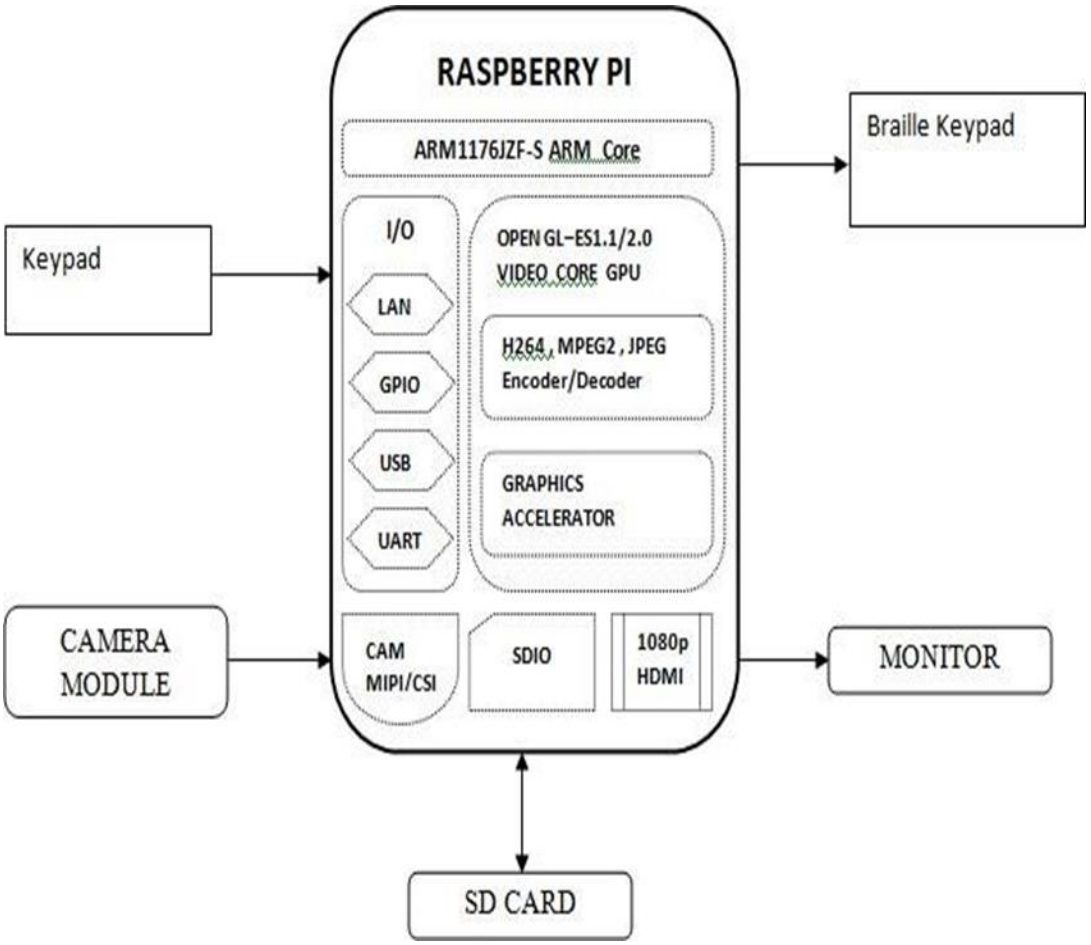

Figure 3.3.1 Main block diagram

To produce Braille text, Raspberry pi receives text from the text file Send them to the control board via serial interface. Raspberry pi then converts the alphabets into Braille symbol and then equivalent servo control signals to actuate the Braille pins. The blinds can feel the sense of touch of the Braille pins that are popped up according to the input letter and they recognize the letter accordingly. The above control mechanism is been programmed in Python language in Raspbian operating system.

HARDWARE REQUIREMENTS

1. Raspberry Pi
2. Camera
3. SD Card
4. Braille Keypad
5. Uln2003 drivers
6. Power Transformer
7. Zener Diode
8. Farad Capacitor
9. Solenoid pull up motors
10. Led
11. Resistor

RASPBERRY PI:

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

All over the world, people use the Raspberry Pi to learn programming skills, build hardware projects, do home automation, implement Kubernetes clusters and Edge computing, and even use them in industrial applications.

Figure 3.4.1 Raspberry pi

Low-cost high-performance computer which can be plugged in TV and monitor and can be used as computer which is very small as credit card.

- Its CPU is 700Mhz single core ARM1176JZF-S,
- It has 4 USB ports
- It has dual core video core iv multimedia coprocessor
- Size of its RAM is 512mb
- It has micro SDHC plot for storage
- Power rating of raspberry pi is 600mA i.e, 3.0W
- It has 17*GPIO plus the same specific functions

This raspberry pi works as the computer of the smart walking stick [4]. Raspberry Pi is a credit card sized single board, low-cost computer [11]. It takes input from the GPIO pins, which can be attached to LEDs, switches, analog signals and other devices. For our proposed design, we connect the GPIO pins to the ultrasonic sensors. It requires a power source of 5V to be operational and we have to insert a Micro SD memory card in it, which acts as its permanent

memory. For our design Raspberry Pi 1 Model B+ is used. It contains 4 USB ports, a HDMI port, an audio jack port and an Ethernet port.

The Ethernet port helps the device connect to the Internet and install required driver APIs. It has a 700 MHz single core processor and supports programming languages such as Python, Java, C, and C++ etc. This minicomputer runs our algorithm, which helps to calculate the distance from the obstacle based on the input it receives from the sensors. Then a Text-to-Speech driver API is used to convert the text message (distance) to speech, which is relayed to the person wearing the earphone.

Raspberry Pi (/paɪ/) is a series of small single-board computers (SBCs) developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom. The Raspberry Pi project originally leaned towards the promotion of teaching basic computer science in schools and in developing countries. The original model became more popular than anticipated, selling outside its target market for uses such as robotics. It is widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design. It is typically used by computer and electronic hobbyists, due to its adoption of the HDMI and USB standards.

ARM11 RASPBERRYPI 3 BOARD

Pi is a credit-card sized computer that connects to a computer monitor or TV and uses input devices like keyboard and mouse. It is capable of performing various functionalities such as surveillance system, military applications, surfing internet, playing high-definition videos, live games and to make databases. implemented using a Raspberry pi 3B board and their specifications are as follows:

Raspberry Pi is a credit-card sized computer manufactured and designed in the United Kingdom by the Raspberry Pi foundation with the intention of teaching basic computer science to school students and every other person interested in computer hardware, programming and DIY-Do-it Yourself projects.

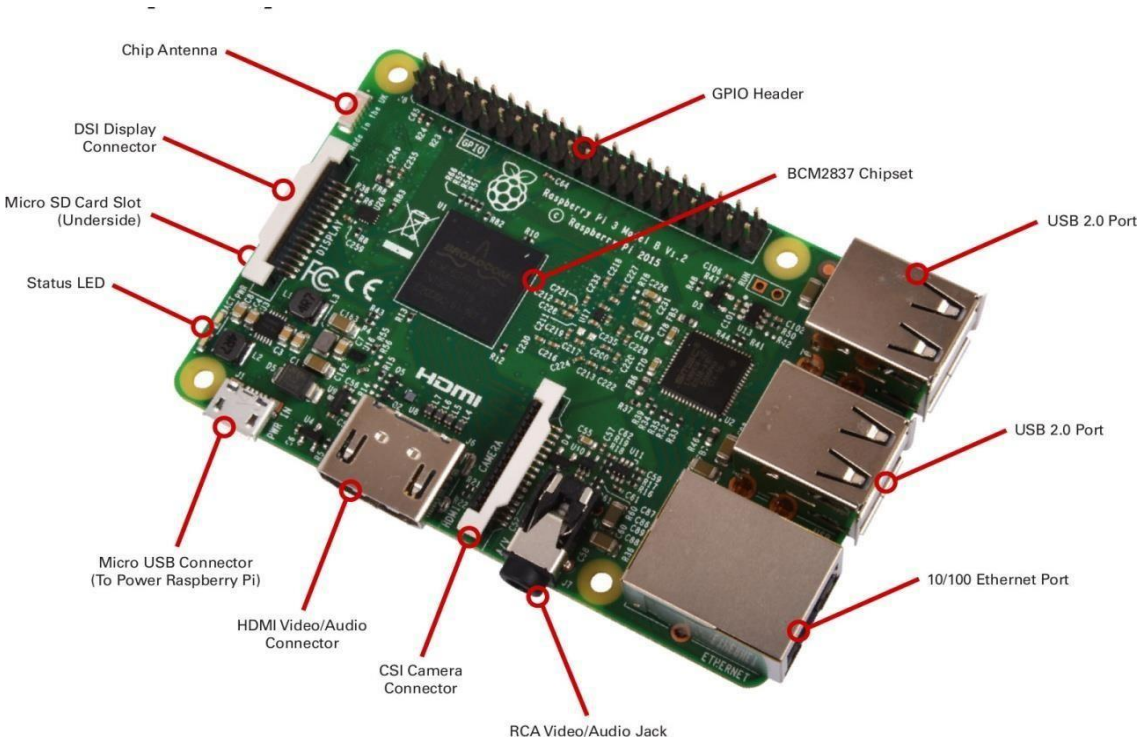

Figure 3.4.2 Specification of Raspberry pi

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Ego man. These companies sell the Raspberry Pi online. Ego man produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pies by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl. As of February 2014, about 2.5 million boards had been sold. The board is available online in India at a price of Rs.3000.

The Raspberry Pi 3 Model B+ contains a wide range of improvements and features that will benefit the designers, developers, and even engineers who are looking to integrate Pi systems into their products. Here are some of the new Pi's specs:

- Quad core 64-bit processor clocked at 1.4GHz
- 1GB LPDDR2 SRAM
- Dual-band 2.4GHz and 5GHz wireless LAN
- Bluetooth 4.2 / BLE
- Higher speed ethernet up to 300Mbps
- Power-over-Ethernet capability (via a separate PoE HAT)

BOOSTS ALL AROUND

Thanks to the ever-increasing technological capabilities of electronics, this Raspberry Pi does not fall behind in any category, at least compared to other Pi computers. It either matches the old model's speed or significantly improves upon it. For example, the CPU has been clocked at 1.4GHz, which is 200MHz faster than the Pi 3 B, and the ethernet speed has been boosted from 100Mbps to 300Mbps.

Figure 3.4.3 The heart of the Raspberry Pi 3 Model B+

EMC COMPLIANCE

One feature included with the Raspberry Pi 3 Model B+ is a wireless dual-band LAN that comes with modular compliance certification. For those who are unaware, electronic products cannot be constructed and then released to the market without having some tests done to them (see CE and FCC), and many of these tests look for interference. Testing for interference (also known as EMC) can be incredibly costly and difficult to isolate, but, thanks to the WLAN's modular compliance certification, you can expect significantly lower EMC issues when integrating the Pi into a product.

PHYSICAL FEATURES

While the mechanical layout of the Pi has not changed (GPIO location, drill holes, etc.), the PCB itself has clearly undergone some physical changes. The main processor is no longer housed in a plastic package. Instead, it has a metal package, which may be beneficial for those who want to keep the temperature of the Pi as low as possible (with the aid of a heat sink). The top side also shows fewer components, and a four-pin header (used for PoE) has been included in the top right of the PCB.

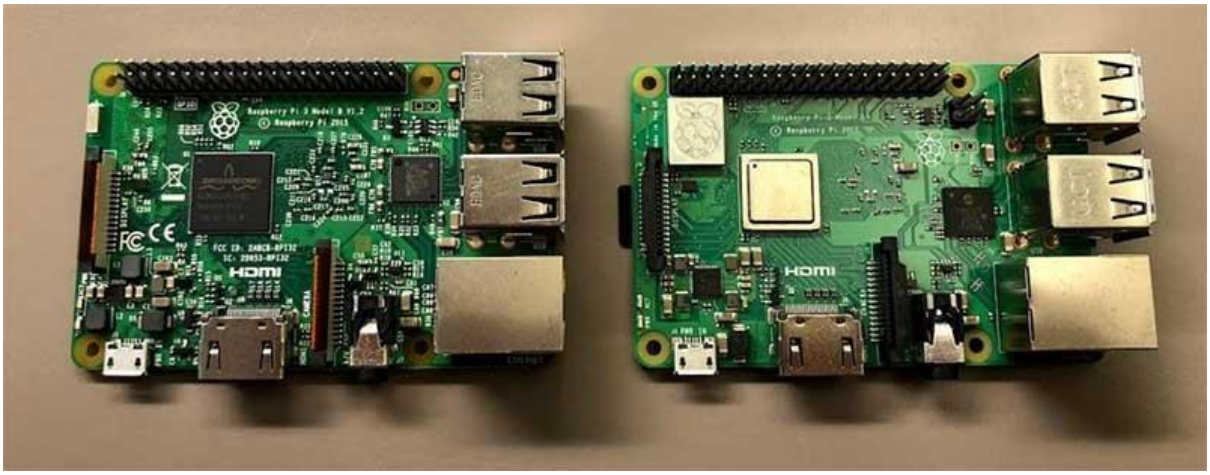

Figure 3.4.4 Comparison of the Raspberry 3 and 3 B+

It is a small board computer, introduced by Raspberry Pi foundation in 14th March 2018 and is the most recent version of the Pi boards. It is a modified form of its predecessor Raspberry Pi 3 B that was introduced in 2016 and came with CPU, GPU, USP ports and I/O pins. Both versions are almost same in terms of functionality and technical specifications; however, there are some exceptions in the B+ model as it comes with USB boot, network boot, and Power over Ethernet option that are not present in the B model.

Technology has been evolved over time with the purpose of making lives easy and convenient. This device was a major development in the technology that made computer learning too easy that anyone with little effort can make their feet wet with the process.

In this tutorial, I'll discuss each and everything related to Raspberry Pi 3 B+, its main functions and features, benefits and everything you need to know, so you find all information in one place without wrestling your mind on the web surfing. Let's dive right in.

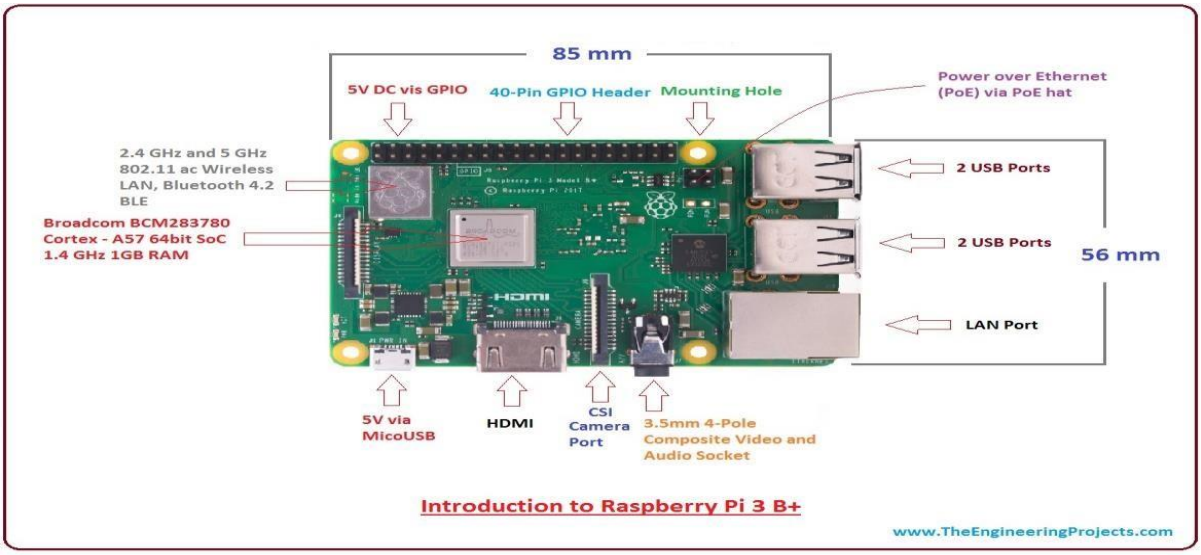

Figure 3.4.5 Raspberry Pi 3 B+

HARDWARE SPECIFICATIONS FOR RASPBERRY PI 3 B+:

- **CPU:** The CPU is a brain of this tiny computer that helps in carrying out a number of instructions based on the mathematical and logical formulas. It comes with a capacity of 64 bit.
- **Clock Speed and RAM:** It comes with a clock speed of 1.4 GHz Broadcom BCM2837B0 that contains quad-core ARM Cortex-A53 and RAM memory is around 1GB (identical to the previous version)
- **GPU:** It stands for graphics processing unit, used for carrying out image calculation. Broadcom video core cable is added in the device that is mainly used for playing video games.
- **USB Ports:** Two more USB ports are introduced in this new version, setting you free from the hassle of using an external USB hub when you aim to join a number of peripherals with the device.
- **MicroUSB Power Source Connector:** This connector is used for providing 5V power to the board. It draws 170 to 200mA more power than B model.

- **HDMI and Composite Connection:** Both audio output socket and video composite now reside in a single 4-pole 3.5mm socket which resides near HDMI. And the power connector is also repositioned in new B+ model and lives next to HDMI socket. All the power and audio video composite socket are now placed on the one side of the PCB, giving it a clean and precise look.
- **USB Hard Drive:** The USB hard drive is available on the board that is used to boot the device. It is identical to the hard drive of regular computer where windows is used to boot the hard drive of the computer.
- **PoE:** B+ model comes with a facility of Power over Ethernet (PoE); a new feature added in this device which allows the necessary electrical current using data cables.
- **Other Changes:** The B+ version comes with little improvement in the features and poses slightly different layout in terms of location of the components. The SD memory slot is replaced by a micro-SD memory card slot (works similar to the previous version). The status LEDs now only contain red and green color and relocated to the opposite end of the PCB.

GPIO PINS:

The raspberry pi board has 17 GPIO ins in it. These GPIO pins provide ability to connect directly to electronic devices. The inputs will be like sensors, buttons or other communication with chips or modules using low level protocols SPI and serial UART connections. It uses 3.3V logic levels. No analog input or output is available in this GPIO pins but we can use external chords for this analog connection. The above block diagram represents the working of the raspberry pi. Many inputs such as ultrasonic sensors, switch input and camera are given to the raspberry pi board through the GPIO pins.

40 Pin header is used to develop an external connection with the electronic device. This is the same as the previous versions, making it compatible with all the devices where older versions can be used. Out of 40 pins, 26 are used as a digital I/O pin and 9 of the remaining 14 pins are termed as dedicated I/O pins which indicate they don’t come with alternative function.

Pin 3 and 5 comes with an onboard pull up resistor which 1.8 kΩ and Pin 27 and 28 are dedicated to ID EEPROM. In B+ model the GPIO header is slightly repositioned to allow more space for the additional mounting hole.

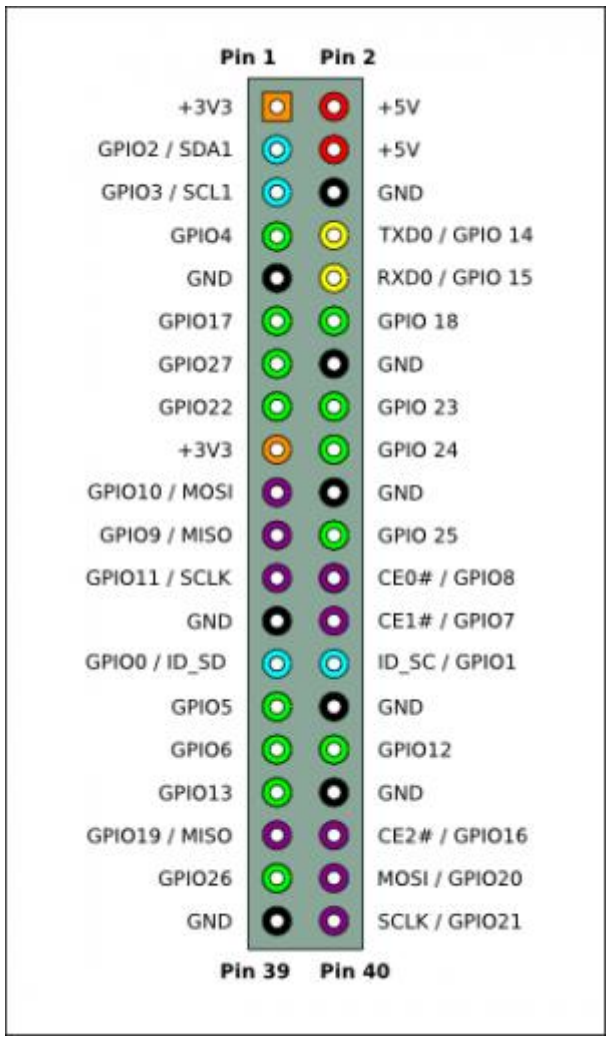

Figure 3.4.6 GPIO pin diagram

POWER SUPPLY:

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable DC voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. DC voltages are required to operate various electronic equipment . These voltages are 5V, 9V or 12V which cannot be obtained directly. Thus the input to the circuit is applied from the regulated power supply.

A power supply takes the AC from the wall outlet, converts it to unregulated DC, and reduces the voltage using an input power transformer, typically stepping it down to the voltage required by the load. For safety reasons, the transformer also separates the output power supply from the mains input.

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices.

Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power.

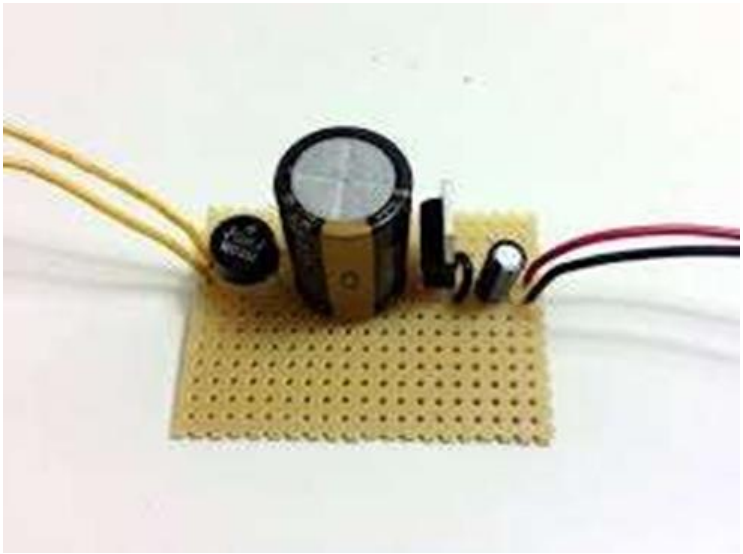

Figure 3.4.7 Power Supply

CAMERA:

USB Cameras are imaging cameras that use USB 2.0 or USB 3.0 technology to transfer image data. USB Cameras are designed to easily interface with dedicated computer systems by using the same USB technology that is found on most computers. A camera is an optical instrument to capture still images or to record moving images, which are stored in a physical medium such as in a digital system or on photographic film. A camera consists of a lens which focuses light from the scene, and a camera body which holds the image capture mechanism.

Figure 3.4.8 Camera

The still image camera is the main instrument in the art of photography and captured images may be reproduced later as a part of the process of photography, digital imaging, photographic printing. The accessibility of USB technology in computer systems as well as the 480 Mb/s transfer rate of USB 2.0 makes USB Cameras ideal for many imaging applications. An increasing selection of USB 3.0 Cameras is also available with data transfer rates of up to 5 Gb/s.

ULN2003 DRIVERS:

The ULN2003 is one of the most common motor driver ICs, consisting of an array of 7 Darlington transistor pairs, each pair is capable of driving loads of up to 500mA and 50V. Four out of seven pairs are used on this board. Known for its high current and high voltage capacity, the ULN2003 gives a higher current gain than a single transistor and enables the low voltage and low current output of a microcontroller to drive a higher current stepper motor.

Figure 3.4.9 ULN2003 drivers

Here we will explore using the versatile ULN2003A Darlington Transistor array with a typical micro-controller such as Raspberry pi. The ULN2003A is a high-voltage, high-current Darlington transistor array consisting of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads.

The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs can be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. Unipolar stepper motor driver using ULN2003 driving PNP Darlington transistors.

The ULN2003A is an array of seven NPN Darlington transistors capable of 500 mA, 50 V output. It features common-cathode flyback diodes for switching inductive loads. It can come in PDIP, SOIC, SOP or TSSOP packaging. In the same family are ULN2002A, ULN2004A, as well as ULQ2003A and ULQ2004A, designed for different logic input levels.

POWER TRANSFORMER:

The power supply transformer raises or lowers the voltage as needed. Most devices require stepped down voltage from standard AC outlets, which output 100 to 240 volts, to a much lower amount. Some transformers, however, will step up the voltage and isolate the

incoming and outgoing circuits.

12-0-12 1Amp Step-Down Transformer is a general-purpose chassis mounting mains transformer. The transformer has 230V primary winding and non-center tapped secondary winding. The transformer has flying colored insulated connecting leads (Approx. 100 mm long). The Transformer act as a step-down transformer reducing AC – 230V to AC – 12V.

The Transformer gives outputs of 12V and 0V. The Transformer's construction is written below with details of Solid Core and Winding.

The transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force (E.M.F) or voltage in the secondary winding. The transformer has cores made of high permeability silicon steel. The steel has a permeability many times that of free space and the core thus serving to greatly reduce the magnetizing current and confine the flux to a path that closely couples the winding.

Figure 3.4.10 Transformer power supply

ZENER DIODE:

A Zener diode is a silicon semiconductor device that permits current to flow in either a forward or reverse direction. The diode consists of a special, heavily doped p-n junction, designed to conduct in the reverse direction when a certain specified voltage is reached.

The Zener diode is a special type of simple PN Junction Diode. This type of diode acts the same way as the PN junction diode that is it allows the current to flow in one direction and inhibits its flow in the opposite direction. However, the Zener diode is optimized in order to be used as the voltage reference or the voltage regulator. Due to the comparatively heavily doped PN junction an effect called Zener Effect arises in the Zener Diode and results in the Zener breakdown. The Zener diode and its schematic symbol are as shown in the following image:

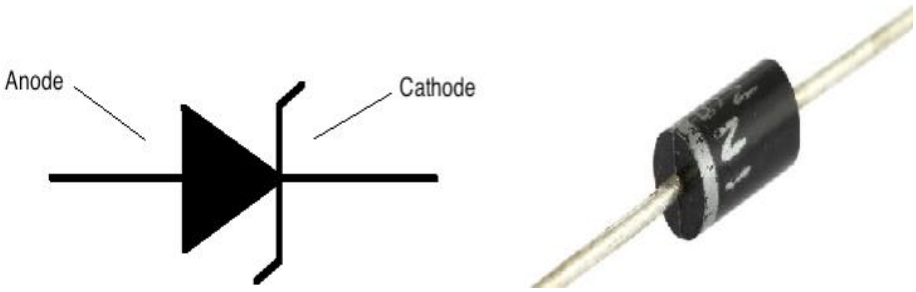

Figure 3.4.11 Zener diode

The Zener diode behaves just like a normal general-purpose diode consisting of a silicon PN junction and when biased in the forward direction, that is Anode positive with respect to its cathode, it behaves just like a normal signal diode passing the rated current.

However, unlike a conventional diode that blocks any flow of current through itself when reverse biased, that is the Cathode becomes more positive than the Anode, as soon as the reverse voltage reaches a pre-determined value, the zener diode begins to conduct in the reverse direction.

This is because when the reverse voltage applied across the zener diode exceeds the rated voltage of the device a process called Avalanche Breakdown occurs in the semiconductor depletion layer and a current start to flow through the diode to limit this increase in voltage.

FARAD CAPACITOR:

A simple passive element that can store electrical energy, when a voltage source applied is called a capacitor. It has an ability or capacity to store electrical energy by producing potential difference across its plates, and it behaves like a rechargeable battery. The capacitor consists of two parallel conductive plates, which are not connected to each other. The plates are separated by an insulating material called Dielectric, which is waxed paper, ceramic, mica plastic or liquid gel.

Due to this insulating material, the DC current cannot flow through the capacitor. It blocks the flow of current and the capacitor charges up to its supply voltage and acts as an insulator. When the capacitor is used in AC circuits, the flow of current is straight through the capacitor with no blocks. The electrical property of the capacitor is capacitance and it is measured in Farads (F). Depending on the dielectric, the capacitance of the capacitor various. There is one capacitor which has the highest storage capacity. One such is a Super Capacitor. This article discusses an overview of supercapacitor.

Figure 3.4.12 Farad capacitor

10000uF 25V Electrolytic Capacitor is a high quality electrolytic capacitor which offers long life and high reliability. Electrolytic Capacitors are most commonly used type of capacitors in Electronic Circuits. Electrolytic Capacitors have 2 Polars - Positive and Negative.

SOLENOID PULL UP MOTORS:

Another type of electromagnetic actuator that converts an electrical signal into a magnetic field producing a linear motion is called the Linear Solenoid. A solenoid is an electromagnetic actuator that converts electrical energy into mechanical action. It consists of a coiled wire tightly wrapped around an iron core, and a ferromagnetic plug or plunger. As an electrical current passes through the coil, a magnetic field is generated.

Figure 3.4.13 Solenoid pull up motors

The linear solenoid works on the same basic principle as the electromechanical relay seen in the previous tutorial and just like relays, they can also be switched and controlled using bipolar transistors or MOSFET's. A "Linear Solenoid" is an electromagnetic device that converts electrical energy into a mechanical pushing or pulling force or motion.

Linear solenoids basically consist of an electrical coil wound around a cylindrical tube with a ferro-magnetic actuator or "plunger" that is free to move or slide "IN" and "OUT" of the coils body. Solenoids can be used to electrically open doors and latches, open or close valves, move and operate robotic limbs and mechanisms, and even actuate electrical switches just by

energizing its coil. Solenoids are available in a variety of configurations and formats with the more common types being the Linear Solenoid, also known as the linear electromechanical actuator (LEMA), which as its name suggests produces a straight-line linear movement, and the Rotary Solenoid which produces a rotational movement over some fixed angle.

Both types of solenoids, linear and rotational are available as either a holding (continuously energized) or as a latching type (ON-OFF pulse) with the latching types being used in either energized or power-off applications. Linear solenoids can also be designed for proportional motion control where the plunger position is proportional to the power input.

LED:

A light-emitting diode is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. A Light Emitting Diode (LED) is one of the latest inventions and is extensively used these days. From your cell phone to the large advertising display boards, the wide range of applications of these magical light bulbs can be witnessed almost everywhere. Today their popularity and applications are increasing rapidly due to some remarkable properties they have. Specifically, LEDs are very small in size and consume very little power.

Figure 3.4.14 Blue led

As is evident from its name, LED (Light Emitting Diode) is basically a small light emitting device that comes under “active” semiconductor electronic components. It’s quite

comparable to the normal general-purpose diode, with the only big difference being its capability to emit light in different colors. The two terminals (anode and cathode) of a LED when connected to a voltage source in the correct polarity, may produce lights of different colors, as per the semiconductor substance used inside it. A light-emitting diode is a two-lead semiconductor light source.

It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

RESISTOR:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Figure 3.4.15. Resistor

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

3.5 SOFTWARE REQUIRMENTS

1. Tesseract ocr
2. Open CV
3. Python
4. VNC Viewer

TESSERACT OCR:

Python Tesseract is an optical character recognition (OCR) engine for various OS. Tesseract OCR is the process of electronically extracting1text from images and1reusing it in a variety of ways1such as document1editing, 1free-text1searches. OCR is a technology that is capable converting documents such as scanned papers, PDF files and captured image into editable data. Tesseract can be used for Linux, Windows and Mac OS. It can be used by programmers to extract typed, printed text from images using an API. Tesseract can use GUI from available 3rd party page.

Purpose of tesseract was integration with the flatbed HP scanners with objectives such as compression which was not possible with the then existing commercial OCR solutions which were struggling with accuracy. Tesseract is an open-source OCR engine that was developed at HP between 1984 and 1994. Like a supernova, it appeared from nowhere for the 1995 UNLV Annual Test of OCR Accuracy, shone brightly with its results, and then vanished back under the same cloak of secrecy under which it had been developed.

The installation process of tesseract OCR is a combination of two parts-The engine and training data for a language. For Linux OS. Tesseract was in the top three OCR engines in terms of character accuracy in 1995. It is available for Linux, Windows and Mac OS X. However, due to limited resources it is only rigorously tested by developers under Windows and Ubuntu.

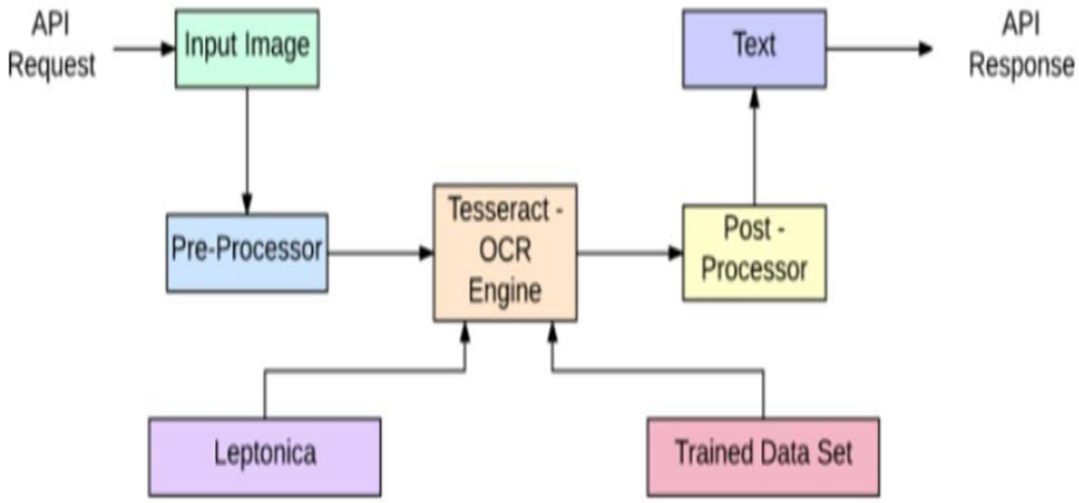

Figure 3.5.1 OCR Process flow

Tesseract up to and including version 2 could only accept TIFF images of simple one-column text as inputs. These early versions did not include layout analysis, and so inputting multi-columned text, images, or equations produced garbled output. Since version 3.00 Tesseract has supported output text formatting, hOCR positional information and page-layout analysis. Support for a number of new image formats was added using the Leptonic library. Tesseract can detect whether text is monospaced or proportionally spaced.

Tesseract can process right-to-left text such as Arabic or Hebrew, many Indic scripts as well as CJK quite well. Accuracy rates are shown in this presentation for Tesseract tutorial at DAS 2016, Santorini by Ray Smith. Tesseract is suitable for use as a backend and can be used for more complicated OCR tasks including layout analysis by using a frontend such as OCRopus. Tesseract can be obtained directly from many Linux distributers. The latest

stableversion of tesseract OCR is 3.05.00. In our project Tesseract is used to convert the captured image text into text format. Tesseract Features: 1) Page layout analysis. 2) supported. 3) Improve forecast accuracy. 4) Add UI.

OPEN CV:

OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez (which was later acquired by Intel). The library is cross platform and free for use under the open-source BSD license. OpenCV supports deep learning frameworks TensorFlow, Torch/PyTorch and Cafe. It has C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available.

A full-featured CUDA and OpenCL interfaces are being actively developed right now. There are over 500 algorithms and about 10 times as many functions that compose or support those algorithms. OpenCV is written natively in C++ and has a templated interface that works seamlessly with STL containers.

OpenCV is written in C++ and its primary interface is in C++, but it still retains a less comprehensive though extensive older C interface. There are bindings in Python, Java and MATLAB/OCTAVE. The API for these interfaces can be found in the online documentation. Wrappers in other languages such as C#, Perl, Ch, Haskell and Ruby have been developed to encourage adoption by a wider audience. Since version 3.4, OpenCV.js is a JavaScript binding for selected subset of OpenCV functions for the web platform.

All of the new developments and algorithms in OpenCV are now developed in the C++ interface. If the library finds Intel's Integrated Performance Primitives on the system, it will use these proprietary optimized routines to accelerate itself. An OpenCL-based GPU interface has been in progress since October 2012, documentation for version 2.4.13.3 can be found at docs.opencv.org.

VNC viewer:

VNC stands for Virtual Network Computing. It is a cross-platform screen sharing system that was created to remotely control another computer. This means that a computer's screen, keyboard, and mouse can be used from a distance by a remote user from a secondary device as though they were sitting right in front of it. VNC works on a client/server model. A server component is installed on the remote computer (the one you want to control), and a VNC viewer, or client, is installed on the device you want to control from. This can include another computer, a tablet, or a mobile phone. When the server and viewer are connected, the server transmits a copy of the remote computer's screen to the viewer. Not only can the remote user see everything on the remote computer's screen, but the program also allows for keyboard and mouse commands to work on the remote computer from afar, so the connected user has full control (after being granted permission from the remote computer.

What's a VNC Server? A server is a piece of computer hardware or software that provides capabilities for other programs called "clients." This is called the client-server model, whereas a server can provide services such as data or resource sharing to one or multiple clients. One server can serve multiple clients in this way, and one single client can use multiple servers. A client will send a request to a server, which then sends a response back to the client. A computer with VNC Server software installed can be accessed and controlled from a different device in a different location. The software allows a broadcast of the device desktop to a secondary device with VNC Viewer installed. Connected VNC Viewer users send a request, and then (with permission) can see the same thing as the person sitting in front of the remote computer.

What's a VNC Viewer? A viewer, on the other hand, is a program that renders the contents of a digital file on screen. VNC Viewer is used for local computers and mobile devices you want to control from. A device such as a computer, tablet, or smart phone with VNC Viewer software installed can access and take control of a computer in another location. It is a graphical desktop sharing system that allows a user to remotely control the desktop of a remote computer (running VNC Server) from your device, and it transmits the keyboard and mouse or touch events to VNC Server, so that once you are connected, you have control over the computer you've accessed. If

you’re using your mobile phone, for example, you would be able to use the computer you’ve remotely accessed as though you were sitting right in front of it.

3.6 FUNCTIONAL REQUIREMENTS:

The functional requirements for a system describe what the system should do. These requirements depend on the type of software being developed, the general approach taken by the organization when writing requirements. The functional system requirements describe the system function in detail, its inputs and outputs, exceptions and so on.

Functional requirements are as follows:

- Raspberry Pi
- Web camera
- Keypad

3.7 NON-FUNCTIONAL REQUIREMENTS:

Nonfunctional requirements, as the name suggests, are requirements that are not directly concerned with the specific functions delivered by the system. They may relate to emergent system properties such as reliability, response time and store occupancy. Alternatively, they may define constraints on the system such as capabilities of I/O devices and the data representations used in system interfaces.

Easy to Operate: The captured image is converted to text using Tesseract OCR and save the text to file out1.txt.Open the text file and split the paragraph into sentences and save it. In OCR, the adaptive thresholding techniques are used to change the image into binary images and the are transferred to character outlines. The converted text is given to the Braille.

Portabability: The important key factor of this project to facilitate these people and to fix them more confident to manage their sites by themselves. The primary advantage is that the device can be taken away easily and is of about less weight.

Cost Effective: Use of simple hardware modules makes the device cost effective.

Platform : Use of sensors makes the system useful in all environments.

3.8 OS RASPBIAN

Although the Raspberry Pi's operating system is closer to the Mac than Windows, it's the latter that the desktop most closely resembles It might seem a little alien at first glance, but using Raspbian is hardly any different to using Windows (barring Windows 8 of course).

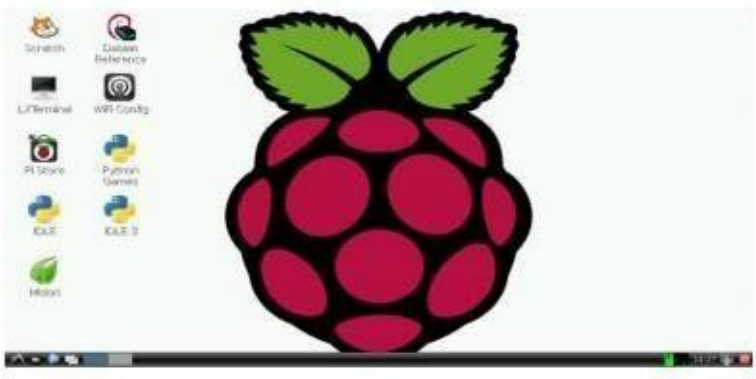

Figure 3.8.1 Raspbian OS

There's a menu bar, a web browser, a file manager and no shortage of desktop shortcuts of preinstalled applications. Raspbian is an unofficial port of Debian Wheezy armhf with compilation settings adjusted to produce optimized "hard float" code that will run on the Raspberry Pi. This provides significantly faster performance for applications that make heavy use of floating point arithmetic operations. All other applications will also gain some performance through the use of advanced instructions of the ARMv6CPU in Raspberry pi. Although Raspbian is primarily the efforts of Mike Thompson (MP Thompson) and Peter Green (plug wash), it has also benefited greatly from the enthusiastic support of Raspberry Pi community members who wish to get the maximum performance from their device.

CHAPTER 4

DESIGN AND METHODOLOGY

4.1 BRAILLE TEXT POPPER

Braille text popper is a key setup which has a solenoid pull up motors below each key. Each solenoid motors is responsible for lowering and raising a pin, which will emerge through perforations on the top plate to form a Braille dot. The perforations serve as guides for the pins and form six dots which is equivalent to one Braille cell.

4.2 SEQUENCE DIAGRAM

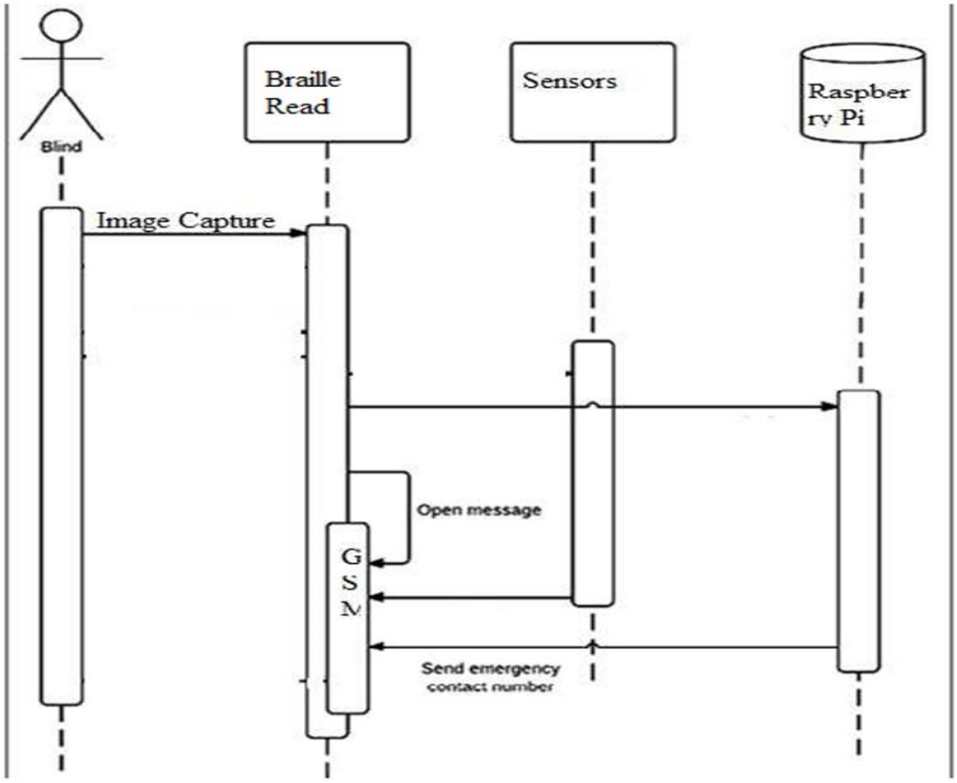

Figure 4.2.1 Sequence diagram

Sequence Diagram explains the sequence of a particular operation that takes place. As we can see in the diagram the blind would Want to read a particular text. The process begins with capturing the image the blind wants to read, we make use of the text read application to read the text from the image, which is then processed to the sensors and which the help of raspberry pi we convert the text retrieved to braille which can be given as the output.

This sequence diagram tutorial is to help you understand sequence diagrams better; to explain everything you need to know, from how to draw a sequence diagram to the common mistakes you should avoid when drawing one.

There are 3 types of Interaction diagrams; Sequence diagrams, communication diagrams, and timing diagrams. These diagrams are used to illustrate interactions between parts within a system. Among the three, sequence diagrams are preferred by both developers and readers alike for their simplicity.

Sequence diagrams, commonly used by developers, model the interactions between objects in a single use case. They illustrate how the different parts of a system interact with each other to carry out a function, and the order in which the interactions occur when a particular use case is executed.

In simpler words, a sequence diagram shows different parts of a system work in a ‘sequence’ to get something done. During the construction of a system architecture, you can use sequence diagrams to show the behavior of design patterns and mechanisms that the system uses.You can refine sequence diagrams to show how a system completes interactions. In the design phase, sequence diagrams explain how the system works to accomplish interactions.

4.3 FLOW CHART

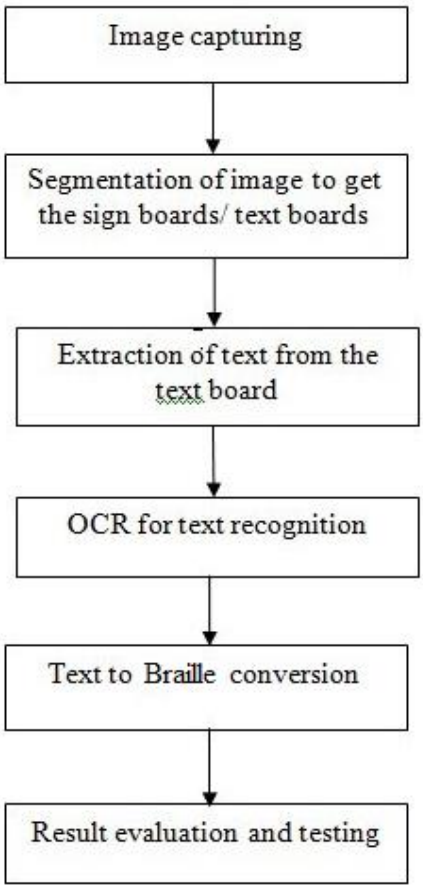

Figure 4.3.1 Flow chart

It basically describes the sequences of operations that takes places with respect to the project. Our project striking feature would be the image capturing for reading a particular text. The flowchart starts with capturing an image that the blind wants to read. Segmentation of the image takes place in order to retrieve the text from the image, which then makes use of the sign board to get the text identified. Extraction of the text from the text board converts the image to the text that the blind will want to read. We make use of OCR for the text recognition. This text is then converted into Braille which helps the blind person to read anything he desires. This feature keeps the blind informed with respect to the surrounding.

CHAPTER 5

IMPLEMENTATION AND RESULTS

5.1 IMPLEMENTATION:

In this chapter we discuss about the outcome of our project. The figure 5.1 below show the snapshot of the hardware. A successful implementation of a Braille keypad is implemented in such way that a visually impaired person can get to known about the images placed in front of camera. The camera will capture the image placed in, it will focus on the character. Later on, it will compare with the database stored in SD card. If character is stored in database, then it will automatically convert into braille language in the form of dots through ocr software.

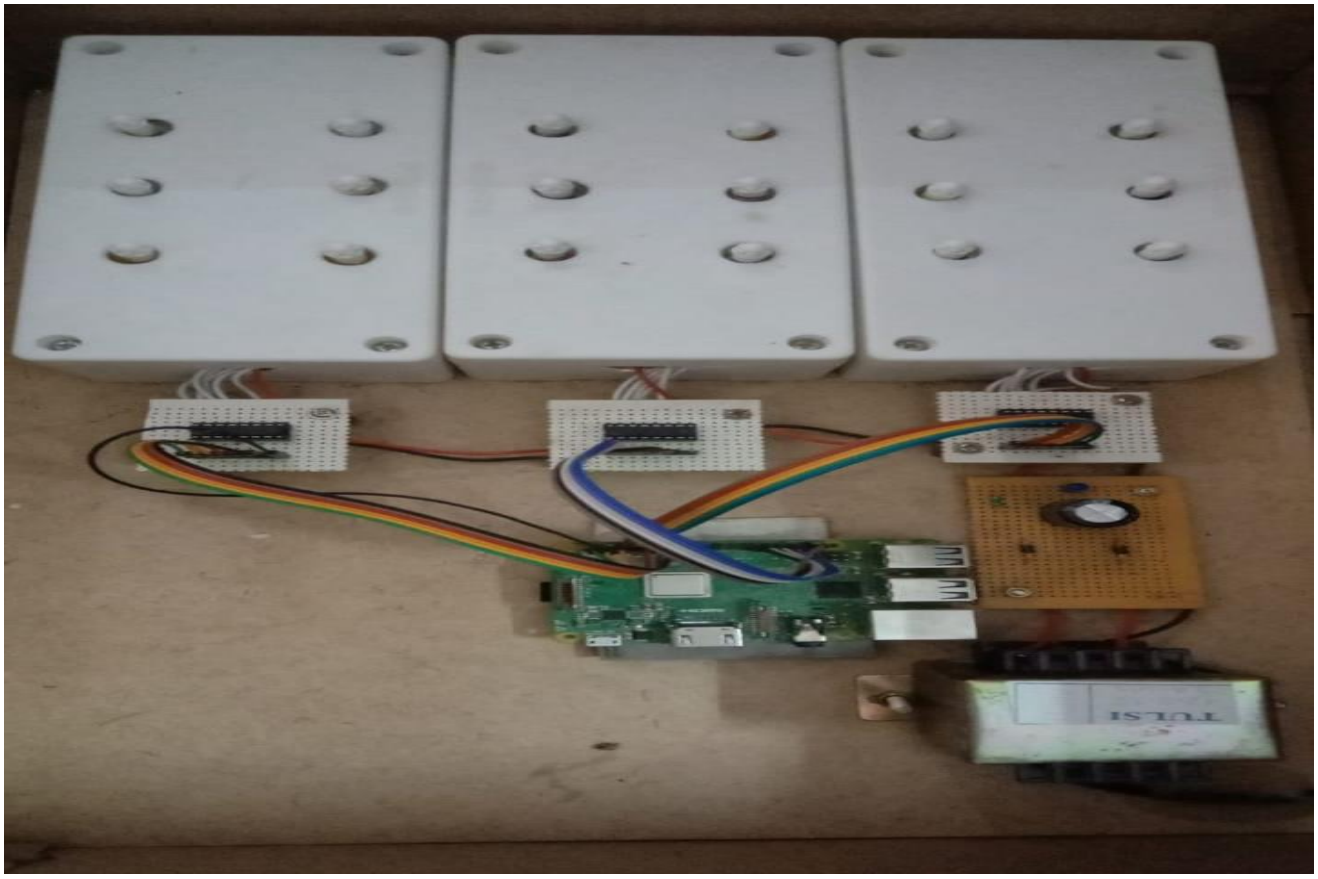

Figure 5.1 Snapshot of Hardware Implementation

The detail implementation starts initially with, the power transformer is connected to the PCB which

has two Zener diode, one resistance and one capacitance which has a capability of controlling high flow of current directly to the braille keypad. Then the PCB is connected to ULN2003 driver and that driver is further connected to braille keypad. Raspberry pi is connected to the ULN2003 driver which will transmit the power supply and the data to the braille keypad.

5.2 RESULTS:

The brief process of braille keypad working starts from power transformer is of 3 amps which is connected to the PCB which supply only required amount of current to the ULN2003 driver and this transmits current to the solenoid motors placed in braille keypad. The camera captures the image which is placed in front of it then, the images are segmented into pixels, after this process the extraction of the text from the textboard will be done. Once the extraction is done optical character reorganization(ocr) is used for the reorganization of the word then this will be converted into braille language and it will popped-up on the braille keypad, by placing the hand on the braille keypad the person can sense the words which is converted into braille dots.

5.3 ISSUES:

Issues that have been face during project is mentioned in below:

- Focus of camera requires a time to capture a word or text.
- Error due to compatibility issue with version of software.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

This device will surely help the visually impaired to be independent and flourish in this fast-developing world. Access to communication in its broadest sense is access to knowledge, and that is vital for us to achieve the highest degree of personal autonomy and be treated as equals. Visually impaired people has to face many issues while accessing the text which are not in braille script. To help them there are many technologies, one among them is text to speech converter, which converts text to speech hence they can hear the words. But usually voice which is used will be inconvenient to listen and even the spellings will not be known to the user. This can be avoided by using character by character recognition but its time consuming. Hence the other technology that can be used to help them is braille displays. The keyboard is aimed towards the welfare of visually impaired people. The visually impaired have an exposure to all the latest equipment's made especially for them, but none has attempted better research over this issue. Hence, this project is sure to create a revolution in its own field and ensure complete support from people of different societies. This project helps the visually impaired to interact with the computer system at a maximum probability and easier to communicate. At the international arena this project will definitely achieve greater heights and is expected to be welcomed by communities for helping the blind.

FUTURE ENHANCEMENT

It can be implemented for numbers and special characters. By implementing numbers and special characters the system will have more beneficial to visually impaired people. They will also get to know about the numbers and special characters, if these numbers and special characters are present in the word documents. It can also be done in real time for the visually impaired persons in their day-to-day life for reading books, newspaper, magazines, etc. In real time the visually impaired persons can carry the portable braille keypad with him/her for everywhere in this day-to-day life style.

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- http://www.iaeme.com/IJECET/issues.asp?JType=IJECET&VType= 7&IType=4 Journal Impact Factor (2016): 8.2691 (Calculated by GISI) www.jifactor.com ISSN Print: 0976-6464 and ISSN Online: 0976-6472

APPENDIX A

PROGRAM

Code:

```
Import re
Import numpy as np
Import sys
Import cv2
Import os
Import pytesseract
From gtts import gtts
From PIL import Image
Import time
Import pyttsx3
Import RPi.GPIO as GPIO
Import time
From Motor import *
From Motor2 import *
From Motor3 import *
GPIO.setmode(GPIO.BCM)


IN1=2
IN2=3
IN3=4
IN4=17
IN5=27
IN6=22

IN7=26
IN8=19
IN9=13
IN10=6
IN11=5
```

```
IN12=21
IN13=14
IN14=15
IN15=18
IN16=23
IN17=24
IN18=25

GPIO.setup(IN1, GPIO. OUT)
GPIO.setup(IN2, GPIO. OUT)
GPIO.setup(IN3, GPIO. OUT)
GPIO.setup(IN4, GPIO. OUT)
GPIO.setup(IN5, GPIO. OUT)
GPIO.setup(IN6, GPIO. OUT)

GPIO.setup(IN7, GPIO. OUT)
GPIO.setup(IN8, GPIO. OUT)
GPIO.setup(IN9, GPIO. OUT)
GPIO.setup(IN10, GPIO. OUT)
GPIO.setup(IN11, GPIO. OUT)
GPIO.setup(IN12, GPIO. OUT)

GPIO.setup(IN13, GPIO. OUT)
GPIO.setup(IN14, GPIO. OUT)
GPIO.setup(IN15, GPIO. OUT)
GPIO.setup(IN16, GPIO. OUT)
GPIO.setup(IN17, GPIO. OUT)
GPIO.setup(IN18, GPIO. OUT)

GPIO.output(IN1, false)
GPIO.output(IN2, false)
GPIO.output(IN3, false)
GPIO.output(IN4, false)
GPIO.output(IN5, false)
GPIO.output(IN6, false)

GPIO.output(IN7, false)
GPIO.output(IN8, false)
GPIO.output(IN9, false)
```

```
GPIO.output(IN10, false)
GPIO.output(IN11, false)
GPIO.output(IN12, false)

GPIO.output(IN13, false)
GPIO.output(IN14, false)
GPIO.output(IN15, false)
GPIO.output(IN16, false)
GPIO.output(IN17, false)
GPIO.output(IN18, false)

GPIO.setwarnings(False)
GPIO.setmode(GPIO. BCM)

Cap = cv2. Video Capture (0)
Sample=0;
Error=0

While (True):
      Ret, img = cap. read ()
      Print(ret)

     Gray=cv2. Color (img, cv2.Color_BGR2GRAY)

     Cv2.imshow('frame', img)
      If cv2.waitKey(1) & 0xFF==ord('q');
While (True):
      ret, img = cap. read ()
      print(ret)

     gray=cv2. cvtColor (img, cv2.COLOR_BGR2GRAY)

     cv2.imshow ('frame', img)
     if cv2.waitLey(1) & 0xFF==ord('q'):
        cv2.imwrite('frame.png',img)
        break
cap.release()
if error==0;
   print('Camera is interrupted\nplease execute the script again')
```

```
    cv2.destroyALLWindows()
if error==1:
  print('image is captured')
im = image. Open("frame.png")
text =pytesseract. image_to_string (im, lang = 'Eng')
 f=open('Bra.txt','w)
f.write(text)
f.close()
print(text)
def listToString(s):
  # Initialize an empty string
  Str1 = ""
  # Traverse in the string
  For ele in s:
       Str1+= ele
  # Return sting
  Return str1
S11= ''
With open ("Brai.txt", "r") as file:
      data = file.readlines()
      for line in data:
           s=listToSting(line)
          #Print ('s {}'. format(s))
          Word = str(line.split())
           s1=re.sub("";:?/.,><+=)(*&^%$#@!{}[]\|~`,s)
           s1= "'.join(c for c in s1 if c.isalpha())
           s11+=str(s1)
   print((s11))

def split(word):
    return[char for char in word]
dd=split(s11)
l=len(dd)
l=int(1)

print('len {}', format(dd))
for i is range(0,len(dd)):

          if i==0 or i==3 or i==6 or i==9 or i==12 or i==15 or i==18 or i==21 or i== 22
             print('first {}', format(dd[1]))
```

```
if dd[i]== ‘A’ or dd[i]== ‘a’:
    A ()
     Time.sleep(1)

if dd[i]== ‘B’ or dd[i]== ‘b’:
   B ()
   Time.sleep(1)

if dd[i]== ‘C’ or dd[i]== ‘c’:
   C()
   Time.sleep(1)

if dd[i]== ‘D’ or dd[i]== ‘d’:
   D ()
   Time.sleep(1)
if dd[i]== ‘E’ or dd[i]== ‘e’:
   E()
   Time.sleep(1)

if dd[i]== ‘F’ or dd[i]== ‘f’:
   F ()
   Time.sleep(1)

if dd[i]== ‘G’ or dd[i]== ‘g’:
   G ()
   Time.sleep(1)

if dd[i]== ‘H’ or dd[i]== ‘h’:
   H ()
   Time.sleep(1)

if dd[i]== ‘I’ or dd[i]== ‘i’:
   I ()
   Time.sleep(1)

if dd[i]== ‘J’ or dd[i]== ‘j’:
   J ()
   Time.sleep(1)

if dd[i]== ‘K’ or dd[i]== ‘k’:
```

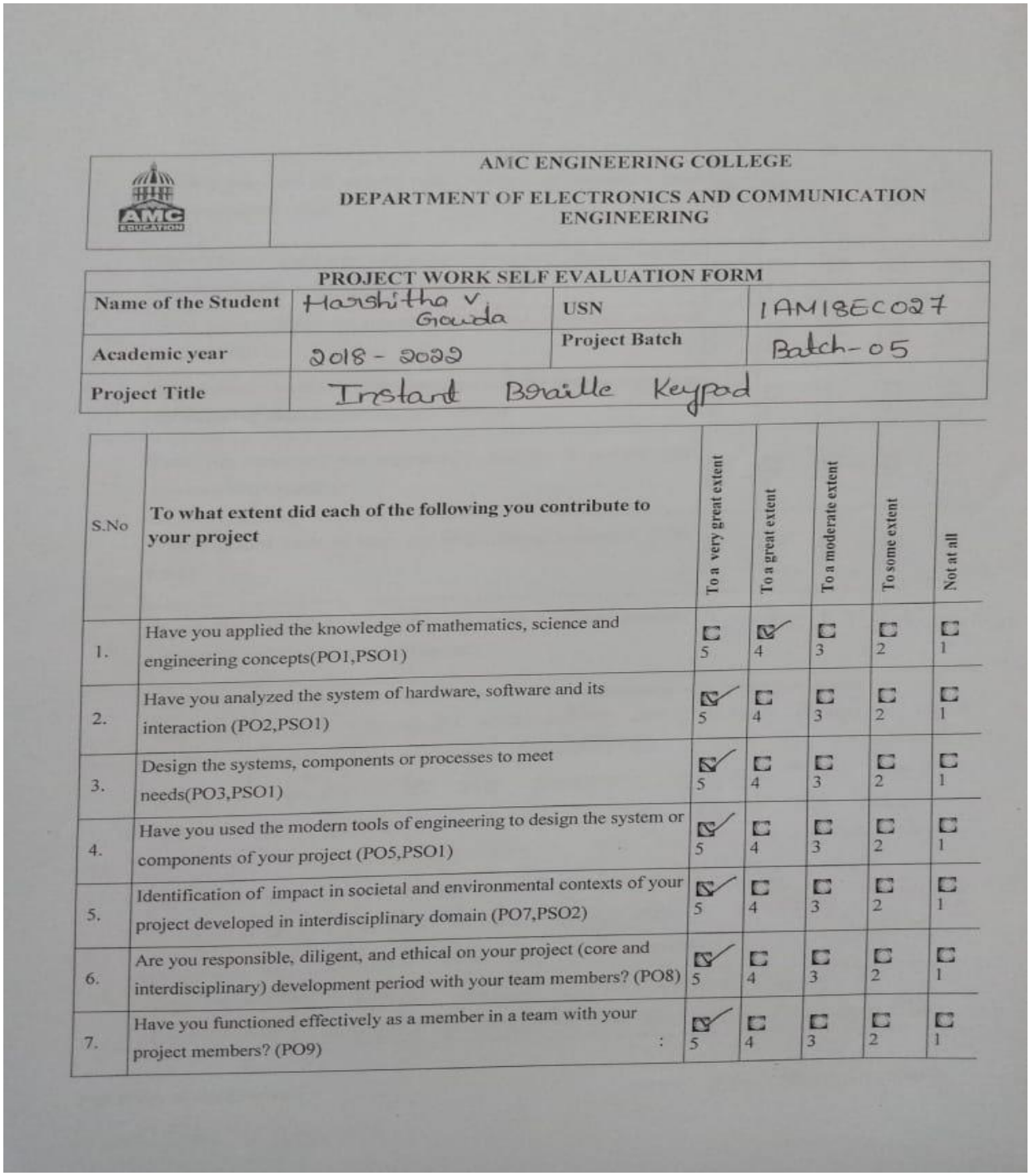
```
    K ()
    Time.sleep(1)

if dd[i]== 'L' or dd[i]== 'l':
    L ()
    Time.sleep(1)

if dd[i]== 'M' or dd[i]== 'm':
    M ()
    Time.sleep(1)

if dd[i]== 'N' or dd[i]== 'n':
    N ()
    Time.sleep(1)

if dd[i]== 'O' or dd[i]== 'o':
    O ()
    Time.sleep(1)

if dd[i]== 'P' or dd[i]== 'p':
    P ()
    Time.sleep(1)

if dd[i]== 'Q' or dd[i]== 'q':
    Q ()
    Time.sleep(1)

if dd[i]== 'R' or dd[i]== 'r':
    R ()
    Time.sleep(1)

if dd[i]== 'S' or dd[i]== 's':
    S ()
    Time.sleep(1)

if dd[i]== 'T' or dd[i]== 't':
    T ()
    Time.sleep(1)

if dd[i]== 'U' or dd[i]== 'u':
```

```
    U ()
    Time.sleep(1)

if dd[i]== 'V' or dd[i]== 'v':
    V ()
    Time.sleep(1)

if dd[i]== 'W' or dd[i]== 'w':
     W ()
    Time.sleep(1)

if dd[i]== 'X' or dd[i]== 'x':
    X ()
    Time.sleep(1)

if dd[i]== 'Y' or dd[i]== 'y':
    Y ()
    Time.sleep(1)

if dd[i]== 'Z' or dd[i]== 'z':
    Z()
    Time.sleep(1)
```

APPENDIX B
PUBLICATION DETAILS

APPENDIX C

PROJECT SELF EVALUATION FORM



AMC ENGINEERING COLLEGE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROJECT WORK SELF EVALUATION FORM

Name of the Student	Harshitha V Gowda	USN	1AM18EC027
Academic year	2018 - 2022	Project Batch	Batch-05
Project Title	Instant Braille Keypad		

S.No	To what extent did each of the following you contribute to your project	To a very great extent	To a great extent	To a moderate extent	To some extent	Not at all
1.	Have you applied the knowledge of mathematics, science and engineering concepts(PO1,PSO1)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
2.	Have you analyzed the system of hardware, software and its interaction (PO2,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
3.	Design the systems, components or processes to meet needs(PO3,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
4.	Have you used the modern tools of engineering to design the system or components of your project (PO5,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
5.	Identification of impact in societal and environmental contexts of your project developed in interdisciplinary domain (PO7,PSO2)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
6.	Are you responsible, diligent, and ethical on your project (core and interdisciplinary) development period with your team members? (PO8)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
7.	Have you functioned effectively as a member in a team with your project members? (PO9) :	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1

8.	Have you assessed any societal, health, safety, legal and cultural issues in your project? (PO6)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
9.	Have you presented your project confidently and prepared effective reports? (PO10)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
10.	Have you completed the project within a time frame and estimated budget? (PO11)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
11.	Is your project leads you to recognize the need for lifelong learning in the context of technological change? (PO12)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
12.	Have you conducted the experiments/ analysis to provide valid conclusion? (PO4,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
13.	Is your project leads to learn any programming languages? (PO5, PSO2)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
14.	Identify the domain of your project (Embedded / Communication/ Network/ Signal Processing/ VLSI and etc)	Artifical Intelligence				
15.	Classify the relevance of your project (Research oriented/application) with proper justification: As we all knaw visually impaired peoples are still facing so many problems even in digital world there is no peroper gadgets to help them to known surrounding them so our project may help them to overcome such problems in their day-to-day life. not completely 100% but they can make it very useful in their life. so this modul or project can really help blind and deaf peoples to overcome there difficulties in day to day life.					

Signature of the Student: Harshitha V Gowda

Date: 22/06/2022

AMC ENGINEERING COLLEGE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROJECT WORK SELF EVALUATION FORM

Name of the Student	Vedapriya. M.N	**USN**	1AM18EC044
Academic year	2018-2022	**Project Batch**	Batch-05
Project Title	Instant Braille Keypad		

S.No	To what extent did each of the following you contribute to your project	To a very great extent	To a great extent	To a moderate extent	To some extent	Not at all
1.	Have you applied the knowledge of mathematics, science and engineering concepts(PO1,PSO1)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
2.	Have you analyzed the system of hardware, software and its interaction (PO2,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
3.	Design the systems, components or processes to meet needs(PO3,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
4.	Have you used the modern tools of engineering to design the system or components of your project (PO5,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
5.	Identification of impact in societal and environmental contexts of your project developed in interdisciplinary domain (PO7,PSO2)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
6.	Are you responsible, diligent, and ethical on your project (core and interdisciplinary) development period with your team members? (PO8)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
7.	Have you functioned effectively as a member in a team with your project members? (PO9) :	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1

8.	Have you assessed any societal, health, safety, legal and cultural issues in your project? (PO6)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
9.	Have you presented your project confidently and prepared effective reports? (PO10)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
10.	Have you completed the project within a time frame and estimated budget? (PO11)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
11.	Is your project leads you to recognize the need for lifelong learning in the context of technological change? (PO12)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
12.	Have you conducted the experiments/ analysis to provide valid conclusion? (PO4,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
13.	Is your project leads to learn any programming languages? (PO5, PSO2)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
14.	Identify the domain of your project (Embedded / Communication/ Network/ Signal Processing/ VLSI and etc)	Artificial Intelligence				
15.	Classify the relevance of your project (Research oriented/application) with proper justification: We known that many of the people are facing problems of low vision so to overcome that and to provide them a useful device which will be helpful for them in their day to day life our device will help them to know what is in front of them and detect the Text which is in front of them. Our device is helpful for both blind and deaf. we have come up with the device that will help for both, so our device will be help for them.					

Signature of the Student: Vedaja M N

Date: 22/06/2022

AMC ENGINEERING COLLEGE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROJECT WORK SELF EVALUATION FORM			
Name of the Student	Pooja.N	USN	1AM18EC063
Academic year	2018-2022	Project Batch	Batch-05
Project Title	Instant Braille Keypad		

S.No	To what extent did each of the following you contribute to your project	To a very great extent	To a great extent	To a moderate extent	To some extent	Not at all
1.	Have you applied the knowledge of mathematics, science and engineering concepts(PO1,PSO1)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
2.	Have you analyzed the system of hardware, software and its interaction (PO2,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
3.	Design the systems, components or processes to meet needs(PO3,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
4.	Have you used the modern tools of engineering to design the system or components of your project (PO5,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
5.	Identification of impact in societal and environmental contexts of your project developed in interdisciplinary domain (PO7,PSO2)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
6.	Are you responsible, diligent, and ethical on your project (core and interdisciplinary) development period with your team members? (PO8)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
7.	Have you functioned effectively as a member in a team with your project members? (PO9)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1

8.	Have you assessed any societal, health, safety, legal and cultural issues in your project? (PO6)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
9.	Have you presented your project confidently and prepared effective reports? (PO10)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
10.	Have you completed the project within a time frame and estimated budget? (PO11)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
11.	Is your project leads you to recognize the need for lifelong learning in the context of technological change? (PO12)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
12.	Have you conducted the experiments/ analysis to provide valid conclusion? (PO4,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
13.	Is your project leads to learn any programming languages? (PO5, PSO2)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
14.	Identify the domain of your project (Embedded / Communication/ Network/ Signal Processing/ VLSI and etc)	Artificial Intelligence				
15.	Classify the relevance of your project (Research oriented/application) with proper justification: As we known that there were many people's who are both blind and deaf. so keeping them in mind we are designing our project in such way that it will convert Text to Braille language using optical character recognition with the help of this model they can understand what the words or text that are their in front of them, by this model can read and understand the text and our model helps them in their day to day life.					

Signature of the Student: POOJA.N

Date: 22/06/2022

AMC ENGINEERING COLLEGE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROJECT WORK SELF EVALUATION FORM

Name of the Student	Prabha. D.N	USN	1AM18EC064
Academic year	2018 - 2022	Project Batch	Batch - 05
Project Title	Instant Braille Keypad		

S.No	To what extent did each of the following you contribute to your project	To a very great extent	To a great extent	To a moderate extent	To some extent	Not at all
1.	Have you applied the knowledge of mathematics, science and engineering concepts(PO1,PSO1)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
2.	Have you analyzed the system of hardware, software and its interaction (PO2,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
3.	Design the systems, components or processes to meet needs(PO3,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
4.	Have you used the modern tools of engineering to design the system or components of your project (PO5,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
5.	Identification of impact in societal and environmental contexts of your project developed in interdisciplinary domain (PO7,PSO2)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
6.	Are you responsible, diligent, and ethical on your project (core and interdisciplinary) development period with your team members? (PO8)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
7.	Have you functioned effectively as a member in a team with your project members? (PO9) :	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1

8.	Have you assessed any societal, health, safety, legal and cultural issues in your project? (PO6)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
9.	Have you presented your project confidently and prepared effective reports? (PO10)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
10.	Have you completed the project within a time frame and estimated budget? (PO11)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
11.	Is your project leads you to recognize the need for lifelong learning in the context of technological change? (PO12)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
12.	Have you conducted the experiments/ analysis to provide valid conclusion? (PO4,PSO1)	☑ 5	☐ 4	☐ 3	☐ 2	☐ 1
13.	Is your project leads to learn any programming languages? (PO5, PSO2)	☐ 5	☑ 4	☐ 3	☐ 2	☐ 1
14.	Identify the domain of your project (Embedded / Communication/ Network/ Signal Processing/ VLSI and etc)	Artificial Intelligence				
15.	Classify the relevance of your project (Research oriented/application) with proper justification: As per the world health Organization there were many people's who are blind and deaf so it is difficult to read and listen, so to help them to read and understand we made this model called Instant Braille Keypad so initially it will capture the image which we show in the form of word or Text of the alphabets then it is Converted into Braille language using optical character recongnition and then it will be popped.					

Signature of the Student: Radha D. N

Date: 22/06/2022