

AN ASSISTIVE SYSTEM FOR VISUALLY IMPAIRED USING RASPBERRY PI

A Project Report Phase – II

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electronics and Communication Engineering

by

VEERABATHINI VINAY (39130504)

VANGAPALLY PAVAN (39130502)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade “A” by NAAC**

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL - 2023



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with "A" grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of) **VEERABATHINI VINAY (39130504) and VANGAPALLY PAVAN (39130502)** who carried out the Project entitled **"An Assistive System for Visually Impaired Using Raspberry Pi"** under our supervision from November 2022 to April 2023.



Internal Guide

Ms. R. Sakthi Prabha, M.E., (Ph.D)

15/4/2023

Head of the Department

Dr. T. RAVI, M.E., Ph.D.,

Submitted for Viva voce Examination held on 26.04.2023

[Signature]

Internal Examiner

V. Vedamarayanan

External Examiner

DECLARATION

We, **VEERABATHINI VINAY (39130504)** and **VANGAPALLY PAVAN (39130502)** here by declare that the Project Report entitled “**An Assistive System For Visually Impaired Using Raspberry Pi**” done by us under the guidance of **Ms. R.SAKTHI PRABHA, M.E.,(Ph.D)** Assistant Professor, Department of Electronics and Communication Engineering, at SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering Degree In Electronics and Communication Engineering.

SIGNATURE OF THE CANDIDATES

Date: 26.04.2023

Place: chennai

1. 
2. 

ACKNOWLEDGEMENT

We are pleased to acknowledge my sincere thanks to **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey my thanks to **Dr.N.M.NANDHITHA M.E.,Ph.D.**, Dean, School of Electrical and Electronics Engineering, and **Dr.T.RAVI M.E.,Ph.D.**, Head of the Department, Dept. of Electronics and Communication for providing us necessary support and details at the right time during the progressive reviews.

Also, we would specially thanks to **Ms.R. SAKTHI PRABHA, M.E.,(Ph.D)**, Assistant Professor, Department of Electronics and Communication Engineering, for her valuable guidance, suggestions, and constant encouragement paved way for the successful completion of my project work, constantly motivating me to work harder and for getting good results.

We would like to extend our appreciation to all Panel members, Year Coordinator, Teaching and Non-teaching staff members of the Department of Electronics and Communication Engineering, who provided us with invaluable support and assistance throughout our project completion

ABSTRACT

Visible damage might be either entire or partial. It affects persons with such problems invisibly, lowering their self-esteem and prohibiting them from spending a substantial portion of their day participating in sports. It might be either long-lasting or ingrained. There is currently no cure, despite many therapies. This article discusses framework ideas for providing persons with a crisp support framework. The reading system, designed with eye impairments in mind, makes it easier for persons with disabilities to read. In this post, we demonstrate yet another Raspberry Pi-based machine reading (OCR), virtual assistant, and vernacular system. This is an excellent system combo. The proposed solution is to design a combination of a reading machine (OCR), virtual assistant, and Demotics system using Raspberry Pi. To address these challenges, the proposed solution involves a combination of a reading machine (OCR), virtual assistant, and home automation system using Raspberry Pi. The OCR technology enables the recognition and conversion of text into audio speech using GTTS (Google Text to Speech) for easier accessibility. Additionally, Google Assistant is used as the platform for the virtual assistant, which can assist with day-to-day activities such as checking emails, weather forecasts, and news updates. Finally, using Python language, a voice-based home automation system can be implemented. The main objective of this project is to assist visually impaired individuals using various technological advancements, making tasks such as reading documents, home automation, and personal assistance achievable through voice commands. Index Terms—Optical Character Recognition (OCR), GTTS, Virtual Assistant, Raspberry-Pi, and Python.

CONTENTS

Chapter No.	TITLE	page. No
	ABSTRACT	V
	LIST OF FIGURES	VIII
	LIST OF ABBREVIATION	IX
	LIST OF TABLES	X
1	INTRODUCTION	1
	1.1 Pertinent facts about individuals with a visual disability	3
	1.2 Challenging obstacles with determination	3
	1.3 Global Prevalence of Visual Impairment	4
	1.4 Impact of vision Impairment	5
	1.5 WHO's Comprehensive Strategy for Eye Health	6
2	LITERATURE SURVEY	7
	2.1 Inferences from Literature Survey	13
	2.2 Problem Definition statement in Existing System	13
3	AIM AND SCOPE OF THE PROJECT INVESTIGATION	14
	3.1 Aim of Existing Methodology	14
	3.2 Proposed Methodology for Developing an Assist Device for Vision Delay	14
4	PROPOSED SYSTEM	22
	4.1 Proposing Methodology System	22

	4.2 Need for Embedded Systems	23
	4.3 Explanation of Embedded Systems	25
	4.4 System Safety and Reliability	29
5	SIMULATION RESULTS AND DISCUSSIONS	33
6	CONCLUSION	40
	6.1 Future Work	40
	STANDARDS AND CONSTRAINTS	41
	REFERENCES	43

LIST OF FIGURES

Fig.No.	Figure Name	Page. No.
1.1	Problems of Visually Impaired People	2
3.1	Proposed Block Diagram of Assistive System for Visually Impaired Using Raspberry Pi	15
3.2	The Deployment Workflow Is Featured	16
3.3	Text detection and conversion into speech	18
3.5	Set up of Raspberry pi 2B+	19
3.6	Raspberry pi with camera	20
4.1	Block diagram of typical Embedded System	27
4.2	Embedded System having Heterogeneous architecture	29
4.3	General Block diagram of Power Supply unit	31
5.1	Hardware connections of an Assistive System	33
5.2	Text converts into speech	34
5.3	Clicked Image by Raspberry Pi Camera	34
5.4	Python Code Text to Speech Enhance Image	35
5.5	Font Analysis Time Chart	37
5.6	Distance Analysis Time Chart	38

LIST OF ABBREVIATION

API	Application Program Interface
SDGs	Sustainable Development Goals
PECI	Package of Eye Care Interventions
ECCF	Eye Care Competency Framework
TTS	Text-To-Speech
OCR	Optical Character Recognition
IVA	Intelligent Virtual Assistant
ICD	In-Circuit Debugger
TCB	Trusted Computing Base

LIST OF TABLES

Table No.	Table Name	Page no.
5.1	Font analysis performance chart for visually impaired people	40
5.2	Comparison between Existing and Proposed Methodology	38

CHAPTER 1

INTRODUCTION

Globally, there are approximately 38 million blind people and 242 million visually impaired people, totalling 280 million visible people. When walking, blind people rely on the help of others. People who are visually impaired express a few difficulties in reading print text using cutting-edge technology, such as design, media, accuracy, style, and performance issues. We offer sophisticated programmes that help visually impaired people read printed materials simply and precisely. The proposed company employs a camera-based assistive device technology that enables people to read text archives. The goal of this design is to enhance image capturing capabilities in embedded systems using the Raspberry Pi board. This design relies on fundamental and intuitive inquiry, and it is a mock-up.[1]

The process of turning a computer into a speaking machine is known as text to voice technology. The principles of natural language processing are applied. There are a variety of strategies available for text reading applications, including Interpretation reading, recorder, Lego Mindstorms, and using pen for support, however all of these can execute speech synthesis by building data banks. A solution into issue is the finger reading technique, which eliminates previously constructed including stowed datasets preserved offers reaction before reading the text provided as instruction, incarcerated portrait. The rhetoric synthesiser turns the auditory type in inclusion document structure, then procedure the content to create Advanced curriculum Despite technological advances allow as the electronic storage of information, textual information. A side from these, rapids is the predominant cause of blindness in 90 percentage of the world legally blind people who live in low, middle, and indeed most modern countries.[2]

The line of reading and the character arrangement are honour using a method. Character recognition and image content capture are carried within the framework of product development using Open-Source Computer Vision (CV) libraries. The two main components of many of the technological tools utilised by people with low vision and macular degeneration are OCR software and voice synthesizer engines. The method of transforming photographed images computer-encrypted text is known as optical character recognition. OCR is a method that gives letters, images, or numbers

associated with a character's visual a symbolic meaning. It is described as a procedure for converting meticulously Computer printed charts reviewed.[3]



Fig.1: Problems of Visually Impaired People

The above Fig.1.depicts the obstacles that individuals with visual impairments encounter, which can hinder their daily routine and self-sufficiency. Owing of the restricted screen real estate, the small size of touch displays on many mobile devices can be extremely difficult for those with visual impairments. Furthermore, this project integrates a Google-powered AI assistant with a system for improving features and offering basic day-to-day services. This can be achieved by turning on the Google Console's Implementation Program Client (API). The Google voice-hat is the system's fundamental component, and it is used to construct the Google-based assistant. Furthermore, the project presents Demotic's, a home automation system that uses the Google search to activate and deactivate various home appliances via voice commands aided by Python programming. A Reed switch-based door sensor is also included.

The estimations were based on prior representative studies as well as 50 national and subnational surveys carried out since 2004. Regional estimates were computed using an approach that considered the state of economic development as well as other aspects. Uncorrected refractive errors, cataracts, and glaucoma are the main causes of visual impairment, while glaucoma, dry eyes, and age-related macular degeneration are the main causes of blindness. It is not possible to compare these estimations to earlier ones because of the different methods used. But there is a decline in visual impairment and blindness on a worldwide and regional scale, which is mostly due to social and economic progress and government and foreign partners' investments in enhancing eye care services. Increasing the provision of eye care

services in all developing nations is important, and the Action Plan for the prevention of caught loss of vision and blindness affords a road map to arrive at this goal [4].

1.1 Pertinent facts about Individuals with a Visual Disability

1. Productivity losses caused by vision impairment are projected to run US\$ 411 One trillion annually, which has a substantial effect on the world economy.
2. Cataracts and uncorrected refractive errors are the main causes of vision loss and blindness.
3. Visual impairment and blindness can strike created of any age, while the majority of those affected are older than 50.
4. Globally, there are a staggering 2.2 billion individuals who suffer from either near or farsightedness, and 1 billion of the possibilities might be avoided or corrected.

1.2 Challenging Obstacles with Determination

The lone ICC of Diseases (2018) divides visual impairment into a couple of groups gaps in both distance as they approach vision.

1. Mild - visual acuity lower or equal to six years and twelve months to 6/18
2. Moderate - visual acuity ranging from six and a half to transform 6/60.
3. Severe - blurred vision ranging from six for sixty to 3/60.
4. A visual threshold of less than three meters to sixty meters - a deficiency

The severity of a person's vision impairment can vary depending on a variety of factors, including the availability of measures to prevent them and treatments, access to vision rehabilitation services and assistive devices (e.g., glasses or canes), and challenges triggered by inaccessible infrastructure and information. A measurement poorer than N6 or M.08 at 40cm is one of the criteria for measuring near visual acuity, although this alone does not completely represent the significance of a cataract on a person's everyday life.

1.3 Global Prevalence of Visual Impairment

Globally, eye problems are a major public health concern that affects many individuals. Nearly two billion individuals suffer from some sort of near or distant visual impairment, with around 1 billion lacking proper treatment or prevention measures. Individuals in this category have moderate to severe distant vision impairment or blindness as a result of uncorrected refractive errors, cataracts, age-related macular degeneration, glaucoma, or diabetic retinopathy. Furthermore, untreated presbyopia is a substantial source of near near-sightedness, affecting around 826 percent million people globally.

Distance diminished vision is more common according to low- and middle-income countries than in high-income regions. Untreated near vision impairment, on the other hand, is extremely common in western, eastern, and central Sub-Saharan Africa, accounting for more than 80% of cases. High-income portions such as North America, Australasia, Western Europe, and Asia-Pacific, on the other hand, have recorded rates of less than 10%. It is worth noting that population expansion and ageing are predicted to increase the likelihood of having a lack of vision, making this a more significant public health concern. Age-related macular degeneration, cataracts, diabetic retinopathy, glaucoma, and uncorrected refractive errors are the main causes of visual impairment globally. However, the incidence of these illnesses varies greatly depending on the accessibility and cost of eye care services as well as the population's degree of eye care literacy. For instance, age-related macular degeneration and glaucoma are more prevalent in high-income nations while cataracts are more common in low- and middle-income nations. The most common causes of visual impairment in children vary greatly by country, with congenital cataract being a major problem in low-income countries and retinopathy of prematurity being more common in middle-income nations. Nevertheless, untreated refractive errors continue to be a major factor in children's visual impairment worldwide.

In essence, visual challenges are a major public health issue that affects billions of people globally. While many cases of visual impairment are avoidable or curable, many people may not have access to the essential treatment and assistance. To successfully address this global health concern, more access to eye care services and education about visual health are required. Furthermore, as the world's population

grows and ages, the prevalence of visual impairment is predicted to climb, making it even more critical to address this issue as soon as possible.

1.4 Impact of Vision Impairment

Children who suffer from significant visual impairment at a young age may endure delayed development in areas like as motor, linguistic, emotional, social, and cognitive development, which can have long-term effects. Furthermore, school-age children with visual impairment may fail to meet academic milestones.

Adults' quality of life is substantially impacted by eyesight impairment. People with impaired eyesight may have reduced labour-force involvement and productivity, as well as increased rates of sadness and anxiety. Vision impairment in older individuals can lead to social isolation, difficulties walking, an increased risk of falls and fractures, and an increased chance of early admission to nursing or care facilities. Firstly, vision impairment can make it challenging to perform basic daily activities such as reading, cooking, and grooming. It can also make it difficult to navigate unfamiliar environments, leading to a decreased sense of independence. This can have a significant impact on a person's quality of life, causing frustration and a reduced ability to participate in social activities. Secondly, people with vision impairment may struggle with learning, reading, and writing, which can impact their educational and employment opportunities. This can lead to a reduced quality of life and a decreased ability to contribute to society. It is important to address these challenges and provide support for people with vision impairment to achieve their full potential. Thirdly, vision impairment can lead to feelings of depression, anxiety, and social isolation, which can have a significant impact on a person's mental health. It may also cause difficulties in social interactions, which can lead to a reduced sense of self-worth. It is important to address the mental health consequences of vision impairment and provide support for individuals to maintain positive mental health.

As it is estimated that the annual global loss in productivity due to visual impairment is roughly dollar of consumption 411 one trillion dollars (in purchasing power parity), vision impairment is a significant financial burden on a global scale. This amount is much higher than the anticipated cost gap of \$25 billion needed to satisfy the unmet requirement of vision impairment.

1.5 WHO's Comprehensive Strategy for Eye Health

World Sight Day is promoted as an annual advocacy event by WHO, and the organisation supports the integration of eye care in health systems through a variety of technical tools, such as the Eye Care in Health Systems - Guide for Action, the Package of Eye Care Interventions (PECI), and the Eye Care Compendium. These are just a few of WHO's main activities in the prevention of blindness. WHO also creates and uses tools to assist nations in evaluating the delivery of eye care services, including the Eye Care Services Assessment Tool, and the Tool for the Assessment of Glaucoma Services, the Refractive Services Assessment Tool, and the Rehabilitation Services and Systems Assessment Tool. WHO has adopted several approaches to prevent blindness and promote eye health. The first strategy involves increasing awareness through World Sight Day, which is celebrated annually on the second Thursday of October. The primary aim of this event is to create public consciousness of the global impact of blindness and vision impairment and inspire people, societies, and governments to take steps towards preventing it. WHO also works to raise awareness about the importance of eye health and to advocate for universal access to eye care services.

This includes working with governments and other stakeholders to develop and implement policies and strategies that promote eye health and to ensure that eye care services are integrated into primary health care systems. WHO also conducts research on eye health and works to develop evidence-based guidelines for the prevention and treatment of eye diseases. This includes conducting epidemiological studies to understand the prevalence and causes of blindness and visual impairment, as well as evaluating the effectiveness of different interventions and treatments. In addition to advocacy, WHO offers technical assistance to nations to help them incorporate eye care into their healthcare systems. This involves creating tools and resources to assist in the delivery of effective and efficient eye care services. Among these resources are the Eye Care in Health Systems - Guide for Action, which offers guidance on developing and implementing a comprehensive eye care program, and the Package of Eye Care Interventions (PECI), which outlines the fundamental interventions that should be included in basic eye care services.

CHAPTER 2

LITERATURE SURVEY

A. G. Sareeka, and V. Sucharitha, et al., [3] pseudo–Eye Mobility Assistance for Visually Impaired Using Image Recognition," in 2018 when prices were lowest 2nd the Worldwide Conference on Inventive Systems and Control (ICISC), Coimbatore, pp. 174-178. The proposal proposes the creation of an electronic aid for the blind. The system is designed to give overall measures such as artificial vision, identifiers of and real-time position monitoring with emergency alerts. Frequently, blind people are unaware of outside hazards and require assistance to reduce the danger of collision. The goal of this study is to create a system to aid blind persons in outdoor navigation. By allowing users to move outside with voice awareness, the suggested technology will be able to lessen the danger of obstacle collisions. The whole system's goal is to produce a low-cost and efficient navigation assistance for the blind that provides a sensation of artificial vision by supplying information about the environmental situation of objects via Artificial intelligence (AI). An ultrasonic sensor is used to calculate the distance between items in the blind person's environment in order to guide the user's voice and vibration, which the blind person can hear and feel. The camera registers objects in front of blind persons and alerts them using the APR voice module. Using machine learning, this research applies an image algorithm based on artificial intelligence (AI) of pre-trained objects on the Image AI dataset. A camera that is aligned with the system's predetermined orientation provides as input to a computer system that contains object recognition to perform real-time object detection. The network output can then be processed and presented to the visually impaired person in the form of audio. The proposed approach could be applied to any given area and offers users with voice aids about nearby obstructions.

Aaron James and William A. et.al.,[1] completed the investigation and concluded that Optical Person Acknowledgement (OCR) is the identification of written characters utilising photoelectric devices and PC programming. Design and development of a Visually Impaired Learning Aid Device Magahi Srusti HK Department of TCE, GSSSIETW, Mysuru Srusti HK Department of TCE, GSSSIETW, Mysuru Bilva Shree v. TCE Department, GSSSIETW, Mysuru Shireen Mariyam Department of TCE, GSSSIETW, Mysuru Basavanna. M Assistant Professor, Department of TCE, GSSSIETW, Mysuru Basavanna includes images created by hand, hard-coded text into

machine-encoded text from separate sources, or subtitle text placed on an image. These images are converted into sound results in this evaluation. OCR is utilised in a variety of machine cycles, including mental figuring, machine comprehension, text to discourse, key data, and text mining. It is commonly employed in the investigation disciplines of character confirmation, counterfeit understanding, and PC vision. In this evaluation, the individual code in text records is dealt with utilizing a Raspberry Pi device, which sees characters via tesseract estimation and python programming, and the sound output is tuned in. We employ information in system plan in the arrangement and improvement of a virtual modernised library to integrate OCR for plan confirmation to perform report picture assessment (DIA). This evaluation is centred on the OCR-based customised book per The Raspberry Pi is used as a client for the apparently incapacitated. The Raspberry PI is based on a Broadcom system on a chip (SOC) that has an ARM-compatible CPU and an on-chip GPU arrangement. It promotes Python programming as an important programming language with the help of BBC BASIC.,2019.”

G. Iannizzotto, and L. L. Bello, et.al.,[6] "A the Plans and Verbal communication Enabled, Customizable, Virtual Assistants (VA for Smart Environments," 2018 compared with 11th An International Seminar on Human System Interaction (HSI), Gdansk, the year of 2018, with articles 50-56. Recent advancements in smart assistants and smart home automation have piqued the interest and curiosity of customers and investigators alike. Speech-enabled virtual assistants (also known as smart speakers) provide a wide range of network-oriented services and, in some situations, can link to smart environments, providing them with new and effective user interfaces. However, such technologies disclose new requirements as well as some flaws. They depict faceless and blind helpers, unable to exhibit a face and thus an experience, and unable to 'see' the user. As a result, the interaction has been restricted and, in some situations, rendered ineffective. Furthermore, many of such gadgets largely rely on cloud-based services, sending potentially sensitive data to faraway servers. To address these difficulties, we combine some of the most cutting-edge techniques in computer vision, deep learning, speech production and recognition, and artificial intelligence in this article to create a virtual assistant architecture for smart home automation systems. The suggested a clerk is effective and resource-efficient, interconnected, and adaptable, and runs on a low-cost, small-sized Raspberry PI 3

device. The system was merged with an open-source home for testing motivating factors

M. Owayjan, and A. Hayek, et.al.,[7] "Smart Assistive Navigation System for Blind and Visually Impaired Individuals," 2015 International Conference on Advances in Biomedical Engineering (ICABME), Beirut, pp. 162-165. A Smart Assistive Navigation System for Blind and visually handicapped Individuals is devised and implemented in this article to ensure safe and low-cost navigation. There are various blind navigation systems, but only a few are totally successful in meeting the needs of blind people to navigate securely, comfortably, and independently. As a result, certain cutting-edge projects are addressed and analysed. Finally, the system's design and implementation are demonstrated.

M. Rajesh and G. Bohouta et.al.,[20], "Text senses and discovering faces aid for visually impaired people using Raspberry PI," 2017 A Global Meeting on Circuit, Power, and Computing Science and technology (ICCPCT), Kollam, with chapters among one and five. Speech and text are the primary modes of human communication. To reach the information in a text, a person must have vision. Those and accepting low vision, on the other hand, can gather information through voice. This research presents a camera-based assistive text reading system to assist visually impaired people in reading the text on a captured image. The mode control can also recognise faces when a person enters the picture. The proposed concept entails extracting text from a scanned image using Tesseract Optical Character Recognition (OCR) and transforming the text to speech using Dragon NaturallySpeaking. The e-Speak tool is a procedure that allows people with disabilities to read text. This is a prototype helping visually impaired persons to recognise products in the real world by extracting text from images and converting it to audio. The proposed method is carried out using a Raspberry Pi, and portability is achieved using a battery backup. As a result, the user can bring the product anywhere and use it at any time. When entering the camera view, previously stored faces are identified and informed, which is a future technology that can be deployed. This technology assists millions of people throughout the world who have substantial visual loss.

S. A. Sabab, and M. H. Ashmafee, et.al.,[16] Blind Reader: "An intelligent assistant for the blind," Dhaka, 2016 19th International Conference on Computer and Information Technology (ICCIT), pp. 229-234. Books and documents are the primary sources of knowledge in the actual world. However, this knowledge is only available to those with a clear vision. In our culture, there are persons who do not have clear vision or who are blind. For this people, the world is a dark delusion. They have no way of knowing an object's shape or structure, let alone reading a paper. It is difficult for the blind to gain knowledge by reading materials. Braille is one of the methods for reading a book or document. Any technique can be used in this method. To make a document understandable to the blind, it requires converted to braille format. The issue occurs since this is a pricey endeavour that is frequently unavailable. The solution is straightforward: offer a smart gadget with a multimodal system capable of converting any paper to an interpreted version for the blind. A blind person can only read a document by tapping words, which are subsequently audibly delivered using a text to voice engine." "Blind Reader" is a user-friendly and successful interactive solution for those who are blind or have impaired eyesight."

S. M. Felix, and A. Veeramuthu et.al., [17] "An Advanced Internal AI Assistant for Those who are visually People," the Chennai suburb of It 2018: 2nd A Global Meeting on Trends in Products and The field of information technology (ICOEI), nos. 1245-1250. 10.1002/j.1538- 7305. 1955.tb01474.x in today's environment, independent living is increasingly a requirement, and visually impaired persons face a significant restriction problem. The visually impaired are at a disadvantage since they require a manual aid to urge information about their surroundings. Because visual information provides the foundation for many tasks, visually impaired people experience limitations in doing many of their daily activities such as going for a stroll, eating, conversing with a group of people, and so on. Technology advancements have made it possible to help those who suffer vision impairments. The goal of this essay is to examine several computer science tools that can be used to help the blind, such as voice recognition and image recognition. Creating an Android application that can recognise voice commands, assess the user's surroundings, and offer pertinent responses is a practical application of this idea. This app offers those who are visually impaired a practical method to use their smartphone to engage with their surroundings.

Syed and S. Rizvi et.al., [15] A means for managing the power of smart home appliances for the disabled, elderly, and blind Kuala Lumpur, Malaysia, 2018, pp. 1-4, 4th the International Congress on Information Sciences and Computer Science (ICCOINS). The idea of a "smart home" is already widely accepted and attracts the cooperation of numerous scientific and engineering fields. Since a decade ago, improving power efficiency and power management have emerged as significant study areas. The goal of this study paper is to make life easier for elderly and disabled individuals. In fact, when compared to healthy persons, the old and disabled have more difficulty performing their daily chores. Smart homes can help the elderly and disabled by offering secure, safe, and controlled settings. The created technology enables users to manage the appliances with minimal physical effort. More specifically, the developed system enables users to turn on and off home appliances simply by sending a message command using an Android application or SMS via a cell phone. The use of Bluetooth technology enables not only distant monitoring but also local administration of appliances. The trial findings show that the user can operate the household appliances using the specified interface. Voice, Bluetooth, and SMS inputs are used in the Android application.

S. Sonth and J. S. Kallimani et.al., [18] OCR-based teacher for the visually challenged, 2017 have been correlated the International Commission on Electrical, technology Communication, and Computer, and Optimization Tricks (ICEECCOT), Mysuru, 2017, pp. 1-7. This study presents a revolutionary implementation of a smart book reader based on Optical Character Recognition, better known for the visually impaired. An easily carried text reader that happens to be affordable, easily carried around and easily accessible to the community is required. We present a camera-based framework built on the computer controlled by the Raspberry Pi that includes image processing techniques, OCR, and a Text-to-Speech (TTS) synthesis module. The camera module is used to capture an image of the printed text, which is then pre-processed before it is supplied into the OCR. Binarization, de-noising, DE skewing, segmentation, and feature extraction are all part of the pre-processing stage. The findings of this investigation discuss an integration of a comprehensive Text Read-out system for the visually impaired. Google Tesseract was utilised for OCR in this project, and Pico was used for TTS.

V.Chayapathy and B.Sharath, et.al.,[17], "IOT-based automation in houses using a personal assistant," 2017 the International Assembly on the Smart Technologies for Smart Nations (SmartTechCon), Bangalore, pp. 385-389. This paper asserts what has been found from your property of a "IoT Personal aide using Raspberry Pi" on the Python, for example, platform. In order to improve users' quality of life by providing a more dynamic and user-friendly living environment, the goal of this project is to develop a personal assistant that enables users to communicate with household appliances using voice and gesture commands. To reach this purpose, the project requires the integration of many tools and components. The Internet of Things (IoT) is a network of physical objects or "things" that are integrated with electronics, sensors, software, and network connectivity to collect and share data. Smart gadgets and sensors in home automation gather physical experiences and translate them into data. The Raspberry Pi is an important component of IoT-based home automation since it collects data from sensors and interprets voice and gesture instructions to operate domestic appliances like lights, fans, and thermostats.as well as heaters, doors, and curtains. For example, if no one is there, the system can automatically turn off lights in the room.

V. Kpuska and G. Bohouta, et.a.l.,[21] "Next-generation digital personal assistants (Microsoft Cortana, Apple Siri, Amazon Alexa, and Google Home)," 2018; this was spread IEEE 8th Annual Understanding and Spending time Workshop and The symposium took place (CCWC), Las Vegas, NV, 2018, pp. 99-103. The realisation of natural interaction between humans and machines is one of the aims of artificial intelligence (AI). In recent years, the fastest developing topic in AI has been dialogue systems, sometimes known as interactive conversational systems. Many firms have developed Virtual Personal Assistants (VPAs) that are targeted to specific applications and areas, such as Microsoft's Cortana, Apple's Siri, Amazon Alexa, Google Assistant, and Facebook's M. This idea, on the other hand, takes a novel strategy that makes use of multi-modal dialogue systems capable of processing two or more user input modes, such as speech, picture, video, touch, manual gestures, gaze, head and body movement. This approach's Next-Generation VPA model aims to improve human-machine interaction by incorporating a variety of technologies such as gesture recognition, image/video recognition, speech recognition, extensive dialogue and conversational knowledge bases, and general knowledge bases

2.1 Inferences from Literature Survey

The use of Raspberry Pi as a platform for assistive technology for visually impaired individuals has become increasingly popular due to its low cost, portability, and flexibility. The system should include a variety of features such as object detection, facial recognition, text-to-speech, and obstacle avoidance to provide comprehensive assistance for visually impaired individuals. Many existing assistive systems use a combination of hardware such as sensors, cameras, and speakers, along with software for data processing, machine learning, and user interfaces. The development of assistive technology for visually impaired individuals requires collaboration between researchers, engineers, and the visually impaired community to ensure that the technology meets the needs and preferences of the end-users.

2.2 Problem definition Statement in Existing System

Obstacle detection and avoidance, one of the primary challenges faced by assistive systems is accurately detecting and avoiding obstacles in the user's path. While there are many sensors and algorithms available for obstacle detection, developing a system that is both accurate and affordable remains a challenge. Another important challenge is developing algorithms that can accurately recognize and label objects in the user's environment. The user interface must also be designed to be accessible to individuals with a range of disabilities and should be customizable to meet the needs of individual users. This requires the use of sensors such as ultrasonic sensors, cameras, or lidar, and advanced algorithms for processing and interpreting the sensor data. Assistive systems must be able to provide accurate and reliable navigation guidance to help users navigate through unfamiliar environments. This requires accurate localization, mapping. Finally, developing a power-efficient system that can operate for long periods of time on battery power is another important challenge. This may involve optimizing algorithms and hardware components to minimize power consumption, as well as designing effective power management strategies to extend battery life.

CHAPTER 3

AIM AND SCOPE OF PROJECT INVESTIGATION

3.1 Aim of the Existing Methodology

The project has been broken down into two stages: training and deployment. The goal is to create a low-cost, portable text reader for the visually impaired community. The proposed solution consists of a camera-based base built on Raspberry Pi that includes image processing methods, optical character recognition (OCR), and a TTS, or text synthesis module. The printed text is captured by the camera module and processed first before being supplied into the OCR. Binarization, de-noising, DE skewing, segmentation, and feature extraction are all part of the pre-processing phase. In this project, Google Tesseract was utilised for OCR, and Pico was used for TTS.

3.2 Proposed Methodology for Developing an Assist Device for Vision Delay

Instead of knowing them, the proposed effort helps viewers realize the visual complexity of the content. It is a wonderful tool for rapidly and effectively going through printed information on paper. It makes use of a camera-based assistive technology solution that visually can be used by people with disabilities to browse archived content. We mentioned that the tool focuses on managing devices using voice recognition and intelligence via Google API, where writers can specify voice as input to be translated into text using a text-to-speech system. Intelligent virtual assistant (IVA) uses raspberry pi voice command system to perform various activities or tasks for humans. A single board computer is the Raspberry Pi Zero. The system is built around the Raspberry Pi, which is nothing more than a small computer used to handle the system's general circuit. Electricity is intended to supply controlled power when required. The system's structure includes a camera that scans the image of the text that will be interpreted by the system. This camera captures images of printed text on paper for reading purposes. The webcam is plugged into the USB port. 5v dc and 12v dc are required to power this whole circuit. The device works with 230v. alternating current. Step down from 230 volts to 12 volts. The output is then routed to a full-wave amplifier. The rectifier subtracts the input voltage's negative high voltage. A regulator is used to convert 12v dc to 5v dc. The output of the regulator remains constant regardless of the input voltage. To indicate whether the

light is on or off, an LED is attached between the controller and the controller. Power is supplied to the pin number

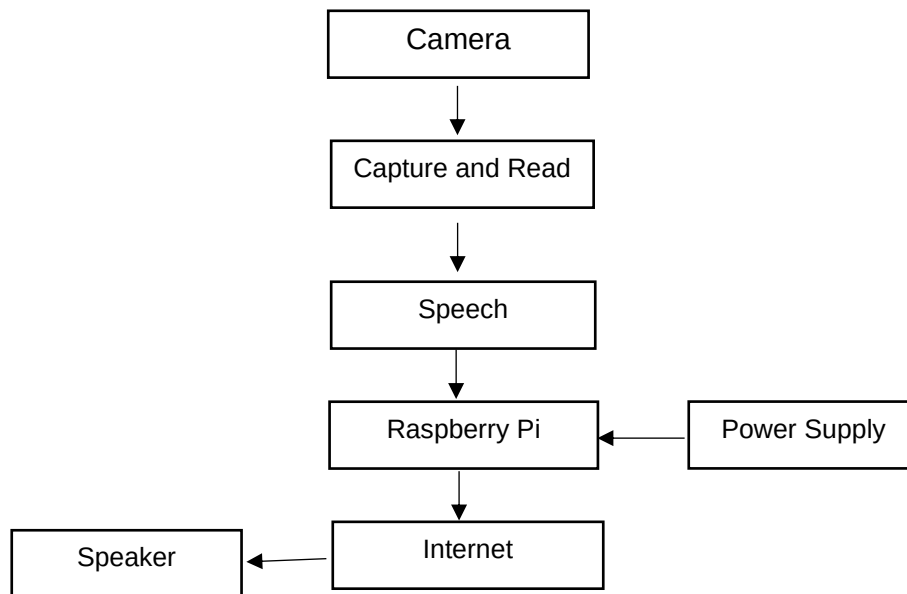


Fig.3.1: Proposed Block Diagram of Assistive System for Visually Impaired Using Raspberry Pi

The above figure 3.1 presents the workflow of the proposed assistive system, which involves capturing images of provisional products using a camera. These images depict the products in different sizes and orientations. The raspberry pi board serves as the Deployment project's framework. The workflow of the system likely involves the following steps: the camera captures images of the provisional products in various sizes and orientations. The Raspberry Pi board's processing power and algorithms enable the extraction of relevant information from these images, which is then used to identify and characterize the product. The result is a system that can provide users with the information they need to make informed decisions about the products they are using. Overall, the proposed system has the potential to streamline the process of identifying and using provisional products, making it easier for users to get the most out of these products. The proposed system appears to be designed to provide users with valuable assistance in identifying and using provisional products, leveraging the power of image processing and machine learning algorithms to make this process more efficient and accurate.

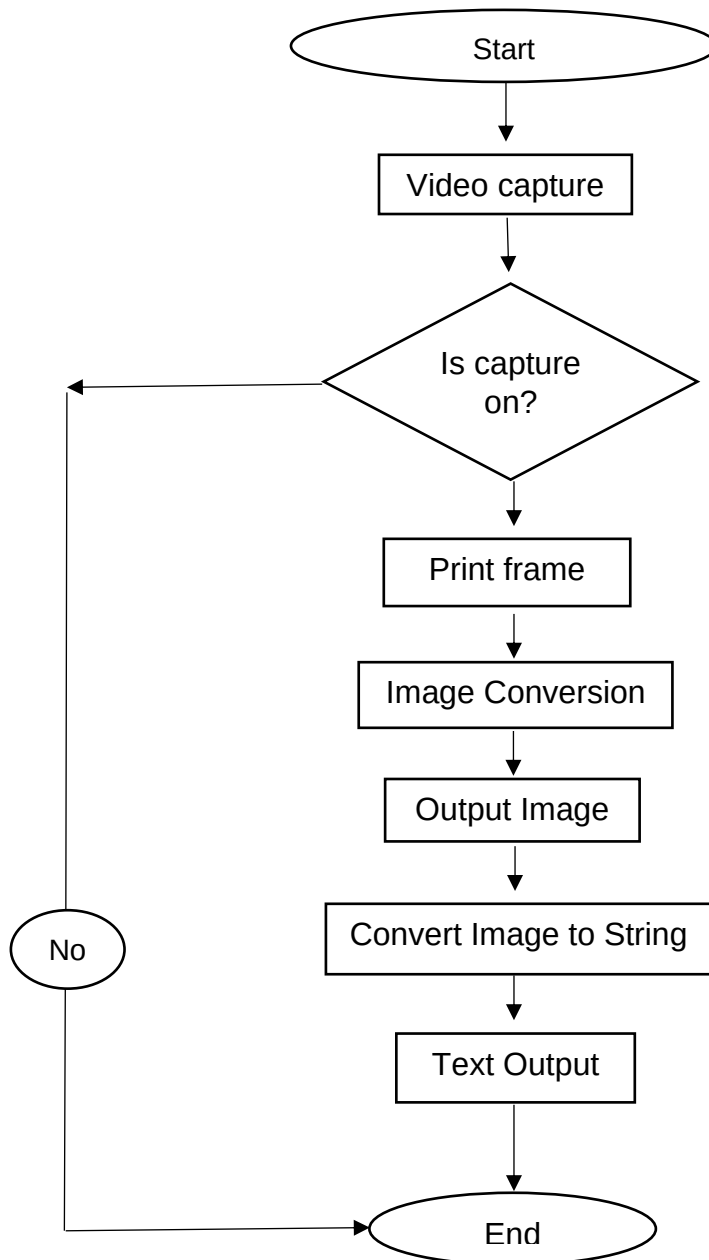


Fig.3.2: The Deployment Workflow Is Featured

The above figure 3.2 depicts the entire building layout of the proposed Reader for Blind Peoples project. The Deployment Work Flow and Block Diagram for that project are as follows. The raspberry pi board serves as the Deployment project's framework. A single board computer is the Raspberry Pi Zero. The system is built around the Raspberry Pi, which is essentially a little computer that controls the entire circuit action of the system. In this system, we designed a power supply unit to give the necessary power supply to the system's circuit components. The power supply is

intended to offer controlled power supply as needed. The system's architecture comprises of a camera that scans the environment. The system is to read a printed text picture.

This camera takes a picture of the text printed on the paper so that it can be read later. Connecting the web camera to the Raspberry Pi's USB port. The conversions are handled by RASPION, the operating system for the Raspberry Pi. The sound that is generated is obtained from the raspberry pi's audio jack. The converted voice output is amplified using an audio amplifier. The sound that outputs is collected from the speaker, which is also linked to the computer's controller. The system is built around the Raspberry Pi, which is nothing more than a small computer used to handle the system's general circuit tasks. During this process, we created a power supply to supply the necessary electricity to the system's circuit region. Electricity is intended to supply controlled power when required. The system's structure includes a camera that scans the image of the text that will be interpreted by the system.

This camera captures images of printed text on paper for reading purposes. The webcam is plugged into the USB port. 5v dc and 12v dc are required to power this whole circuit. The device works with 230v. alternating current. Step down from 230 volts to 12 volts. The output is then routed to a full-wave amplifier. The rectifier subtracts the input voltage's negative high voltage. The rectifier's output is moving current. A capacitive filter is used to eliminate errors. Capacitors have a voltage of 12v dc. However, the microcontroller works on 5v dc. A regulator is used to convert 12v dc to 5v dc. The output of the regulator remains constant regardless of the input voltage. To indicate whether the light is on or off, an LED is attached between the controller and the controller. Power is supplied to the pin number.

The Raspberry Pi has been picked as the embedded controller in our framework plan due to its small size and convenient comfort. With its four USB alliance, four modules can be attached and used at the same time. For persons who are hearing challenged, OCR technology proved to be a game changer. OCR software employs sophisticated algorithms to detect patterns in scanned images, which are then utilised to recognise text letters. The OCR software can also discern between different fonts and styles, which improves the recognition process's accuracy.

There are many different OCR software programs available, both free and paid. Some popular OCR software programs include ABBYY FineReader, Adobe Acrobat Pro, and Google Docs. Each OCR software program has its own strengths and weaknesses, and it is important to choose the right program for the task at hand. For example, some OCR software programs are better suited for recognizing handwritten text, while others are better suited for recognizing printed text.

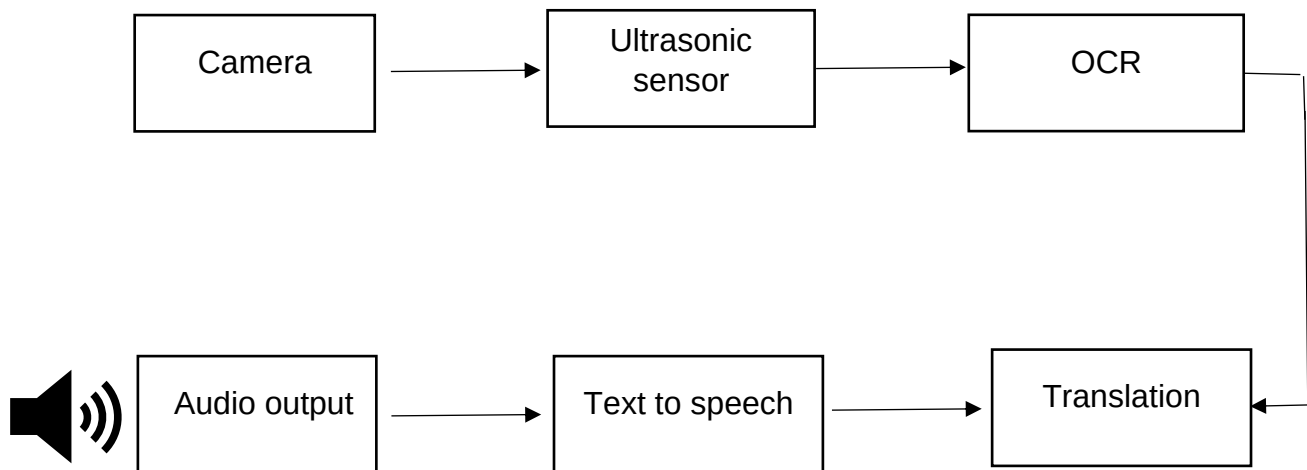


Fig.3.3: Text detection and conversion into speech

The above figure 3.3 depicts about illustrating the process of converting text to speech. Once the OCR software has analysed the scanned image and recognized the text characters, the extracted text is saved in a digital format, such as a text document or a PDF file. The extracted text can then be read using TTS software, which converts the written text into spoken words. TTS software uses complex algorithms to convert text into speech, including natural-sounding inflections and pauses.

There are many different TTS software programs available, both free and paid. Some popular TTS software programs include Microsoft's Immersive Reader, Natural Reader, and Balabolka. TTS software programs can be customized to suit individual preferences, including voice type, speed, and volume. Some TTS software programs can also be integrated with other assistive technologies, such as screen readers and Braille displays. People who are visually impaired can now access a wider range of materials, including textbooks, research papers, and other printed materials. OCR technology has also made it possible for visually impaired individuals to live more independently, as they can now read and access information on their own. One of the

key components of OCR technology is the OCR software itself. OCR software is designed to analyse the scanned image of a printed document and recognize the text characters. OCR software uses complex algorithms to identify patterns in the scanned image, which are then used to recognize the text characters. The OCR software can also distinguish between different fonts and styles, which helps to improve the accuracy of the recognition process.

In addition to OCR and TTS software, there are also many other assistive technologies available for people who are visually impaired. Screen readers are software programs that can read aloud the content displayed on a computer screen, including websites, documents, and emails. Screen readers can be customized to suit individual preferences, including voice type, speed, and volume. Another important consideration when using OCR and TTS software is the quality of the scanned image. The quality of the scanned image can have a significant impact on the accuracy of the OCR software. To improve the accuracy of OCR software, it is important to use high-quality scanning equipment and to ensure that the scanned image is free of smudges, tears, and other imperfections.



Fig.3.4: Setup of Raspberry pi 2B+

The above figure 3.4 shows Raspberry Pi 2B+ board layout, shows the various components of the board, including the CPU, RAM, GPIO pins, USB ports, and Ethernet port. It is a small single-board computer which can integrate multiple devices to carry light weight projects. The model comes with a CPU of 900 MHz (quadcore ARM Cortex A7). It has a GPU of Broadcom Video Core IV 250 MHz. It has a Memory of 1 GB with 4 USB ports. The video input is carried 15-pin MIPI camera interface (CSI) connector and the output are achieved by composite video (PAL and NTSC) via 3.5 mm jack. It has a storage as MicroSD which can be used to install required

software, drivers, libraries, and to store program related files. The power rating is 800 mA (4.0 W) hence it is a micro-USB compatible for power source. The GPU was identical to the original. The raspberry pi 2B+ can be overclocked up to 1500MHz. Overclocking is the action of increasing a component's clock rate, running it at a higher speed than it was designed to run. On Raspberry Pi 2B+ the Ethernet port is provided by a built-in USB Ethernet adapter using the SMSC LAN9514 chip. The Raspberry Pi Foundation provides Raspbian, it promotes Python and Scratch as the main programming languages, with support for many other languages.

The Raspberry Pi is a versatile and popular single-board computer that has gained a significant following among makers, hobbyists, and developers. One of the key advantages of the Raspberry Pi is its flexibility in terms of peripheral connectivity. While it is often configured to operate as a headless computer, meaning that it can be controlled remotely without the need for a monitor or keyboard, it is also capable of working with a wide range of peripherals, including USB devices, storage devices, and various other components. Although often pre-configured to operate as a headless computer, the Raspberry Pi may also optionally be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and virtually any other device/component with USB capabilities, depending on the installed device drivers in the underlying operating.



Fig. 3.5: Raspberry pi camera

The above figure 3.5 depicted the camera module designed for use with the Raspberry Pi. The Raspberry Pi Camera Board v2 is a high quality 8-megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a

fixed focus lens. It is capable of 3280 x 2464-pixel static images, and also supports 1080p30, 720p60, and 640x480p90 video. This version of the camera is compatible with the raspberry pi and it provides a frame rate of 90fps which is good for a real-time feed purpose.

OCR is a task that consists of extracting text from images, hardcopy, or scanned document so that it can be saved in editable soft copy, in other words, it's like a TXT or DOC file from a scanned JPG of a printed or handwritten page. With the help of a digital camera OCR technology is widely used for data reading. They consist of step-by-step process these are as follows. The OCR process involves several steps, starting with pre-processing to improve the chances of successful recognition. The Tesseract library then recognizes the text in segments or parts, using a process of training and testing to compare the text with vectors and find the closest match. Finally, post-processing ensures that the recognized words make sense in terms of grammar, spelling, and accuracy. This technology has greatly impacted businesses, government agencies, and individuals who need to access and manipulate printed text for various purposes. With the help of a digital camera, OCR can easily convert a scanned JPG of a printed or handwritten page into a TXT or DOC file, making it editable and accessible. In conclusion, OCR technology has revolutionized the way we digitize and process printed text. With its step-by-step process, it has simplified the conversion of printed documents into editable soft copy. As a result, OCR has enhanced document management and made it easier to access and manipulate printed text. OCR pre-processes images to improve the chances of successful recognition. The text is recognised by the Tesseract library in segments or parts. This is the character recognition part it is done by training and testing; it will compare the text with vector and find the closest match. Post processing will ensure that the recognised word makes sense grammar wise, spelling and accuracy (Optical Character Recognition) is a technology that has revolutionized the way we digitize and process printed text.

CHAPTER 4

PROPOSED SYSTEM

4.1 Proposing Methodology System

In the earliest years of computers in the 1930–40s, computers were sometimes dedicated to a single task, but were far too large and expensive for most kinds of tasks performed by embedded computers of today. Over time however, the concept of programmable controllers evolved from traditional electromechanical sequencers, via solid state devices, to the use of computer technology. One of the first recognizably modern embedded systems was the Apollo Guidance Computer, developed by Charles Stark Draper at the MIT Instrumentation Laboratory. At the project's inception, the Apollo guidance computer was considered the riskiest item in the Apollo project as it employed the then newly developed monolithic integrated circuits to reduce the size and weight. An early mass-produced embedded system was the Automatics D-17 guidance computer for the Minuteman missile, released in 1961. It was built from transistor logic and had a hard disk for main memory. When the Minuteman II went into production in 1966, the D-17 was replaced with a new computer that was the first high-volume use of integrated circuits. Embedded development makes up a small fraction of total programming. There are also many embedded architectures, unlike the PC world where 1 instruction set rules, and the Unix world where there are only 3 or 4 major ones. This means that the tools are more expensive. It also means that they are lowering featured, and less developed. On a major embedded project, at some point you will almost always find a compiler bug of some sort.

Debugging tools are another issue. Since you cannot always run general programs on your embedded processor, you cannot always run a debugger on it. This makes fixing your program difficult. Special hardware such as JTAG ports can overcome this issue in part. However, if you stop on a breakpoint when your system is controlling real world hardware (such as a motor), permanent equipment damage can occur. As a result, people doing embedded programming quickly become masters at using serial IO channels and error message style debugging. To save costs, embedded systems frequently have the cheapest processors that can do the job. This means your programs need to be written as efficiently as possible. When dealing with large data sets, issues like memory cache misses that never matter in PC

programming can hurt you. Luckily, this will not happen too often- use reasonably efficient algorithms to start, and optimize only when necessary. Of course, normal profilers will not work well, due to the same reason debuggers don't work well.

Memory is also an issue. For the same cost savings reasons, embedded systems usually have the least memory they can get away with. That means their algorithms must be memory efficient (unlike in PC programs, you will frequently sacrifice processor time for memory, rather than the reverse). It also means you can't afford to leak memory. Embedded applications generally use deterministic memory techniques and avoid the default "new" and "malloc" functions, so that leaks can be found and eliminated more easily. Other resources programmers expect may not even exist. For example, most embedded processors do not have hardware FPUs (Floating-Point Processing Unit). These resources either need to be emulated in software, or avoided altogether. Embedded systems frequently control hardware, and must be able to respond to them in real time. Failure to do so could cause inaccuracy in measurements, or even damage hardware such as motors. This is made even more difficult by the lack of resources available. Almost all embedded systems need to be able to prioritize some tasks over others, and to be able to put off/skip low priority tasks such as UI in favour of high priority tasks like hardware control.

4.2 Need for Embedded Systems

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So, when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular task or set of tasks costs far more time and money. Many embedded computers even come with extensive libraries, so that "writing your own software" becomes a very trivial task indeed. From an implementation viewpoint, there is a major difference between a computer and an embedded system. Embedded systems are often required to provide Real-Time response. The main elements that make embedded systems unique are its reliability and ease in debugging.

Embedded debugging may be performed at different levels, depending on the facilities available. From simplest to most sophisticated, they can be roughly grouped

into the following areas: Interactive resident debugging, using the simple shell provided by the embedded operating system (e.g., Forth and Basic) External debugging using logging or serial port output to trace operation using either a monitor in flash or using a debug server like the Remedy Debugger which even works for heterogeneous multi core systems.

An in-circuit debugger (ICD), a hardware device that connects to the microprocessor via a JTAG or Nexus interface. This allows the operation of the microprocessor to be controlled externally, but is typically restricted to specific debugging capabilities in the processor. An in-circuit emulator replaces the microprocessor with a simulated equivalent, providing full control over all aspects of the microprocessor. A complete emulator provides a simulation of all aspects of the hardware, allowing all of it to be controlled and modified and allowing debugging on a normal PC. Unless restricted to external debugging, the programmer can typically load and run software through the tools, view the code running in the processor, and start or stop its operation. The view of the code may be as assembly code or source-code.

Because an embedded system is often composed of a wide variety of elements, the debugging strategy may vary. For instance, debugging a software (and microprocessor) centric embedded system is different from debugging an embedded system where most of the processing is performed by peripherals (DSP, FPGA, co-processor). An increasing number of embedded systems today use more than one single processor core. A common problem with multi-core development is the proper synchronization of software execution. In such a case, the embedded system design may wish to check the data traffic on the busses between the processor cores, which requires very low-level debugging, at signal/bus level, with a logic analyzer, for instance. Embedded systems often reside in machines that are expected to run continuously for years without errors and in some cases recover by them if an error occurs. Therefore, the software is usually developed and tested more carefully than that for personal computers, and unreliable mechanical moving parts such as disk drives, switches or buttons are avoided. The system cannot safely be shut down for repair, or it is too inaccessible to repair. Examples include space systems, undersea cables, navigational beacons, bore-hole systems, and automobiles.

1. The system must be kept running for safety reasons. "Limp modes" are less tolerable. Often backups are selected by an operator. Examples include aircraft

navigation, reactor control systems, safety-critical chemical factory controls, train signals, engines on single-engine aircraft.

2. The system will lose large amounts of money when shut down: Telephone switches, factory controls, bridge and elevator controls, funds transfer and market making, automated sales and service.

A variety of techniques are used, sometimes in combination, to recover from errors both software bugs such as memory leaks, and soft errors in the hardware:

1. Watchdog timer that resets the computer unless the software periodically notifies the watchdog
2. Subsystems with redundant spares that can be switched over to
3. software "limp modes" that provide partial function
4. Designing with a Trusted Computing Base (TCB) architecture [6] ensures a highly secure & reliable system environment
5. An Embedded Hypervisor can provide secure encapsulation for any subsystem component, so that a compromised software component cannot interfere with other subsystems, or privileged-level system software. This encapsulation keeps faults from propagating from one subsystem to another, improving reliability. This may also allow a subsystem to be automatically shut down and restarted on fault detection. Immunity Aware Programming

4.3 Explanation of Embedded Systems

Embedded systems are designed to perform specific tasks or sets of tasks. They typically consist of a combination of hardware and software components that work together to achieve their designated purpose. In embedded systems, the software architecture plays a crucial role in determining the functionality and effectiveness of the system. There are several different types of software architecture commonly used in embedded systems. One such architecture is the simple control loop, where the software is designed with a loop that executes subroutines, each of which manages a specific aspect of the hardware or software. This architecture is straightforward and easy to implement, but it may not be suitable for more complex systems.

Another architecture used in embedded systems is the interrupt-controlled system. In this design, the processor relies on hardware interrupts to trigger specific software

routines. When an interrupt occurs, the processor suspends its current task and executes the interrupt service routine (ISR) associated with that interrupt. Once the ISR completes, the processor resumes its previous task. This architecture is more sophisticated and allows for more complex functionality, but it can be more challenging to implement and requires more resources. Another common software architecture in embedded systems is the event-driven architecture. This architecture is designed to respond to events or changes in the system's state. When an event occurs, the system triggers a specific routine to handle the event. This architecture is ideal for systems that require real-time responsiveness and can be more efficient than other architectures in certain situations.

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use. Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Physically, embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected.

Monitor the environment; embedded systems read data from input sensors. This data is then processed and the results displayed in some format to a user or users
Control the environment embedded systems generate and transmit commands for actuators. Transform the information embedded systems transform the data collected in some meaningful way, such as data compression/decompression. Although

interaction with the external world via sensors and actuators is an important aspect of embedded systems, these systems also provide functionality specific to their applications. Embedded systems typically execute applications such as control laws, finite state machines, and signal processing algorithms. These systems must also detect and react to faults in both the internal computing environment as well as the surrounding electromechanical systems. There are many categories of embedded systems, from communication devices to home appliances to control systems.

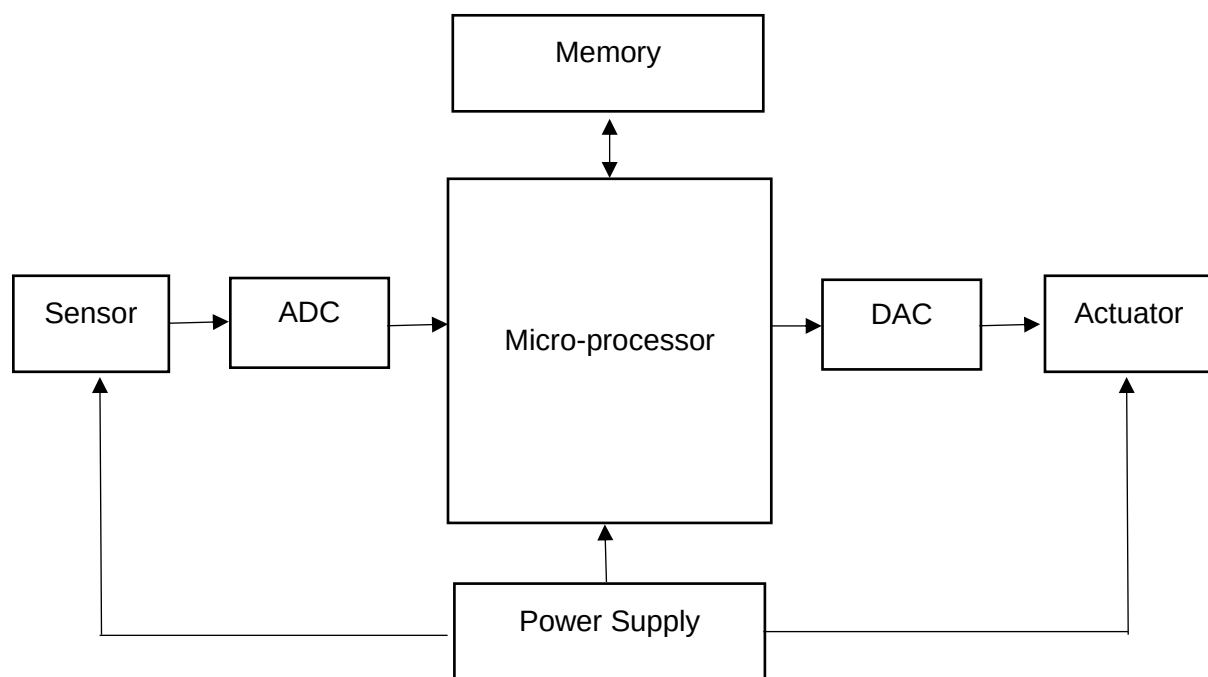


Fig.4.1: Block diagram of a typical embedded system

The above Figure 4.1 depicts standard the various components of an embedded system are presented. Which comprises various components such as microcontrollers, memory units, input/output devices, communication interfaces, and an embedded processor. Many appliances that have a digital interface microwave, VCRs, utilize embedded systems. Some embedded systems include an operating system. Others are very specialized resulting in the entire logic being implemented as a single program. These systems are embedded into some device for some specific purpose other than to provide general purpose computing. One key characteristic of embedded systems is that they are typically designed to perform a specific function, and they are not intended for general-purpose computing. For example, a microwave oven contains an embedded system that is designed to control the oven's heating elements and manage the user interface. Similarly, a car contains multiple embedded

systems that control the engine, the transmission, the entertainment system, and various other functions. Embedded systems are characterized by a unique set of characteristics. Each of these characteristics imposed a specific set of design constraints on embedded systems designers. The challenge to designing embedded systems is to conform to the specific set of constraints for the application.

Embedded systems are not general-purpose computers. Embedded system designs are optimized for a specific application. Many of the job characteristics are known before the hardware is designed. This allows the designer to focus on the specific design constraints of a well-defined application. As such, there is limited user reprogram ability. Some embedded systems, however, require the flexibility of reprogram ability. Programmable DSPs are common for such applications. As mentioned earlier, a typical embedded systems model responds to the environment via sensors and control the environment using actuators. This requires embedded systems to run at the speed of the environment. This characteristic of embedded system is called “reactive”. Reactive computation means that the system (primarily the software component) executes in response to external events. External events can be either periodic or aperiodic. Periodic events make it easier to schedule processing to guarantee performance. Aperiodic events are harder to schedule. The maximum event arrival rate must be estimated in order to accommodate worst case situations. Most embedded systems have a significant reactive component. One of the biggest challenges for embedded system designers is performing an accurate worst case design analysis on systems with statistical performance characteristics (e.g., cache memory on a DSP or other embedded processor). Real time system operation means that the correctness of a computation depends, in part, on the time at which it is delivered. Systems with this requirement must often design to worst case performance. But accurately predicting the worst case may be difficult on complicated architectures. This often leads to overly pessimistic estimates erring on the side of caution. Many embedded systems have a significant requirement for real time operation in order to meet external I/O and control stability requirements. Many real-time systems are also reactive systems. A common characteristic of an embedded system is one that consists of communicating processes executing on several CPUs or ASICs which are connected by communication links. The reason for this is economy. Economical 4 8-bit microcontrollers may be cheaper than 32-bit processors. Even after adding the cost of the communication links, this approach may be

preferable. In this approach, multiple processors are usually required to handle multiple time-critical tasks. Devices under control of embedded systems may also be physically distributed.

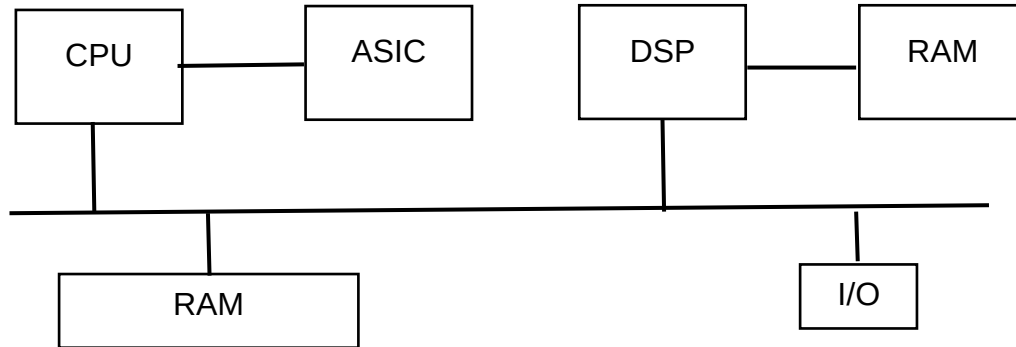


Fig.4.2: Embedded Systems having Heterogeneous Architectures

The above Figure.4.2 as depicted embedded systems frequently feature architectures with varying components and functionalities. The diagram shows multiple embedded systems, each with a different architecture, including ARM, AVR, and PIC. They may contain different processors in the same system solution. They may also be mixed signal systems. The combination of I/O interfaces, local and remote memories, and sensors and actuators makes embedded system design truly unique. Embedded systems also have tight design constraints, and heterogeneity provides better design flexibility. Many embedded systems do not operate in a controlled environment. Excessive heat is often a problem, especially in applications involving combustion (e.g., many transportation applications). Additional problems can be caused for embedded computing by a need for protection from vibration, shock, lightning, power supply fluctuations, water, corrosion, fire, and general physical abuse.

4.4 System Safety and Reliability

As embedded system complexity and computing power continue to grow, they are starting to control more and more of the safety aspects of the overall system. These safety measures may be in the form of software as well as hardware control. Mechanical safety backups are normally activated when the computer system loses control in order to safely shut down system operation. Software safety and reliability is a bigger issue. Software does not normally "break" in the sense of hardware. However, software may be so complex that a set of unexpected circumstances can

cause software failures leading to unsafe situations. Discussion of this topic is outside the scope of this book, but the challenges for embedded designers include designing reliable software and building cheap, available systems using unreliable components. The main challenge for embedded system designers is to obtain low-cost reliability with minimal redundancy.

One of the main reasons for embedding a computer is to interact with the environment. This is often done by monitoring and controlling external machinery. Embedded computers transform the analog signals from sensors into digital form for processing. Outputs must be transformed back to analog signal levels. When controlling physical equipment, large current loads may need to be switched in order to operate motors and other actuators. To meet these needs, embedded systems may need large computer circuit boards with many non-digital components. Embedded system designers must carefully balance system trade-offs among analog components, power, mechanical, network, and digital hardware with corresponding software. Many embedded computers are physically located within some larger system. The form factor for the embedded system may be dictated by aesthetics.

Embedded systems have become increasingly common in many industries, from medical devices to automotive systems. These systems are designed to perform specific tasks, often in constrained environments and with limited resources. One of the key challenges faced in the design and implementation of embedded systems is managing costs, particularly in relation to the cost of the computer hardware used in the system. The impact of computer costs on profitability is closely tied to the proportion of cost changes relative to the total system cost. This is particularly relevant in the case of embedded systems, where the cost of the computer hardware can be a significant factor in determining the final cost of the system. The cost of the computer hardware used in an embedded system can be a major factor in determining the overall cost of the system. As such, careful consideration must be given to the selection of hardware components, as well as to the overall design of the system, in order to minimize costs and maximize profitability. In many cases, this involves balancing the need for high-performance components with the need for low-cost components, as well as considering other factors such as power consumption and heat production. For example, the form factor for a missile may have to fit inside the nose of the missile. One of the challenges for embedded systems designers is to

develop non-rectangular geometries for certain solutions. Weight can also be a critical constraint. Embedded automobile control systems, for example, must be light weight for fuel economy. Portable CD players must be light weight for portability purposes. Cost is an issue in most systems, but the sensitivity to cost changes can vary dramatically in embedded systems. This is mainly because of computer costs have on profitability and is more a function of the proportion of cost changes compared to the total system cost. Embedded systems have strict constraints on power. Given the portability requirements of many embedded systems, the need to conserve power is important to maintain battery life as long as possible. Minimization of heat production is another obvious concern for embedded systems. Power consumption and heat production are critical considerations in the design of embedded systems, particularly those that are intended to be portable. The use of off-the-shelf components and custom-designed components are two approaches that can be used to manage computer costs

Regulation principles refer to a set of guidelines that help ensure the effectiveness and fairness of regulatory frameworks. While the specific principles can differ based on the sector and region, there are some general ones that most regulatory frameworks follow. Firstly, regulations should be in the public interest, ensuring that the public's health, safety, and wellbeing are protected. Secondly, regulatory bodies should maintain transparency in their decision-making and provide clear communication to the public.

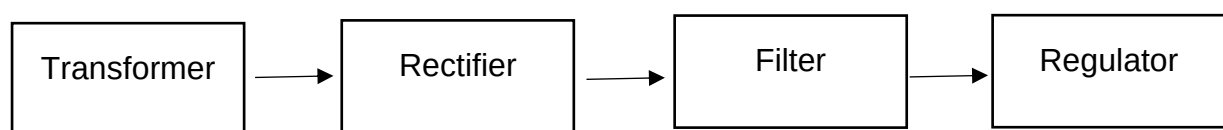


Fig. 4.3: General Block Diagram of Power Supply Unit

The above figure 4.3 depicting the general block diagram of a power supply unit is shown, displaying the various components involved in the unit. of a typical power supply unit, including the input filter, rectifier, filter capacitor, regulator, and output stage. All electronic circuits work only in low DC voltage, so we need a power supply unit to provide the appropriate voltage supply for their proper functioning. This unit consists of transformer, rectifier, filter & regulator. AC voltage of typically 230volts rms is connected to a transformer voltage down to the level to the desired ac voltage.

A diode rectifier that provides the full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. Custom-designed components can be optimized for the specific requirements of the system, and can often be designed to be more power-efficient and produce less heat than off-the-shelf components. However, custom-designed components are often more expensive than off-the-shelf components, and may require additional development time in order to design and test. A regulator circuit can use this dc input to provide dc voltage that not only has much less ripple voltage but also remains the same dc value even the dc voltage varies somewhat, or the load connected to the output dc voltages changes. A transformer is a static piece of which electric power in one circuit is transformed into electric power of same frequency in another circuit. It can raise or lower the voltage in the circuit, but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using a step-down transformer to providing a necessary supply for the electronic circuits. Here we step down a 230volts ac into 12volts ac. A DC level obtained from a sinusoidal input can be improved 100% using a process called full wave rectification. Here in our project for full wave rectification we use bridge rectifier. So that a capacitive filter circuit is used where a capacitor is connected at the rectifier output & a dc is obtained across it. The filtered waveform is essentially a dc voltage with negligible ripples & it is ultimately fed to the load.

The controller IC has two 8-bit registers, an instruction registers (IR) and a data register (DR). The IR stores the instruction codes and address information for display data RAM (DD RAM) and character generator RAM (CG RAM). The IR can be written, but not read by the MPU. When an address code is written to IR, the data is automatically transferred from the DD RAM or CG RAM to the DR. Similarly, for the MPU write of the DR, the next DD RAM or CG RAM address is selected for the write operation. The dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver.

CHAPTER 5

SIMULATION RESULTS AND DISCUSSIONS

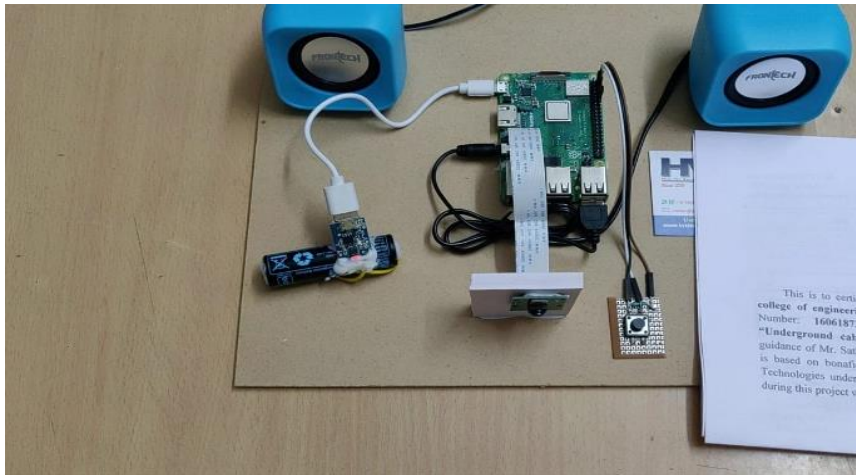


Fig.5.1: Hardware Connections of an assistive system

The above Fig.5.1 shows as illustrated the link-up of multiple hardware components in an accessibility setup. typically comprise the physical connections and wiring of various hardware components used in the system. The specific connections depend on the components used in the system; The ASCII values of the recognized characters are processed by Raspberry Pi board. Here each of the characters is matched with its corresponding template and saved as normalized text transcription. This transcription is further delivered to the audio output. Ultrasonic sensors are typically connected to the Raspberry Pi board using jumper wires, which connect to the GPIO pins on the board. An audio output device, such as a speaker or headphones, can be connected to the Raspberry Pi board using the 3.5mm audio jack or via HDMI. The hardware connections of an assistive system typically involve the physical connections and wiring of various hardware components used in the system. The specific connections depend on the components used in the system, but some common examples include: 3.5mm audio jack or via HDMI.

The Raspberry Pi board requires a 5V power supply, which can be provided using a micro-USB cable connected to a power source. Proper hardware connections are crucial for the effective functioning of an assistive system. It is essential to ensure that all connections are secure and correctly wired to prevent any potential damage or malfunction of the components.

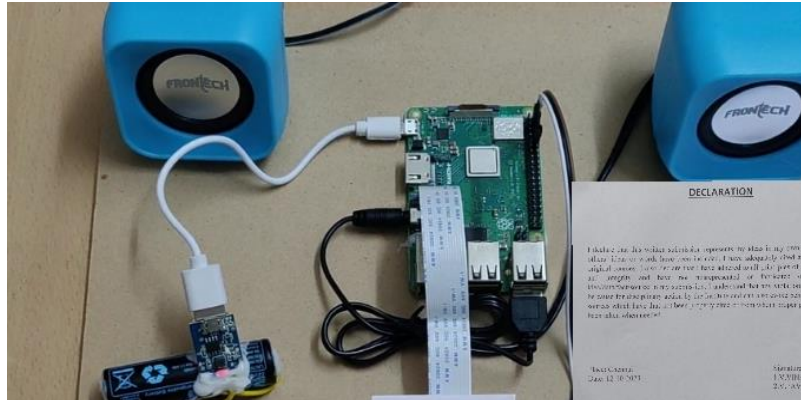


Fig.5.2: Text is converts into speech

The above Figure.5.2 snapshot of the experimental setup and obtained output given in the pre-processed output of the camera, which includes all the features mentioned above, was created using a multifunctional system of essential components, which helps people live better lives. This project utilizes the Raspberry Pi 3B+ model as the platform for programming and execution, using a combination of Python and its associated packages. The project aims to implement image to text to speech, conversion, as well as creating a Google based personal assistant with home automation capabilities. Personal assistants like the Amazon Echo have been shown to be ineffective at giving users a sense of control since they can become unresponsive when given voice instructions that are invalid and cost a lot of money.

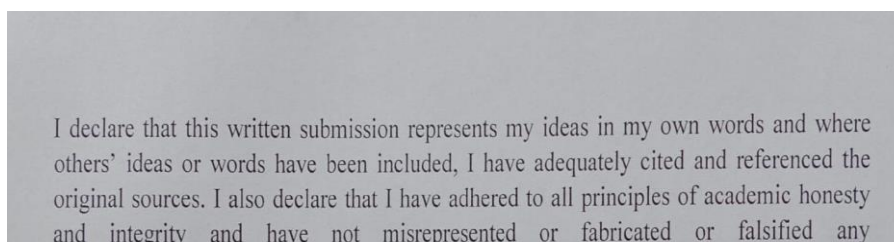
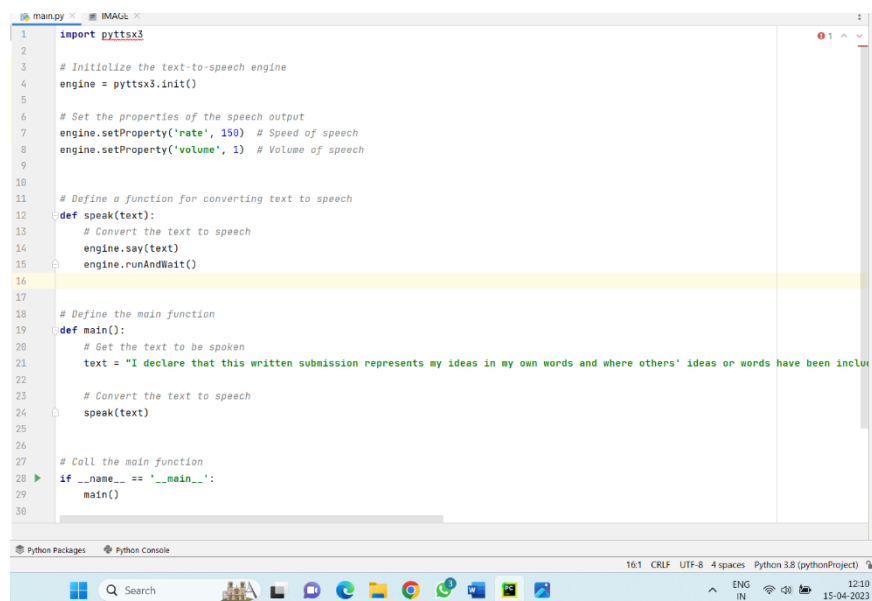


Fig. 5.3: Clicked Image by raspberry PI camera

The above Figure 5.3 the illustration depicts a typical example. and recognition, which is an essential task in many applications, such as OCR (Optical Character Recognition) systems, document digitization, and automated text analysis Text is one of the most expressive and widely used means of communications an example of image input for text detection and recognition could be a photograph or a digital image containing text. The image can be captured using a camera connected to a Raspberry Pi or any other device capable of capturing images. The system would then use

various image processing techniques, such as resizing, noise reduction, and binarization, to enhance the quality of the image and make the text more visible.

After pre-processing the image, the text detection component of the system would identify the regions of the image containing text. Python is a popular language used for image processing and OCR. Libraries such as OpenCV and Tesseract provide support for image processing and OCR, respectively. With these libraries, developers can easily build a text detection and recognition system in Python that runs on a Raspberry Pi or any other device capable of running Python. Such systems can have numerous practical applications, such as automatically extracting text from scanned documents or images, enabling text-to-speech conversion for individuals with visual impairments, and facilitating the translation of text in real-time. Overall, image input for text detection and recognition is a crucial step in building a robust text recognition system that can be used in various applications.

A screenshot of a code editor window showing a Python script. The script imports the pyttsx3 library, initializes a text-to-speech engine, sets properties for rate and volume, defines a speak function, and a main function that uses the speak function to convert a specific text string into speech. The code is as follows:

```
1 import pyttsx3
2
3 # Initialize the text-to-speech engine
4 engine = pyttsx3.init()
5
6 # Set the properties of the speech output
7 engine.setProperty('rate', 150) # Speed of speech
8 engine.setProperty('volume', 1) # Volume of speech
9
10
11 # Define a function for converting text to speech
12 def speak(text):
13     # Convert the text to speech
14     engine.say(text)
15     engine.runAndWait()
16
17
18 # Define the main function
19 def main():
20     # Get the text to be spoken
21     text = "I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included"
22
23     # Convert the text to speech
24     speak(text)
25
26
27 # Call the main function
28 if __name__ == '__main__':
29     main()
30
```

The editor interface includes a file explorer on the left, a code editor in the center, and a Python console at the bottom. The status bar at the bottom indicates the file encoding (UTF-8), line length (161), and the Python version (3.8).

Fig.5.4: Using open CV library to enhance image

The above figure 5.4 using open CV library to enhance image, The code snippet shows an example of using the pyttsx3 library in Python to convert text from a file into speech output. Text present in the images, signboards, social media posts or any document has a lot of potential of conveying information about the said image or post. Retrieval of textual data from such images can be significant. Text Detection is the process of detecting text regions in the input image and labelling them. Whereas Text recognition is to recognize the text found in the picture and making it available in a

machine-readable format. This machine-readable data further can be fed to text to speech conversion method to get audio as an output. This audio output can be provided to the visually impaired person.

Table 5.1 Font Analysis Performance Chart for Visually Impaired People

TYPE OF FONT	DURATION TO READ (SEC)		
	2 words	10 words	100 words
Arial	3	12	122
Batang	4	14	142
Berlin sans	4	14	146
Bell MT	3	12	128
Calibri	4	13	130
Garmond	5	16	166
Harrington	Cannot recognize		
Times new roman	2	14	120

The above table 5.1 depicts font analysis performance chart for visually impaired people. The webcam captures image from a given picture and the text from the captured image is converted into an audio output using Raspberry Pi. And, we measure the distance of the object using the ultrasonic sensor. Both outputs are heard in an audio. The Font analysis time chart is a graphical representation of the time taken by an assistive system for visually impaired using Raspberry Pi to perform font analysis on different fonts. Developers can use the chart to evaluate and compare the accuracy and speed of different machine learning models or algorithms on a variety of fonts. This helps in selecting the most suitable algorithm for a particular task or application, and in optimizing the system's performance for a specific set of fonts. the Font analysis time chart is its ability to aid in the development of assistive technology for people with disabilities. Assistive technology has the potential to make a significant impact on the lives of people with disabilities, by providing them with tools that allow them to perform tasks that would otherwise be difficult or impossible. Overall, the Font analysis time chart provides valuable insights into the performance of the assistive system and can help in improving the system's accuracy, speed, and overall user experience.

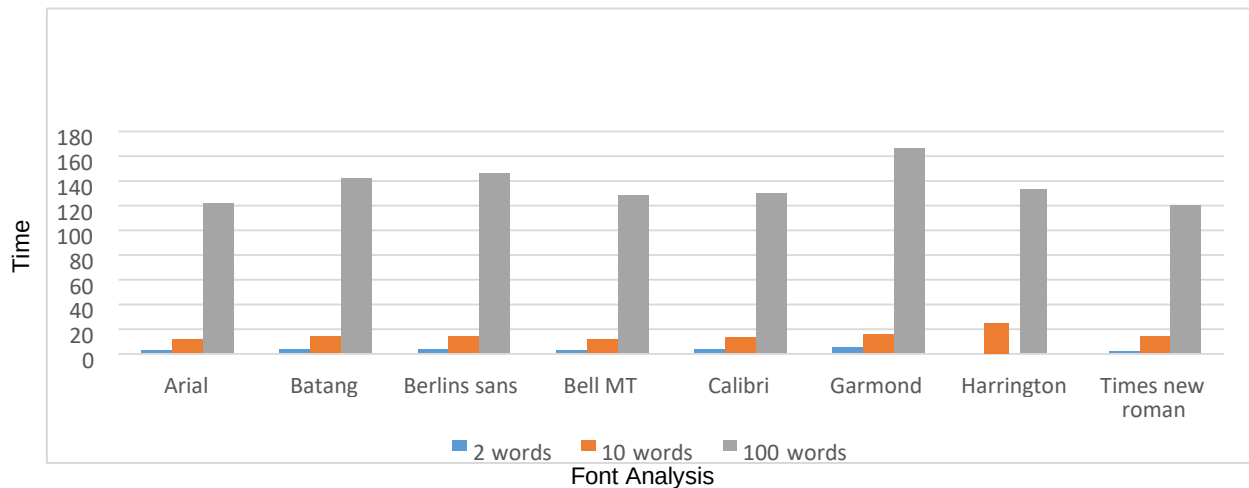


Fig.5.5: Font Analysis Time Chart

The above Figure 5.5 shows about Font analysis time chart the x-axis, which is the horizontal axis at the bottom of the chart, represents the different fonts that were analysed by the system. Each font is labelled with its name or a unique identifier, which is placed below the corresponding bar on the chart. The fonts are arranged in ascending order from left to right, meaning that the first font on the left-hand side of the chart is the one that was analysed first, followed by the second font, and so on. The y-axis, which is the vertical axis on the left-hand side of the chart, represents the time taken by the system to perform font analysis on each font. The time is measured in seconds or minutes, depending on the scale of the chart. The y-axis is divided into equal intervals, each representing a specific time duration, and labelled with tick marks and numbers indicating the duration. is a graphical representation of the time taken by an assistive system for visually impaired using Raspberry Pi to perform font analysis on different fonts.

This chart is used to evaluate the performance of the system in terms of its ability to recognize and process different fonts accurately and quickly. Font analysis is an essential step in text recognition, as different fonts can have variations in character shapes, sizes, and spacing, which can affect the accuracy of the recognition process. To analyse different fonts, the system uses machine learning algorithms that are trained on a database of fonts to identify the characteristics of each font and recognize the characters. The font analysis time chart displays the time taken by the system to analysed each font and recognize the characters accurately. This helps in identifying the fonts that take longer to analysed and recognize and improving the system's

performance on those fonts. The chart can also be used to compare the performance of different systems and algorithms in font analysis and recognition.

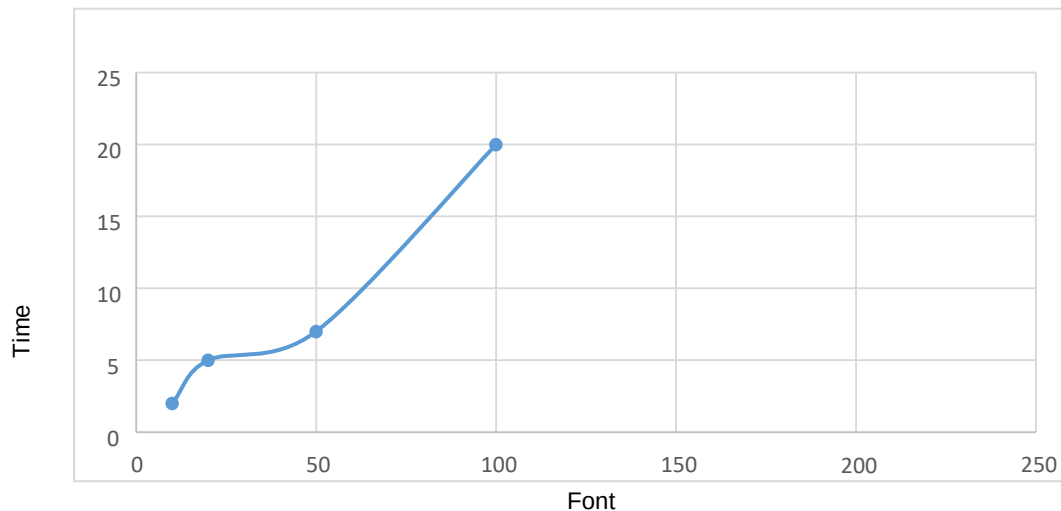


Fig.5.6: Distance Analysis Time Chart

The Above Figure 5.6 depicts about Font analysis time chart the x-axis of the chart represents the different fonts that were analysed by the assistive system, while the y-axis represents the time taken by the system to perform font analysis on each font. Each bar on the chart represents a specific font, and its height indicates the time taken by the system to analyse and recognize that font accurately. The bars are arranged in descending order, with the font that took the least amount of time at the top and the font that took the longest time at the bottom. The chart provides a visual representation of the system's performance in analyzing different fonts, making it easier to identify any patterns or trends in the data. By analyzing the chart, one can determine which fonts take longer to analyze and recognize and identify any areas where the system can be improved to enhance its performance. The Font analysis time chart provides a visual representation of the time taken by the assistive system to perform font analysis on different fonts. By analyzing the chart, users can identify which fonts took longer to analyze and recognize, and how well the system performed on each font. This information can be used to optimize the system's performance, improve its accuracy, and enhance the user experience

Table 5.2 Comparison between Existing and Proposed Methodology

Contents	Existing Method	Proposed Method
Platform	Raspberry Pi	Raspberry Pi
Hardware Components	Sensors, cameras, speakers	Sensors, cameras, speakers, additional components for real-time navigation and mapping, augmented reality
Software Components	Data processing, machine learning, user interfaces	Data processing, machine learning, user interfaces, more user-friendly interface that can be customized to suit individual preferences
Features	Object detection, facial recognition, text-to-speech, obstacle avoidance	Object detection, facial recognition, text-to-speech, obstacle avoidance, real-time navigation and mapping, augmented reality
Advantages	Low cost, portability, flexibility	Additional features, more user-friendly interface
Limitations	May lack some features	May require more advanced hardware and software
User Feedback	User testing and feedback is essential	User testing and feedback is essential

The above table 5.2 depicts the existing methodology for an assistive system for visually impaired using Raspberry Pi has the advantages of low cost, portability, and flexibility, but may lack some features that could be useful for visually impaired individuals. The proposed methodology would use similar components but could offer additional features and a more user-friendly interface, although it may require more advanced hardware and software components.

CHAPTER 6

CONCLUSION

The objective of the initiative is resulting in a system that meets the obligations of people with sight impairments. The system aims to enhance the lifestyle of visually impaired individuals by providing a multifunctional device that can be used on the go. The device combines the functions of various components, to provide a comprehensive solution for visually impaired consumers, which involves image-to-text the process of conversion, speech-to-s conversion, a Google-based an intimate way helping hand, and home automation. This feature provides visually impaired individuals with access to printed information that would otherwise be inaccessible. The system developed in this project is a comprehensive solution that caters to the needs of visually impaired individuals. The system is cost-effective, portable, and easy to use, making it an ideal solution for visually impaired individuals who lead an active lifestyle. The system provides visually impaired individuals with access to printed information, control over their home environment, and a sense of independence and control. It is a significant step towards creating a more inclusive and accessible society for visually impaired individuals.

6.1 FUTURE WORK

In the field of assistive technology, there is significant potential for the use of the Raspberry Pi to develop innovative and effective systems for individuals with visual impairments. Future work on an assistive system for the visually impaired using Raspberry Pi could focus on several areas, such as improving the system's accuracy and reliability, expanding its functionality and range of applications, and making it more accessible and user-friendly. Some possible avenues for research and development could include the use of advanced machine learning algorithms to enhance image recognition capabilities, the integration of new sensors and feedback mechanisms to enhance the user's sensory experience, and the development of new software interfaces and control systems to facilitate easier interaction with the system.

STANDARDS

Numerous standards have an immediate application, but for individuals who are primarily blind or visually strained, or who have reading or a variety of bottlenecks printed materials can be a challenge, depriving them of reading materials that many take for granted. This can significantly limit their ability to pursue education, careers, and personal enrichment. Fortunately, the Assistive system for visually impaired individuals provides a solution, enabling thousands of individuals each year to read in libraries, ranging from serious books for school or work to recreational reading. Additionally, listening to smart assistive systems can help with critical thinking, language skills, and memory improvement. Although no words can fully describe the importance of books for humanity, it is essential to acknowledge the significance of books for visually impaired individuals. The California Collection is just one example of the technological advancements that have made life easier for persons with disabilities, and assistive systems have proved to be a boon for those who are blind or partially blind.

IEEE STANDARDS

IEEE P1451.99	uniformity Standard for Web of Things, also called the Devices and Systems
IEEE P2650	The normal level for This allows Mobile The gadget They to be Apply as Audiometric Pre-Screening Platforms
IEEE Std 208.1995	The Standard IEEE 208-1995 The ways to monitor lens system acuity are explained.
IEEE 802.15	Wireless Metropolitan Area Network (Wireless MAN)

CONSTRAINTS

In a country like India, the diversity of language provides a significant barrier in providing accessible formats of books and information for the nearly 5 million blind and low vision people who speak 22 different languages. Local organisations that work with blind people frequently must take on the effort of making smart assistive technology accessible, which causes delays and leaves many needs unmet. Some researchers are also investigating the use of haptic feedback and other sensory technologies to improve the user experience for people who are visually impaired. However, visually challenged people can still use a screen reader and keyboard commands to browse the internet, open files, check emails, and read papers. Web elements are translated to voice or braille by screen readers, which are either built into the operating system or employ accessibility APIs. Smart canes with sensors and GPS, for example, can detect impediments and provide navigation help, while braille displays and refreshable braille devices can convert digital text into braille. While there are still many hurdles to overcome, developments in technology and increased awareness of accessibility issues are assisting in improving the lives of visually impaired people in India and around the world.

REFERENCES

- [1] Aaron James. S and William A. and finished the work and they contemplated that Optical Person Acknowledgment (OCR) is the ID of printed characters using photoelectric contraptions an PC programming. Design & Development of Learning Assistance device for Visually Impaired People Maagha SNDept of TCE 2019, pp. 563-568
- [2] Agrawal M.P and Gupta A.R, Smart Stick for the Blind and Visually Impaired People, 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT), Coimbatore, 2018, pp. 542-545.
- [3] Athira Panicker Ms. Smart Shopping assistant label reading system with voice output for blind using raspberry pi, Ms.Anupama Pandey, Ms.Vrunal Patil YTIET, University of Mumbai ISSN 2278 – 1323 International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Vol. 5, Issue 10, Oct 2016 2553 www.ijarcet.org
- [4] Bourbakis N, Automatic Image-to-Text-to-Voice Conversion for In-Ter actively Locating Objects in Home Environments, 2008 20th IEEE International Conference on Tools with Artificial Intelligence, Dayton, OH, 2008, pp. 49-55
- [5] Chayapathy, G. S. Anitha and B. Sharath,” IOT based home automation by using personal assistant,” 2017 International Conference on Smart Technologies for Smart Nation (SmartTechCon), Bangalore, 2017, pp. 385-389
- [6] Din.Z.U and David Lim.W, Home automation with smart robot featuring live video feed and remotely controlled switches, 2013 IEEE Conference on Sustainable Utilization and Development in Engineering and Technology (CSUDET), Selangor, 2013, pp. 1-6.
- [7] Felix S.M, Kumar S and Veeramuthu A,” A Smart Personal AI As-sistant for Visually Impaired People,” 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI), Tirunelveli, 2018, pp. 1245-1250. doi: 10.1002/j.1538- 7305. 1955.tb01474.x
- [8] Govardanam V, Vignesh Babu T.N, Sri Hari Kavın N, “Automated Read-Write kit for Blind using Hidden Markov Model and Optical Character Recognition”, International Conference on Applied and Theoretical Computing and Communication Technology, 29-31 Oct. 2015, pp. 828-831.

- [9] Iannizzotto G, Bello L.L , Nucita A and Grasso G.M , "A Vision and Speech Enabled, Customizable, Virtual Assistant for Smart Environ-ments," 2018 11th International Conference on Human System Interaction (HSI), Gdansk, 2018, pp. 50-56.
- [10] Kpuska.V and Bohouta. G," Next-generation of virtual personal assis-tants (Microsoft Cortana, Apple Siri, Amazon Alexa and Google Home)," 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, 2018, pp. 99-103.
- [11] Lee M.R, and Zhuo C, Novel design of a social mobile robot for the blind disabilities, Proceedings of the 2013 IEEE/SICE International Symposium on System Integration, Kobe, 2013, pp. 161-166.
- [12] Lin.Y, Hsu.Y and Kao.Y, A Smartphone-Based Chinese DAISY Digital. Talking Book Player for Visually Impaired, 2012 Sixth International Conference on Genetic and Evolutionary Computing, Kitakushu, 2012, pp. 296-299.
- [13] Michael McEnaney Finger Reader Is audio reading gadget for Index Finger IJECCE Vol. 5, Issue 4 July-2014.
- [14] Nagaraja L, Nagarjun R S, Nishanth M, Nlthin D, Veena S Murthy, "Vision based text recognition using raspberry pi", International Journal of Computer Applications, National Conference on Power Systems & Industrial Automation, 2015, pp. 1-3.
- [15] Owayjan, A. Hayek, Nassrallah. H and Eldor M, "Smart Assis-tive Navigation System for Blind and Visually Impaired Individuals," 2015 International Conference on Advances in Biomedical Engineering (ICABME), Beirut, 2015, pp. 162-165.
- [16] Rajesh M. Text recognition and face detection aidfor visually impaired person using Raspberry PI," 2017International Conference on Circuit, Power and ComputingTechnologies (ICCPCT), Kollam, 2017, pp. 15
- [17] Ray Kurzweil K Reader Mobile User Guide, knfb Reading Technology Inc. (2008). [Online]. Available: <http://www.knfbReading.com>
- [18] Rithika H and Santhoshi, B.N "Image text to speech conversion in the desired language by translating with Raspberry Pi," 2016 IEEE International Conference on Computational

- [19] Rizvi .S, Sohail .I, Saleem M.M , Irtaza A, A Smart Home Appliances Power Management System for Handicapped, Elder and Blind People, 2018 4th International Conference on Computer and Information Sciences (ICCOINS), Kuala Lumpur, 2018, pp. 1-4.
- [20] Sabab S.A and Ashmafee M.H, Blind Reader: An intelligent assistant for blind, 2016 19th International Conference on Computer and Information Technology (ICCIT), Dhaka, 2016, pp. 229-234.
- [21] Sanjana.B, Rejina.J Parvin. G, "Voice assisted text reading system for visually impaired persons using TTS method", IOSR Journal of VLSI and Signal Processing, May-June 2016, vol. 6, issue 3, ver. III, pp. 15-23.
- [22] Santra P.E, Bhowmick.S , Deyasi.A, Development of GUI for Text-to-Speech Recognition using Natural Language Processing, 2018 2nd International Conference on Electronics, Materials Engineering Nano- Technology (IEMENTech), Kolkata, 2018, pp. 1-4.
- [23] Sareeka A. G.,Kirthika .K, Gowthame M.R and Sucharitha V, "pseudo-Eye Mobility assistance for visually impaired using image recognition," 2018 2nd International Conference on Inventive Systems and Control (ICISC), Coimbatore, 2018, pp. 174-178.
- [24] Shrote S.B , Sanjaykumar Mathapati D. Assistive Translator for Deaf & Dumb People IJECCE Vol. 5, Issue 4 July, Technovision-2014.
- [25] Sonth.S and Kallimani J.S," OCR based facilitator for the visually challenged," 2017 International Conference onElectrical, Electronics, Communication, Computer, and Optimization Techniques (ICEECOT), Mysuru, 2017, pp.1-7.