



**SOUND BITE HEARING SYSTEM  
EMBED WITH OCR  
TECHNIQUES FOR BLIND  
AND DEAF PEOPLE**



**PROJECT PHASE I REPORT**

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degree of*

**BACHELOR OF TECHNOLOGY**

*In*

**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

**HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY**

Approved by AICTE, New Delhi, Accredited with 'A++' Grade  
By NAAC (An Autonomous Institution, Affiliated to Anna University,  
Chennai) Valley Campus, Pollachi Highway, Coimbatore – 641 032

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## **Hindusthan College of Engineering And Technology**

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### **BONAFIDE CERTIFICATE**

Certified that this project report “**SOUND BITE HEARING SYSTEM EMBED WITH OCR TECHNIQUES FOR BLIND AND DEAF PEOPLE**” is the bonafide work of **SRIVATHSAN P S (20115057), VASEEKARAN D (20115059), SANTHOSH SHIVAN (20115802), and SANJAY R (20115046)**” who carried out the project work under my supervision.

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**EXTERNAL EXAMINER**

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## **ABSTRACT**

Speech and text is the main medium for human communication. A person needs vision to access the information in a text. However those who have poor vision can gather information from voice. This project has been built around Arduino Uno board. It is controlling the peripherals like Camera and headset which act as an interface between the system and the user. Optical Character Recognitions (OCR) is implemented in this project to recognize characters which are then read out by the system through a headset. The camera is mounted on spectacles; it captures a full view of the paper into the system. It is ensured that there are good lighting conditions. The content on the paper should be written in English and be of good font size. When all these conditions are met the system takes the photo, processes it and if it recognizes the content written on the paper it will announce on the headset speaker that the content on the paper has been successfully processed. After this it speaks out the content that was converted in to text format in the system from processing the image of the paper. In this way Arduino Based Reader for Blind helps a blind person to read a paper without the help of any human reader or without the help of tactile writing system.

<b>TABLE OF CONTENTS</b>		
<b>CHAPTER NO</b>	<b>TITLE</b>	<b>PAGE NO</b>
	<b>ABSTRACT</b>	<b>xi</b>
	<b>LIST OF FIGURES</b>	<b>xiii</b>
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 CAUSES	2
	1.2 OVERVIEW OF OCR	2
	1.3 OCR TECHNOLOGY	2
	1.4 EXPLANATION	2
	1.5 APPLICATION OF OCR	2
	1.6 TEXT TO SPEECH (TTS) OVERVIEW	3
	1.7 IOT WORKS	4
	1.8 IOT ACROSS VARIOUS DOMAINS	7
	1.9 IOT APPLICATIONS	8
<b>2</b>	<b>LITERATURE SURVEY</b>	<b>6</b>
	2.1 A SMART INFRARED MICRO CONTROLLER-BASED BLIND GUIDANCE SYSTEM	6
	2.2 SENSOR-BASED ASSISTIVE DEVICES FOR VISUALLY IMPAIRED PEOPLE: CURRENT STATUS, CHALLENGE, AND FUTURED	6
	2.3 A WEARABLE- ASSISTIVE TECHNOLOGY FOR THE VISUALLY IMPAIRED WITH DOOR KNOB DETECTION AND REAL- TIME FEEDBACK FOR HAND-TO-HANDLE MANIPULATIONHOUSE MANAGEMENT	7

	2.4 WEARABLE ASSISTIVE DEVICE FOR VISUALLY IMPAIRED: A STATE-OF-THE-ART SURVEY	7
	2.5 A SMART PERSONAL AI ASSISTIVE FOR VISUALLY IMPAIRED PEOPLE	8
<b>3</b>	<b>PROBLEM DEFINITION</b>	<b>10</b>
	3.1 EXISTING SYSTEM 3.2 INTRODUCTION TO READER AND OBJECT DETECTOR FOR BLIND 3.3 DISADVANTAGE OF EXISTING SYSTEM	10
	3.4 PROPOSED SYSTEM 3.5 WORKING OF PROPOSED SYSTEM 3.6 ALGORITHM FOR READING IMAGE 3.7 TEXT SYNTHESIS 3.8 TEXT TO SPEECH SYNTHESIS 3.9 OCR TECHNOLOGY 3.10 TESSERACT OCR 3.11 HARDWARE IMPLEMENTATION 3.12 HARDWARE REQUIREMENTS 3.13 HARDWARE DESCRIPTION 3.14 THE MICROCONTROLLER 3.15 POWER SUPPLY 3.16 RELAY DRIVER 3.17 SERIAL COMMUNICATION 3.18 MOUTH BITE VIBRATION MOTOR 3.19 CAMERA	11

<b>4</b>	<b>SOFTWARE REQUIREMENT AND RESULTS</b>	<b>33</b>
	4.1 PYTHON	33
	4.1 PYTHON WORK	33
	4.2 SETTING UP THE PYTHON IDLE	35
	4.3 ARDUINO IDE	40
	4.4 CAYENNE	41
<b>5</b>	<b>CONCLUSION AND FUTURE ENHANCEMENTS</b>	<b>45</b>
	5.1 CONCLUSION	45
	5.2 FUTURE ENHANCEMENTS	46
	<b>REFERENCES</b>	<b>47</b>

<b>LIST OF FIGURES</b>		
<b>FIGURE NO</b>	<b>FIGURE NAME</b>	<b>PAGE NO</b>
1.1	OCR Technology	21
1.2	TTS Technology	4
1.3	IOT Works	4
1.4	IOT Applications	9
3.1	System Flow of Reading Image	13
3.2	Flow of Pre Processing	14
3.3	Text to Speech Synthesis	16
3.4	OCR Flow Process	17
3.5	Tesseract OCR	19
3.6	System Architecture	20
3.7	Microcontroller ATMEGA 328	22
3.8	PIN Diagram of ATMEGA 328	24
3.9	Block Diagram of a Regulator	25
3.10	Stepdown Transformer	25
3.11	Power Supply Circuit	26
3.12	Relay Model	26
3.13	Relay Circuit	27
3.14	LCD Display	31
3.15	LCD Interface with Arduino UNO	32
3.16	Works of Vibration Motor	33



# **CHAPTER 1**

## **INTRODUCTION**

There are approximately 285 million blind and visually problem people around the world. The term visual impairment covers a wide range and variety of vision, from lack of usable sight and blind, to low vision. Visually impairment cannot be corrected with eyeglasses or contact lenses to moderate visual impairment and an ability to read books, newspapers or any written notes. Globally the major causes of visual impairment are uncorrected refractive errors (myopia, hyperopia, astigmatism), 43% Unoperatic cataract, 33% the first cause of blindness is cataract 51%. Visually impairment individuals usually only can read using the Braille system. The Braille system contains 63 codes of character. Each of them made of 1 to 6 raised dots in different position matrix or cells.

The Braille system was invented by Louis Braille in 1824. Braille can be difficult to learn, not all people's fingertips are sensitive enough to use it. The blind people face three aspects of difficulties in their daily life. Environmental aspect, social aspect and technology aspect. For the environmental aspect, blind people often have difficulties in self navigating outside well-known environments. Blind people also may face great difficulty when travelling or walking in a crowded place. Because of this, they need to bring along well-sighted friends or family to help them. The obstacles such as table and chair must be placed in one location to prevent any undesirable events. In terms of the social aspect, blindness affects the person's ability to complete the job duties. Because of this, job opportunities for blind people are limited. This will affect their finances as well as their self-esteem. In the technology aspect, blind people cannot read an information on a web page.

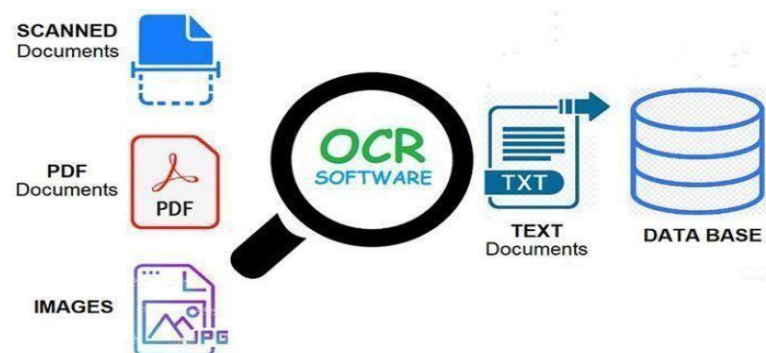
## 1.1 CAUSES

Due to eye diseases, age related causes, uncontrolled diabetes, accidents and other reasons the number of visually impaired persons increased every year. One of the most significant difficulties for a visually impaired person is to read. Recent developments in mobile phones, computers, and availability of digital cameras make it feasible to assist the blind person by developing camera based applications that combine computer vision tools with other existing beneficial products such as Optical Character Recognition (OCR) system.

## 1.2. OVERVIEW OF OCR

Optical character recognition or optical character reader (OCR) is the electronics or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo). OCR is a field of research in pattern recognition, artificial pattern recognition, artificial intelligence and computer vision.

### 1.2.1 OCR TECHNOLOGY



**Fig 1.1 OCR Technology**

### **1.2.2 EXPLANATION**

OCR technology is a business solution for automating data extraction from printed or written text from a scanned document or image file and then converting the text into a machine readable form to use for data processing like editing or searching.

### **1.2.3 APPLICATION OF OCR**

- ✓ Data entry for business documents, e.g. cheque, passport, invoice
- ✓ Bank statements and receipt
- ✓ Automatic number plate recognition
- ✓ In airports, for passport recognition and information extraction
- ✓ Traffic sign recognition

## **1.3 TEXT - TO-SPEECH (TTS) OVERVIEW**

Voice synthesis, defined as TTS (acronym for Text-To-Speech), is a computer system that should be able to read aloud any text, regardless of its origin. The use of TTS aims to produce human voice artificially. Voice synthesis is a complex process and complex algorithms are needed to produce an intelligible and natural result. TTS synthesis makes use of techniques of Natural Language Processing. Since the text to be synthesized is the first entry of the system, it must be the first to be processed.

There are several techniques to create a synthesized voice:

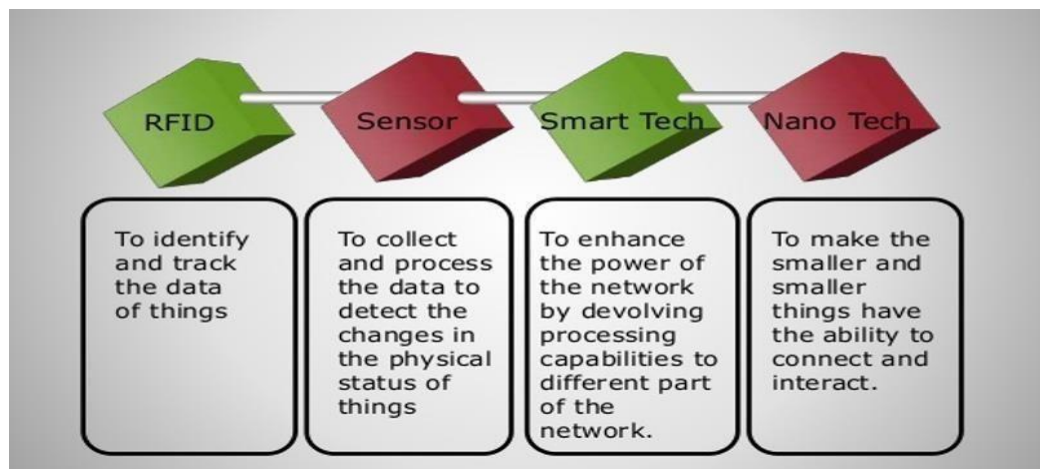
- Articulatory synthesis
- Formant synthesis
- Concatenation synthesis
- Hidden Markov models synthesis.



**Fig 1.2 TTS Technology**

The main synthesis techniques, presented above, are the methods used in the study and development of speech synthesis systems. However, a way to profit from the inherent advantages of each technique is to use a hybrid of the various techniques in the development of future systems speech synthesis.

#### **1.4 IOT WORKS**



**Fig 1.3 IOT Works**

#### **FEW APPLICATIONS OF IOT**

- Medical and Healthcare system
- Building and Home automation
- Manufacturing
- Environmental monitoring
- Transportation

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 A SMART INFRARED MICRO CONTROLLER- BASED BLIND GUIDANCE SYSTEM**

In this work a simple, cheap, friendly user, smart blind guidance system is designed and implemented to improve the mobility of both blind and visually impaired people in a specific area. The proposed work includes a wearable equipment consists of head hat and mini hand stick to help the blind person to navigate alone safely and to avoid any obstacles that may be encountered, whether fixed or mobile, to prevent any possible accident. The main component of this system is the infrared sensor which is used to scan a predetermined area around blind by emitting-reflecting waves. The reflected signals received from the barrier objects are used as inputs to PIC micro controller. The micro controller is then used to determine the direction and distance of the objects around the blind. It also controls the peripheral components that alert the user about obstacle's shape, material, and direction. The implemented system is cheap, fast, and easy to use and an innovative affordable solution to blind and visually impaired people in third world countries.

#### **2.2 SENSOR-BASED ASSISTIVE DEVICES FOR VISUALLY IMPAIRED PEOPLE: CURRENT STATUS, CHALLENGE, AND FUTURE DIRECTION**

In this paper, we present a comparative survey of the wearable and portable assistive devices for visually-impaired people in order to show the progress in assistive technology for this group of people. Thus, the contribution of this literature survey is to discuss in detail the most significant devices that are presented in the literature to assist this population and highlight the improvement.

### **2.3 A WEARABLE ASSISTIVE TECHNOLOGY FOR THE VISUALLY IMPAIRED WITH DOOR KNOB DETECTION AND REAL- TIME FEEDBACK FOR HAND-TO-HANDLE MANIPULATION**

In this paper, we propose an AI-driven wearable assistive technology that integrates door handle detection, user's real-time hand position in relation to this targeted object, and audio feedback for "joy stick-like command" for acquisition of the target and subsequent hand-to-handle manipulation. When fully envisioned, this platform will help end users locate doors and door handles and reach them with feedback, enabling them to travel safely and efficiently when navigating through environments with thresholds. Compared to the usual computer vision models, the one proposed in this paper requires significantly fewer computational resources, which allows it to pair with a stereoscopic camera running on a small graphics processing unit (GPU). This permits us to take advantage of its convenient portability.

### **2.4 WEARABLE ASSISTIVE DEVICE FOR VISUALLY IMPAIRED: A STATE-OF-THE-ART SURVEY**

In the last decade, there was a tremendous amount of work in developing wearable assistive devices dedicated to the visually impaired people, aiming at increasing the user cognition when navigating in known/unknown, indoor/outdoor environments, and designed to improve the VI quality of life. This paper presents a survey of wearable/assistive devices and provides a critical presentation of each system, while emphasizing related strengths limitations. The paper is designed to inform the research community and the VI people about the capabilities of existing systems, the progress in assistive technologies and provide a glimpse in the possible short/medium term axes of research that can improve existing devices. The survey is based on

various features and performance parameters, established with the help of the blind community that allows systems classification using both qualitative and quantitative measures of evaluation. This makes it possible to rank the analyzed systems based on their potential impact on the VI people life.

## **2.5 A SMART PERSONAL AI ASSISTIVE FOR VISUALLY IMPAIRED PEOPLE**

In today's advanced hi-tech world, the need of independent living is recognized in case of visually impaired people who are facing main problem of social restrictiveness. They suffer in strange surroundings without any manual aid. Visual information is the basis for most tasks, so visually impaired people are at disadvantage because necessary information about the surrounding environment is not available. With the recent advances in inclusive technology, it is possible to extend the support given to people with visual impairment.

This project is proposed to help those people who are blind or visually impaired using Artificial Intelligence, Machine Learning, Image and Text Recognition. The idea is implemented through Android mobile app that focuses on voice assistant, image recognition, currency recognition, e- book, chat bot etc. The app is capable to assist using voice command to Recognize objects in the surrounding, do text analysis to recognize the text in the hard copy document. It will be an efficient way in which blind people can also interact with the environment with the facilities of the technology.

## **CHAPTER 3**

### **PROBLEM DEFINITION**

#### **3.1 EXISTING SYSTEM**

##### **3.1.1 INTRODUCTION TO READER AND OBJECT DETECTOR FOR BLIND**

The existing model is capable of either detecting the objects around or reading the text from an image. No work has been done to include both technologies into one single model. We realized that these two technologies can be beneficial to the blind people, but it's not possible for them.

##### **3.1.2 DISADVANTAGE OF EXISTING SYSTEM**

2. Blind people have a tough time finding good reading materials in accessible formats. Millions of people in India are blind but we do not have even the proper textbooks in braille, leave alone the novels and other leisure reading materials. Internet, the treasure trove of information and reading materials, too is mostly inaccessible for the blind people.
3. As most of the blind people depend on the objects' shape and texture
4. To identify them arranging the laundry becomes a challenging task. Although a majority of blind people device their own technique to recognize and arrange at least their own clothes but it still is a challenging chore.
5. Even though a blind person can use screen reading software but it does
6. Not make the Internet surfing experience very smooth if the websites are not designed accordingly. Blind person depends on the image description for understanding whatever is represented through pictures. But most of the time,



websites do not provide clear image description.

7. Obviously, blind people roam easily around their house without any help because they know the position of everything in the house. People living with and visiting blind people must make sure not to move things around without informing or asking the blind person.
8. White cane may easily creak/break, The stick may get stuck at pavement
9. Creaks of different objects. And the common disadvantages including the smart devices cannot be carried easily, needs a lot of training to use.

### **3.2 PROPOSED SYSTEM**

The proposed system of our project will present both a document reader and object detector for blind people.

- The smart Assistive device that takes audio commands and image as an input and outputs results in the audio format.
- The Proposed system followed by the steps are,
- The input is taken in the form of an image captured from the web camera. This image is then processed either for the purpose of text reading or for object detection based on user choice.
- It uses the 'Optical Character Recognition' (OCR) technology to read the printed characters captured using USB camera.
- OCR and TTS (Text-To-Speech) are used to convert images of printed text into an intermediate form that is then changed to audio output.
- The captured image is first converted to gray scale and then filtered using a Gaussian filter to reduce the noise in the image.
- Here adaptive Gaussian thresholding is used to reduce the noise

- Image, filtered image is converted to binary.
- The binarized image is cropped so that the portions of the image with no characters are removed. The output loaded to OCR Tesseract.

### **3.2.1 WORKING OF PROPOSED SYSTEM**

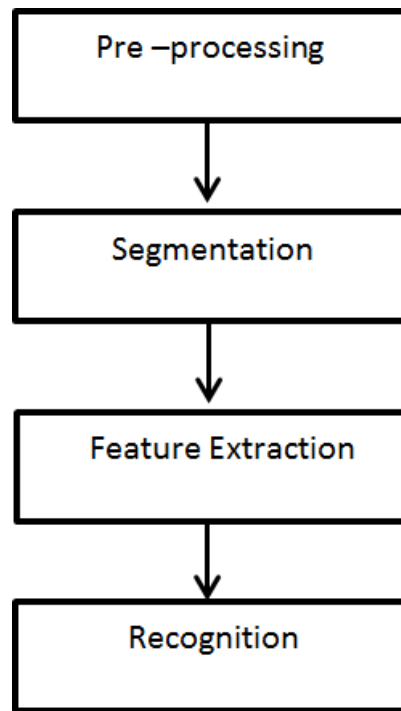
The proposed method is to help blind person in reading the text present on the text labels, printed notes and products as a camera based assistive text reader. The implemented idea involves text recognition from image taken by camera on spectacle and recognizes the text using OCR. Conversion of the recognized text file to voice output by Speak algorithm. The system is good for portability. The portability allows the user to carry the device anywhere and can use at any time.

The system captures the frame and checks the presence of text in the frame. If a character is found by the camera the user will be informed that image with some text was detected. Thus if the user wanted to hear or to know about the content in the image. The process done by OCR and TTS Technology. The final we get audio output through the speaker. The e-Speak creates an analog signal corresponding to the text file given as the input. The analog signal produced by the e-Speak is then given to a headphone to get the audio output signal.

Python-tesseract is an optical character recognition (OCR) tool for python. That is, it will recognize and "read" the text embedded in images. Additionally, if used as a script, python-tesseract will print the recognized text instead of writing it to a file. Python-tesseract is a wrapper for Google's Tesseract-OCR Engine. It is also useful as a stand-alone invocation script to tesseract, as it can read all image types supported by the pillow and Leptonic imaging libraries, including jpeg, png, gif, bmp, tiff, and others. Additionally, python-tesseract will print the recognized text instead of writing it to a file.

### 3.2.2 ALGORITHM FOR READING IMAGE

- 1) Pre –processing
- 2) Segmentation
- 3) Feature extraction
- 4) Recognition

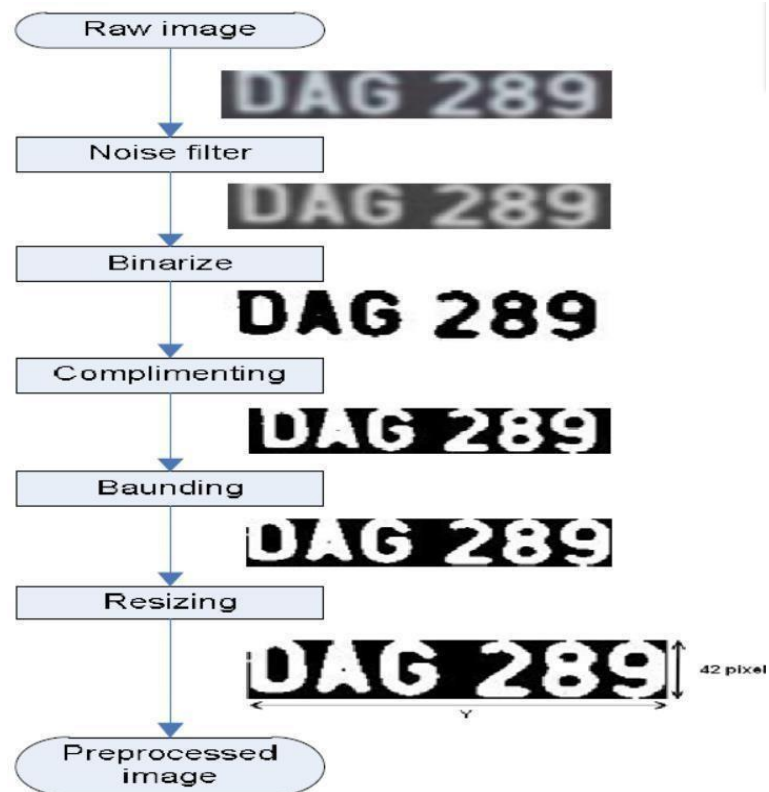


**Fig 3.1** System Flow of Reading Image

#### **Pre – Processing**

The Process of image in a mathematical operation using an Image Processing Unit which consists an image as an input. Process involves isolating the individual color planes of an image and treating them as two-dimensional signal. The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing

## FLOW CHART FOR PRE- PROCESSING



**Fig 3.2** Flow of Pre-Processing

### Segmentation Process

This process mainly consists of line segmentation, word segmentation and then the characters. These segments are then put together for proper identification of the text. Individual letters in a word are separated in Kannada and Tamil languages as they are non-cursive script.

### Line Segmentation

Recognition of lines in the given image has following steps:

Text image is scanned horizontally along the vertical co-ordinate axis to find

the first ON pixels.

### **Word Segmentation**

Scanning the image vertical, we can segment the line into words .it involves the following steps:

- ❖ To find the first ON pixel, the line segment of the text image is scanned Vertically along x1 axis.
- ❖ Once the word would have started, we find number of on pixels.
- ❖ The final OFF pixels column is obtained along the x2 co-ordinate axis.

### **Character Segmentation**

- ❖ The required word segment is scanned vertically along x1 co-ordinate
- ❖ Axis to get first on pixel.
- ❖ Once the character start, we find lots of on pixel.
- ❖ Along the x2 co-ordinate axis we obtain the final off pixel column.

### **Recognition**

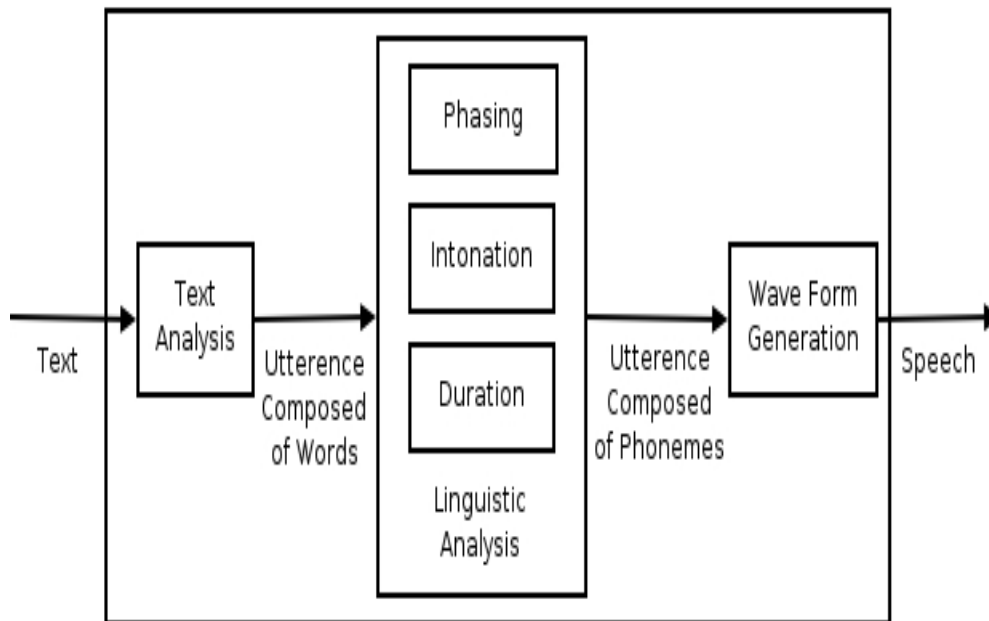
- ❖ Finally the segmentation process are completed. And the image are Recognition by OCR technology

### **3.2.3 TEXT SYNTHESIS**

By the use of Optical Character Recognition scripts can be easily identified. The components of this system include scanner, binarization device, segmentation, extraction and identification. The text is obtained through a scanner and it's segmented. The scanned features are recognized and the words are reconstructed. Synthesizing a text is the process of pulling together background knowledge, newly learned ideas, constructions, inferences and summaries into a complete and original understanding of the text. When students synthesize, they are made aware of how their thinking.

### 3.2.4 TEXT TO SPEECH SYNTHESIS

This is a system that will read the detected text to the user. The block diagram below explains this synthesizer.

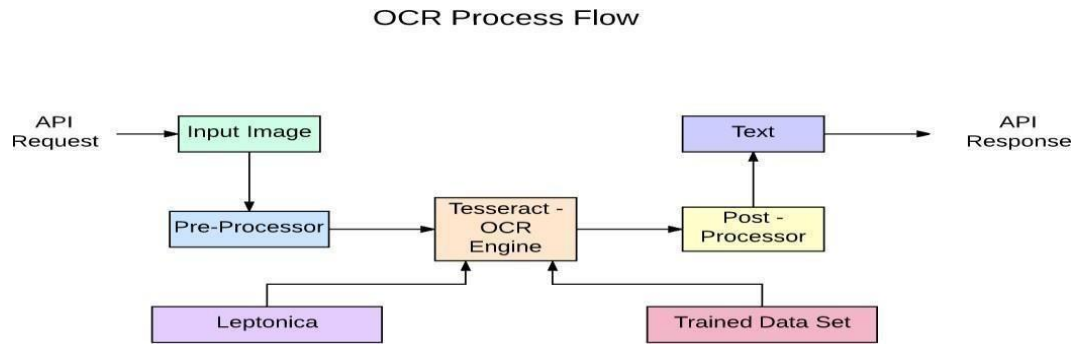


**Fig 3.3** Text to Speech Synthesis

The system consists of two parts: front end and back end. The front end converts symbols, numbers into equivalent of written words. This is called pre-process or normalization. The back end converts symbols or text into voice.

### 3.2.5 OCR TECHNOLOGY

Optical Character Recognition (or) Optical Character Reader is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine encoded text, whether from a scanned document, a photo of a document, a scene photo, for example the text on signs and billboards in a landscape photo.



**Fig 3.4 OCR Flow Process**

### **3.2.5.1 TYPES OF OCR**

#### **Intelligent Character Recognition**

ICR is an advanced optical character recognition (OCR) or rather more specific handwriting recognition system that allows fonts and different styles of handwriting to be learned by a computer during processing to improve accuracy.

#### **Intelligent Word Recognition**

IWR is the recognition of unconstrained handwritten words. IWR recognizes entire handwritten words or phrases instead of character by character, like its predecessor, optical character recognition (OCR). IWR technology matches handwritten or printed words.

### **3.2.5.2 APPLICATION OF OCR**

OCR engines have been developed into many kinds of domain specific OCR application, such as receipt OCR, invoice OCR, check OCR, legal billing Document OCR.

They can be used for: Data entry for business documents, E.g. Cheque, passport, invoice, bank statement and receipt.

#### **Banking**

The Banking industry, along with other finance sector industries like insurance and securities, is a major consumer of OCR. The most frequent use of OCR is to handle checks: a handwritten check is scanned, its contents converted into digital text, the signature verified and the check cleared in real time, all with human involvement.

### **Legal**

Few industries generate as much paperwork as the legal industry, and so OCR has multiple applications herein. Reams and reams of affidavits, judgments, filings, statements, wills and other legal documents, especially the printed ones, can be digitised, stored, databased and made searchable using the simplest of OCR readers.

### **Healthcare**

This is another industry that does well with OCR. Having one's entire medical history on a searchable, digital store means that things like past illnesses and treatments, diagnostic tests, hospital records, insurance payments.

### **3.2.6 TESSERACT OCR**

Tesseract is an open source text recognition (OCR) Engine, available under the Apache 2.0 license. It can be used directly, or (for programmers) using an API to extract printed text from images. It supports a wide variety of languages. Tesseract doesn't have a built-in GUI, but there are several available from the 3<sup>rd</sup> Party page. Tesseract is compatible with many programming languages and frameworks through wrappers that can be found here.



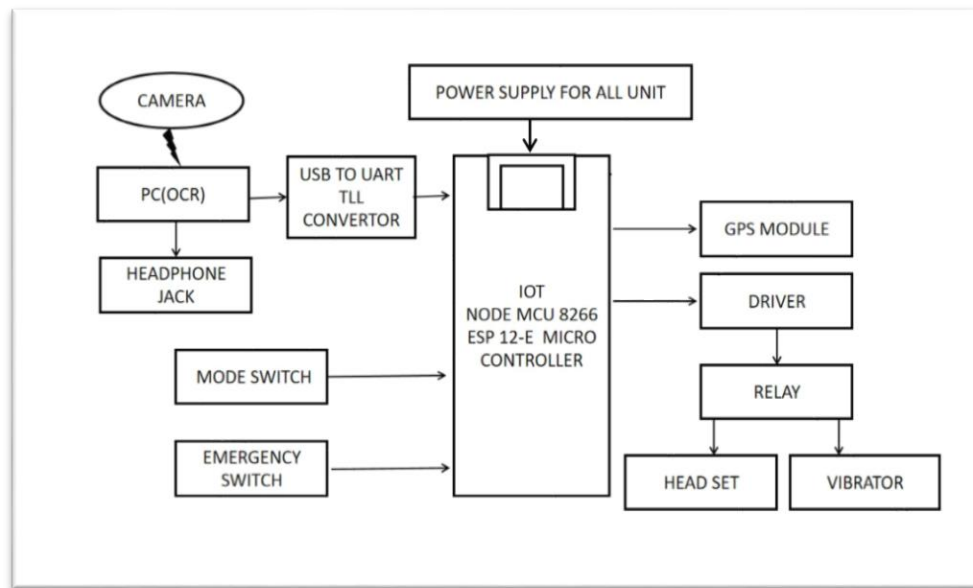


**Fig 3.5** Tesseract OCR

#### **3.2.6.1 OCR WITH PYTESSERACT AND OPENCV**

Pytesseract is a wrapper for Tesseract-OCR Engine. It is also useful as a stand-alone invocation script to tesseract, as it can read all image types supported by the Pillow and Leptonic imaging libraries, including jpeg, png, gif, bmp, tiff, and others. More info about Python approach read [here](#). The code for this tutorial can be found in this repository.

## BLOCK DIAGRAM



**Fig 3.6** System Architecture

### 3.3 HARDWARE IMPLEMENTATAION

Hardware components used for this system are Arduino Uno, camera on spectacle and a power bank. The camera on spectacle captures the image from the frame. The captured images are sent to Arduino Uno and all the image processing was done. The voice output is available on the Bluetooth headset.

#### HARDWARE REQUIREMENTS

- Camera
- Headset
- Relay
- Vibration Motor
- Power Supply
- Arduino (ATMEGA 328)

### **3.3.1 HARDWARE DESCRIPTION**

#### **3.3.1.1 INTRODUCTION**

Arduino is an open source platform for prototyping based on user- friendly software. It provides a flexible base for engineers to experiment on designing interactive environments. They can be programmed for specific applications to create embedded systems which can control and sense real time parameters. It consists of a microcontroller ATmega328 which is programmed using the Arduino software.

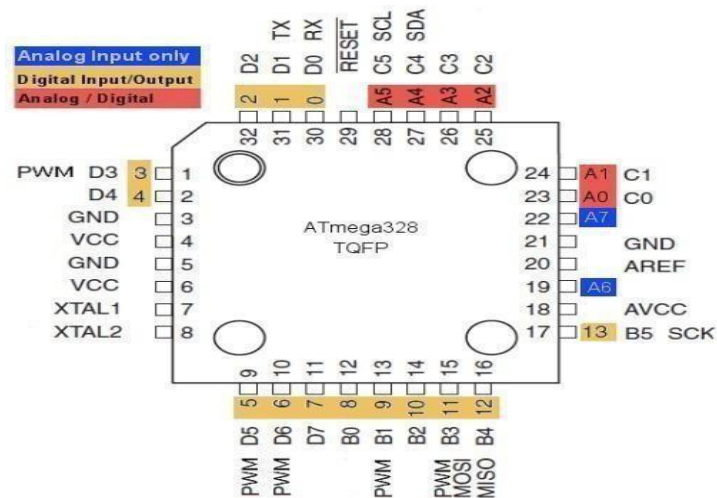
It behaves like the Arduino board and programmed using the Arduino IDE. Its main components are

- 14 digital input/output pins (6 can be used as PWM outputs)
- 6 analog inputs (can also be used for digital I/O - so a total of 20 digital I/O's).
- 16 MHz crystal oscillator

#### **Memory**

Memory can be broadly divided into 3 classes:

- a. 32KB Flash memory –This is the storage space of the compiled program of which the boot load reuses 0.5 KB.
- b. 2KB SRAM – This is mainly used during run time.
- c. 1KB EEPROM –This is used for storing data that should not be erased upon switching off power.



**Fig 3.7** Microcontroller ATmega328-Pin Diagram

### Power Setup

The Arduino R3 operates at 5 Volts. It can either be powered through USB cable from the computer or through the DC jack provided on the Board.

### The DC Jack

The voltage regulator 7805 is provided in the board for obtaining 5v regulated output voltage. The input voltage applied can be between 7-25 volts DC power.

### USB Power

When powered through the USB, the 500mA Re-settable fuse on the USB power line is used to abstain the board from drawing current in excess.

### Summary

Microcontroller	: ATmega328
Operating Voltage	: 5V
Input Voltage	: 7-12V
Digital I/O Pins	: 14 (of which 6 provide PWM
output) Analog Input Pins	: 6
DC Current per I/O Pin	: 40 mA

DC Current for 3.3V Pin : 50 mA  
SRAM : 2 KB (ATmega328)

## **Hardware**

The Arduino R3 / Arduino Uno Boards have 14 programmable I/O's. They are grouped mainly as

- Pins 0 to 13
- Pins 0 to 5 [Analog Inputs 0 to 5]

### **Digital I/O's**

The 20 I/O's can accept digital signals as input as well as outputs. The digital pins are numbered from 0 to 19. The Digital Pins can be used for controlling LED's, Relays and for accepting input from Push-Buttons, Digital Sensors.

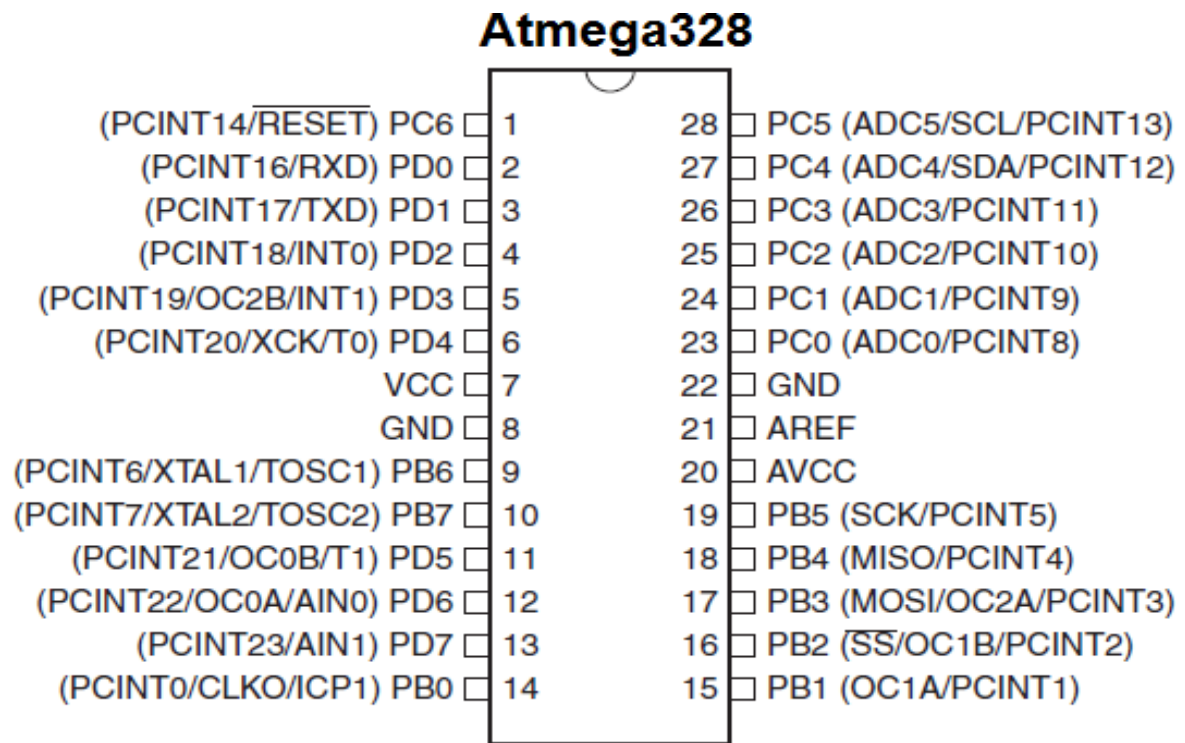
### **Analog I/O's**

Analog inputs can be given to pins A0-A5. An inbuilt ADC analog to digital converter is present that converts analog voltages in the range of 0 to 5 volts to a 10-bit value. Analog sensors that sense changes in temperature or light can work with these inputs.

### **Analog Output**

The six pins marked PWM are pins dedicated to produce Analog Output Signal. They can produce analog voltages in the range of 0 to 5 volts with a resolution of 8-bits. They can be used for Intensity Control, Speed Control, Etc.

## PIN DIAGRAM

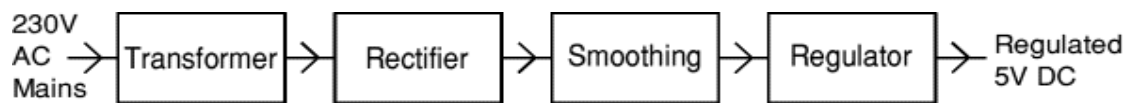


**Fig 3.8** Pin Diagram of ATMEGA 328

### 3.3.4 POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

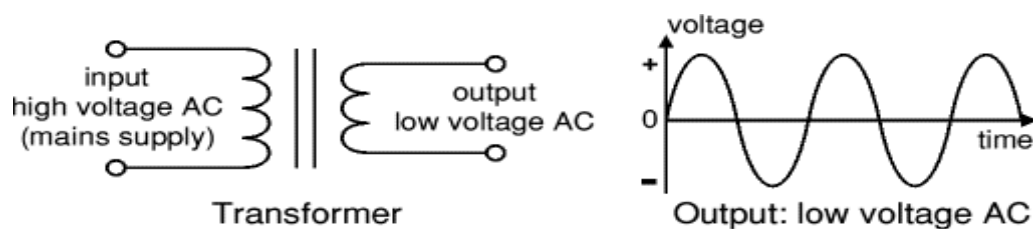
Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more



**Fig 3.9** Block Diagram of a Regulator

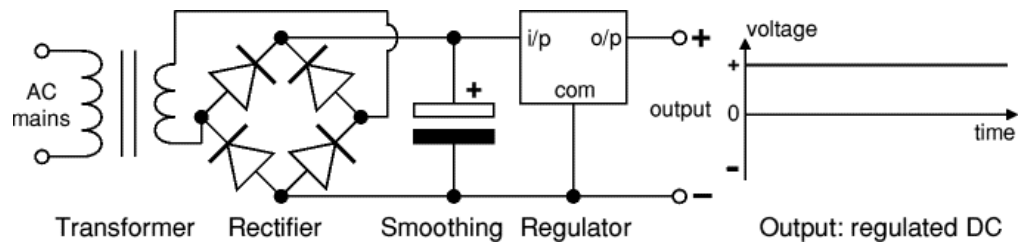
### 3.3.4.1 TRANSFORMER

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core.



**Fig 3.10** Stepdown Transformer

The low voltage AC output is suitable for lamps, heaters and special AC motors. It is not suitable for electronic circuits unless they include a rectifier and a smoothing capacitor. The regulated DC output is very smooth with no ripple. It is suitable for all electronic circuits.



**Fig 3.11** Power Supply Circuit

### 3.3.5 RELAY DRIVER (ULN 2003 IC)

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (change over) switch contacts.



**Fig 3.12** Relay Model

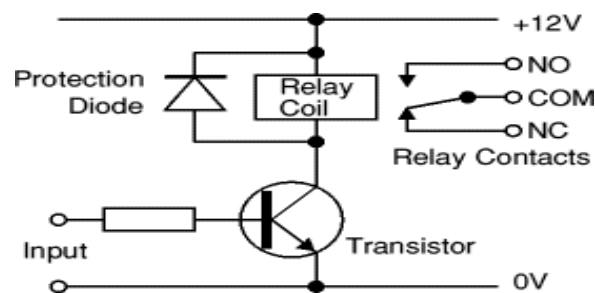
Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. A relay is an electrically operated switch. Current



flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (change over) switch contacts as shown in the diagram. Relays allow one circuit to switch a second circuit which can be completely separate from the first.

### 3.3.5.1 PROTECTION DIODES FOR RELAYS

Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. The diagram shows how a signal diode (eg 1N4148) is connected 'backwards' across the relay coil to provide this protection.



**Fig 3.13** Relay Circuit

### ADVANTAGES OF RELAYS

- ❖ Relays can switch AC and DC, transistors can only switch DC.
- ❖ Relays can switch higher voltages than standard transistors.
- ❖ Relays are often a better choice for switching large currents ( $> 5\text{ A}$ ).
- ❖ Relays can switch many contacts at once.

### FEATURES

- TTL, DTL, PMOS, or CMOS-Compatible Inputs
- Output Current to 500 mA
- Output Voltage to 95 V

- Transient-Protected Outputs
- Dual In-Line Plastic Package or Small-Outline IC Package

### 3.3.6 SERIAL COMMUNICATION

The communication can be established with the computer or other Arduino boards. For this purpose, the Atmega328 provides UART TTL (5V) serial communication, existing on digital pins 0 (RX) and 1 (TX). A FT232RL IC on the board paves the way for this serial communication over USB and appears as a virtual com port to the computer. The Atmega328 provides I2C / Two Wire Communication through the Analog Pins A4 (SDA) & A5(SCL). The Arduino software includes a Wire library to simplify use of the I2C bus. I2C Communication can be use for communicating with other microcontrollers / Ics. The Atmega328 supports SPI communication through pins 10 (SS), 11 (MOSI), 12 (MISO), 13(SCK). SPI communication is supported by the Arduino IDE using the SPI library. SPI Communication can also be used to communicate with other peripherals / Ics – SD Cards, Ethernet Controller, Etc.

Atmega328 from within the Arduino IDE. The Bootloader is loaded initially when the board is powered on / reset. Upon receiving a signal from the IDE that a new program needs to be uploaded, it writes into the program memory of the microcontroller using serial communication for reception. The programming in Arduino IDE is much similar to ‘c’ programming. There are two special functions that are a part of every Arduino sketch: setup () and loop. At the start of power or a reset, the setup () function is called once.

It is used only for one time operations required at power on. The loop () function takes care of the application code. It keeps on executing until the power supply is switched off. It is mandatory to include both the

functions, whether needed or not.

### 3.3.6.1 VIBRATION MOTOR

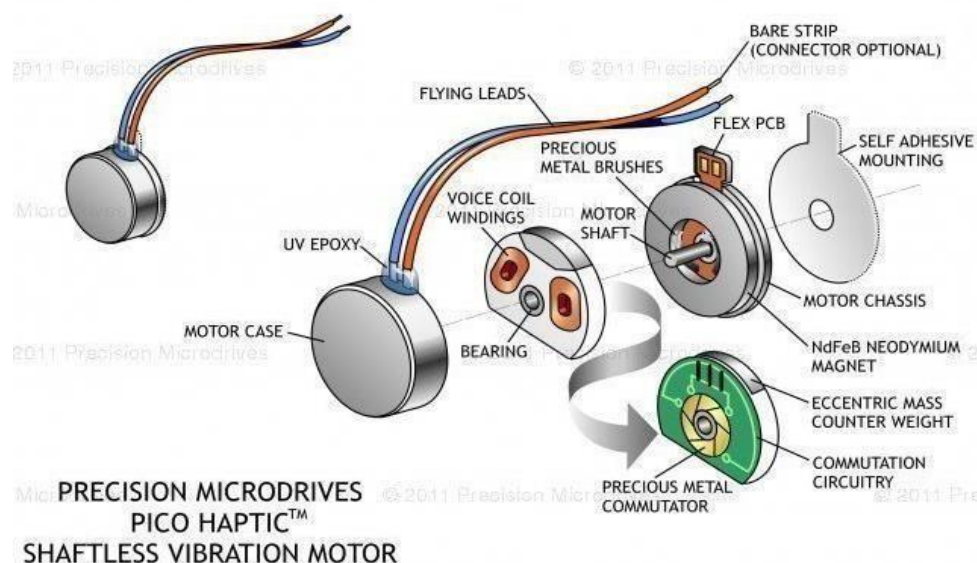
A vibrator is a mechanical device to generate vibrations. The vibration is often generated by an electric motor with an unbalanced mass on its driveshaft. There are many different types of vibrator. Typically, they are components of larger products such as cell phones, pagers, or video game controllers with a “rumble” feature.

When mobile phones and pagers vibrate, the vibrating alert is produced by a small component that is built into the phone or pager. Many older, non-electronic buzzers and doorbells contain a component that vibrates for the purpose of producing a sound. Tattoo machines and some types of electric engraving tools contain a mechanism that vibrates a needle or cutting tool.

Vibrations are caused due to these motors. Haptics, is the use of the sense of touch that gives feedback to the electronic devices through vibrations. Haptic is a Greek word derived from haptain means “to fasten”.

Two motors are responsible for setting up the vibrations :

- ✓ Eccentric Rotating motor (ERM)
- ✓ Linear Resonant Actuator (LRA)

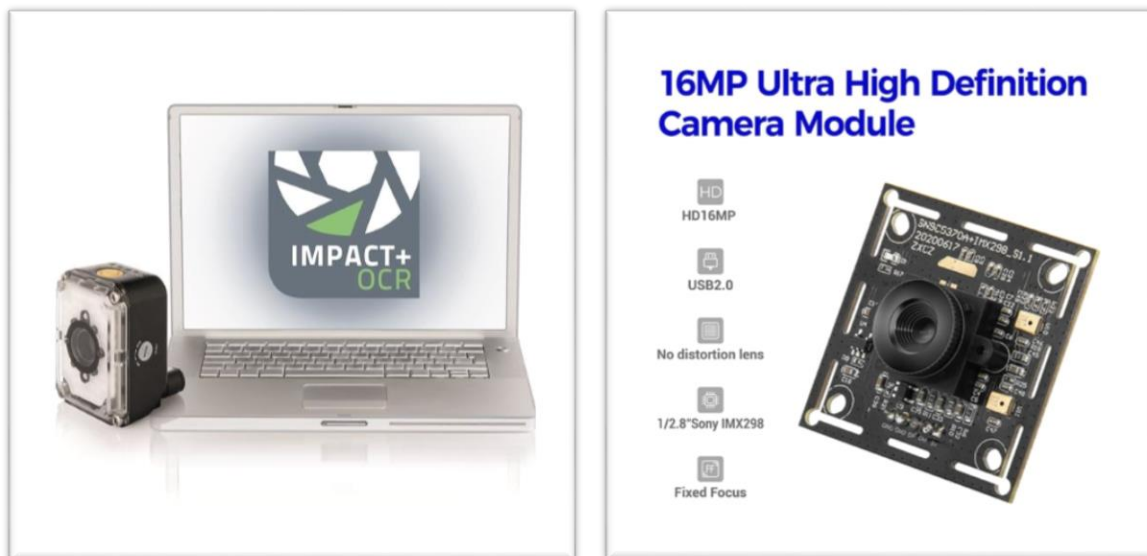


**Fig 3.16 Works of Vibration Motor**

The process of vibration starts with a signal or touch from a software or hardware .An electrical signal from hardware, such as incoming message or call goes to a Microprocessor with haptic senses. Depending on the type of input (i.e. Message or call) vibrations are varied. Due to insufficient power of microprocessor to create the vibrations, it transfers it to haptic drivers (these are included in processors externally or internally during manufacturing.This control signal from the processor, makes the haptic drivers send current, which generates strength in the motors, causing vibrations.

### 3.3.6.2 CAMERA

A compactable camera on spectacle is used for image capturing. It has auto focusing capability with a resolution of 1280X720 which is capable of capturing some good quality images. The USB powered camera is used in order to connect it with Arduino uno board.



## **CHAPTER 4**

### **SOFTWARE REQUIREMENT AND RESULTS**

There are two software required namely,

1. Python IDLE
2. Arduino IDE

#### **4.1 PYTHON**

Python is a popular programming language. It was created by Guido van Rossum, and released in 1991.

It is used for:

- Web development (server-side),
- Software development,
- Mathematics,
- System scripting.

##### **4.1.1 PYTHON WORK**

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.
- Python can be used for rapid prototyping, or for production-ready software development.

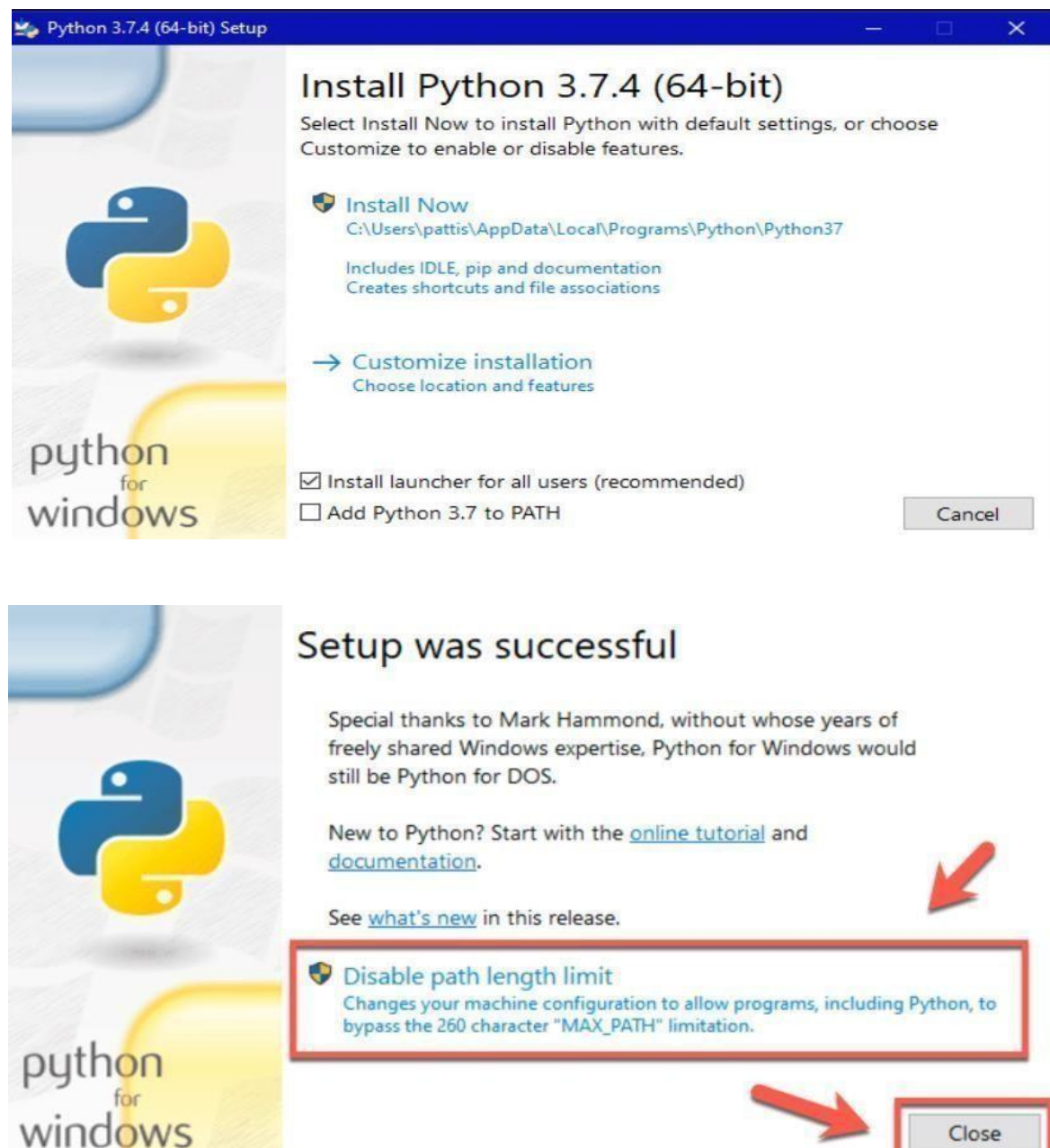
There are two attributes that make development time in Python faster than in other programming languages:

1. Python is an interpreted language, which precludes the need to compile code before executing a program because Python does the compilation in the background. Because Python is a high-level programming language, it abstracts many sophisticated details from the programming code. Python focuses so much on this abstraction that its code can be understood by most novice programmers.
2. Python code tends to be shorter than comparable codes. Although Python offers fast development times, it lags slightly in terms of execution time. Compared to fully compiling languages like C and C++, Python programs execute slower. Of course, with the processing speeds of computers these days, the speed differences are usually only observed in benchmarking tests, not in real-world operations. In most cases, Python is already included in Linux distributions and Mac OS X machines.
3. Python is a dynamic, high level, free open source and interpreted programming language. It supports object –oriented programming as well as procedural oriented programming. Python is a very easy to code as compared to other language like c , c ++, java etc.. It is also a developer- friendly language. Python is also an Integrated language because we can easily integrated python with other language like c, c ++, etc..

## 4.2 SETTING UP THE PYTHON IDLE

### Step 1 –Download the python IDLE software

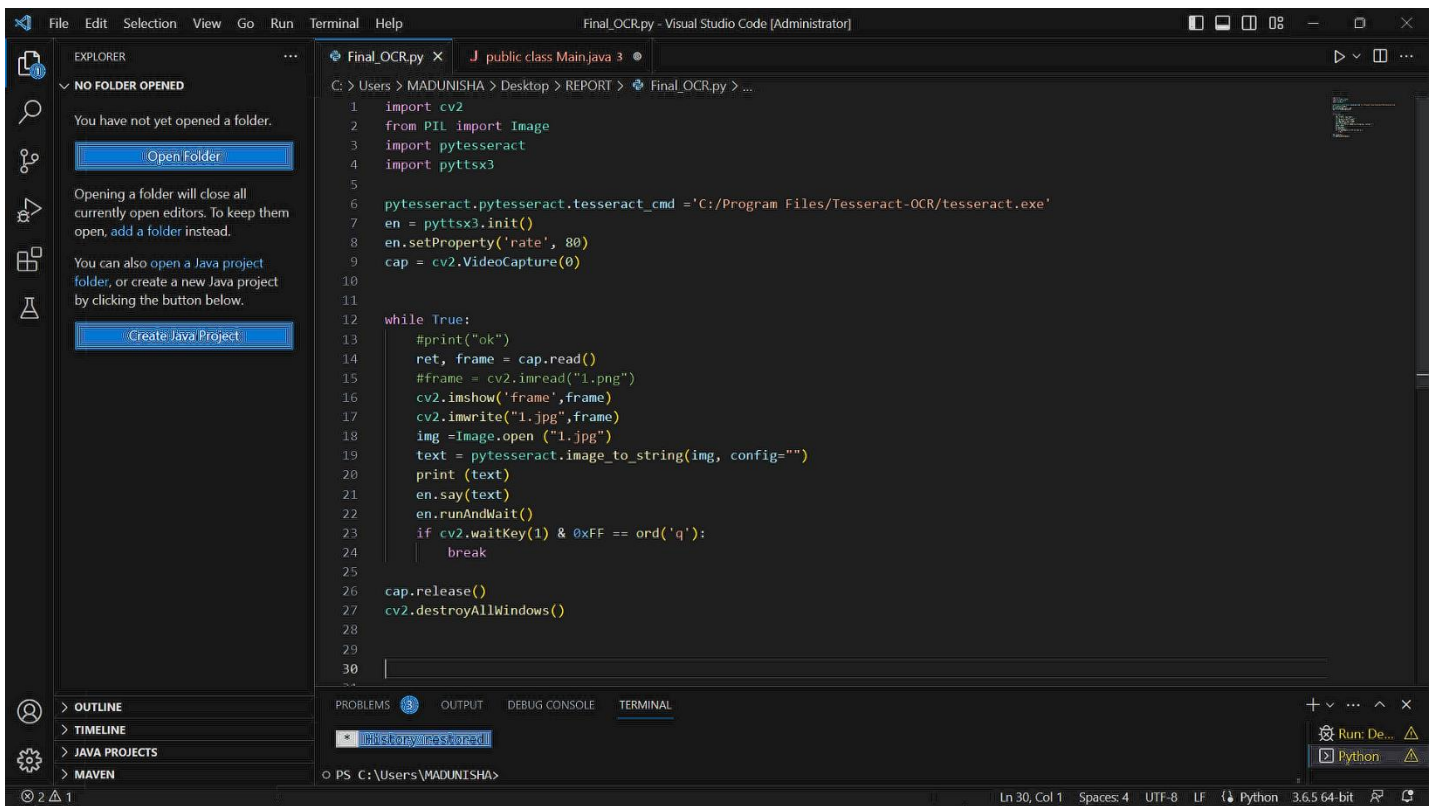
Open your web browser and navigate to the Downloads for Windows section of the official python website



**Fig 4.1** Steps for Python Installation

## Step 2-Write the program for Detect the Text to Convert Audio through speaker

+



**Fig 4.2** Program for Text to Audio Conversion



## Step 3-To Run the program

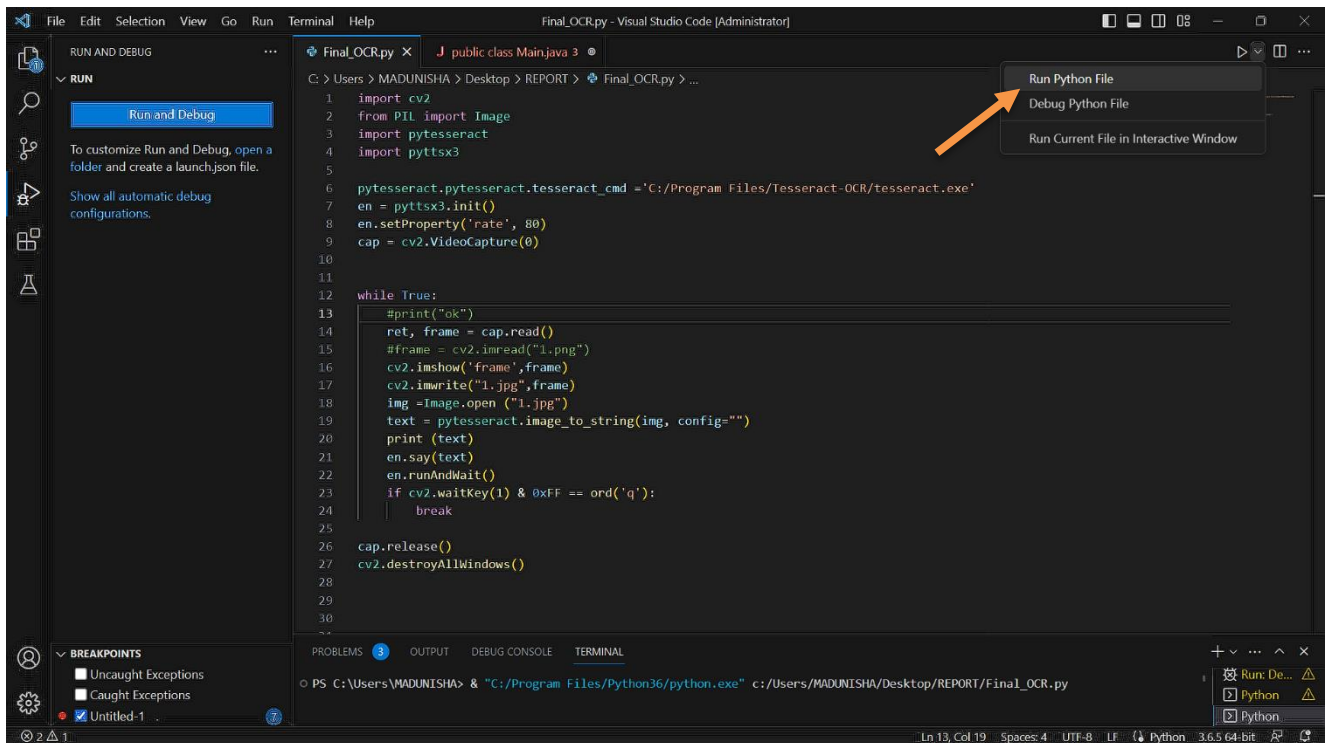


Fig 4.3 Program for Run Module

## Step 4-Continue for Run module

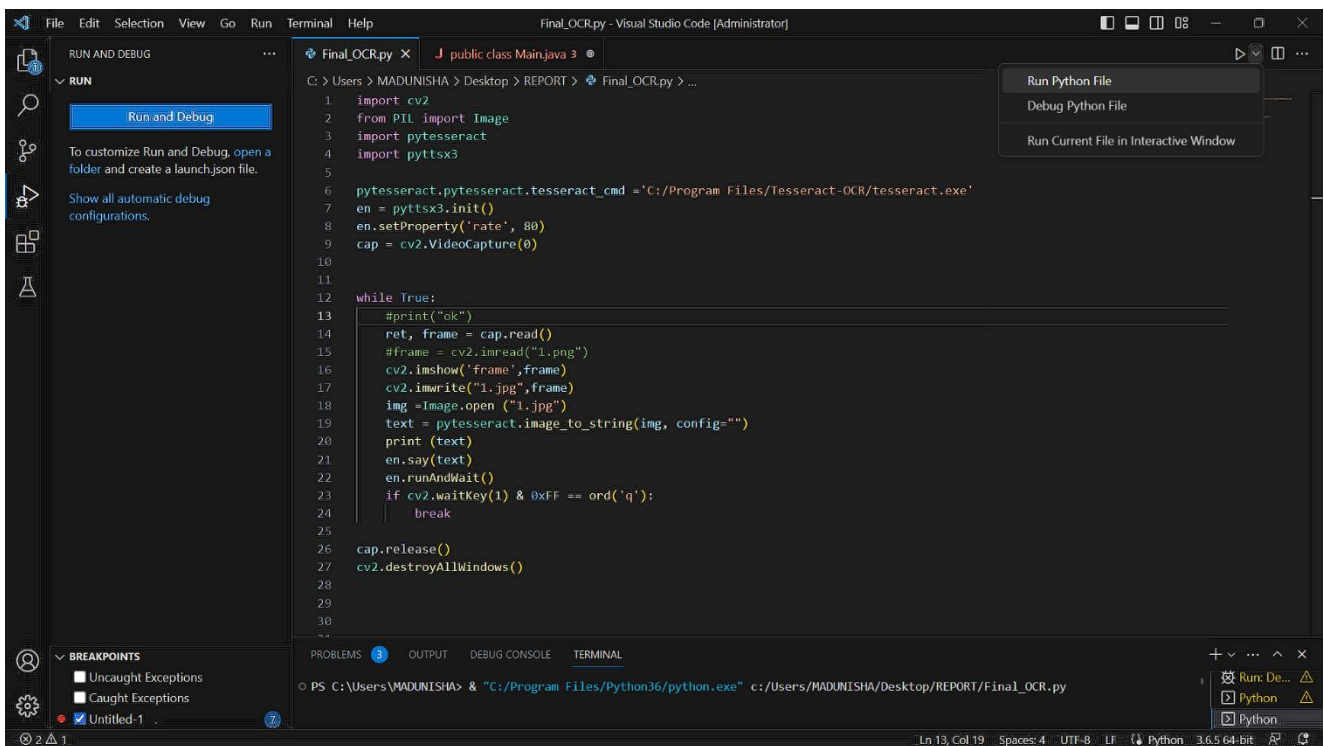


Fig 4.4 Continue Program for Run Module

## Step 5-Detection of Text one by one

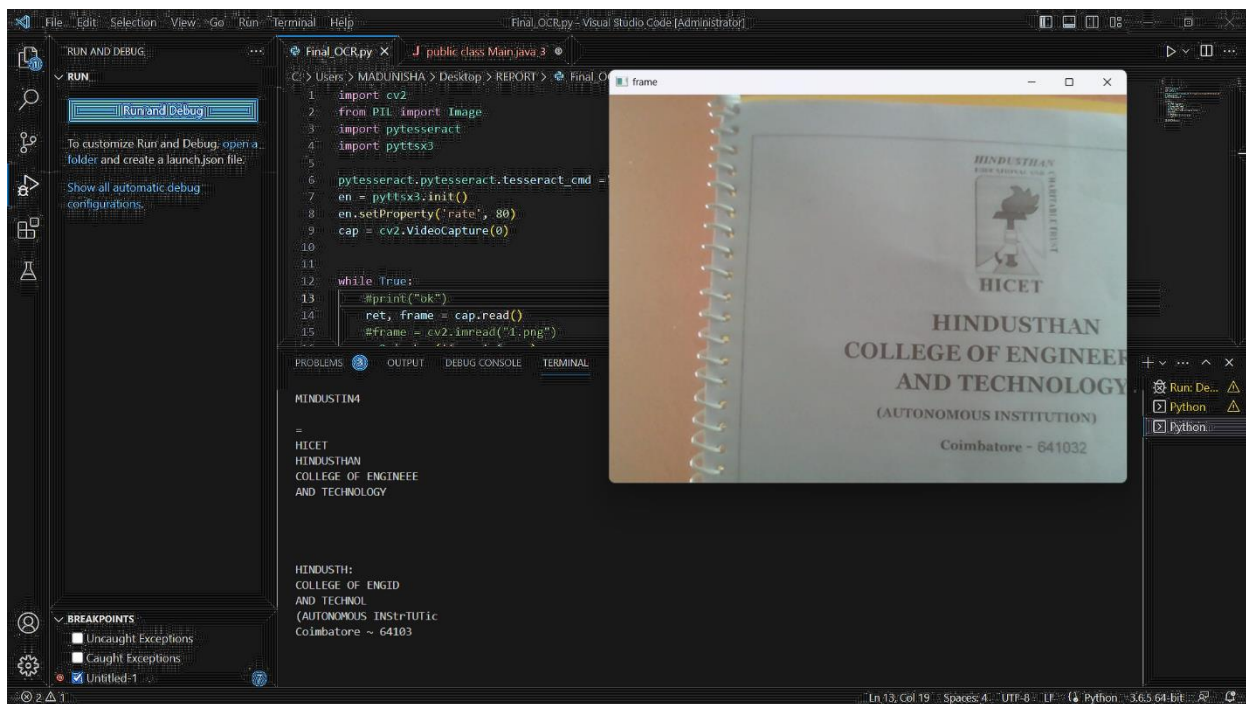


Fig 4.5 Image Detection

## Step 6-Finally Text is detected &get audio output by using OCR&TTS

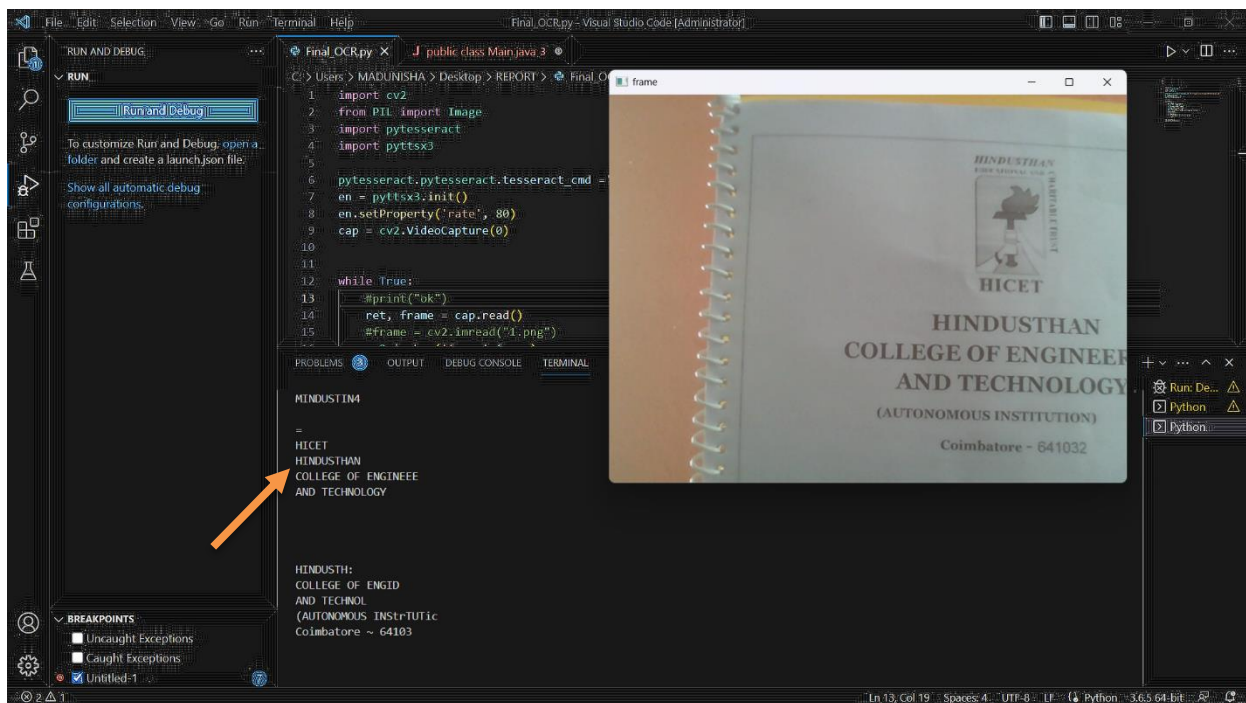


Fig 4.6 Final Output for Read Text

### 4.3 ARDUINO IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.



**Fig 4.9** Arduino Model

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

#### **4.4 CAYENNE**

Cayenne is an online IoT dashboard that takes most of the complication out of creating hardware-oriented programming. Originally it worked with just the Raspberry Pi. Now it is available for the Arduino as well.



**Fig 4.10** Cayenne

Cayenne is a drag-and-drop programming system for the IoT that really does make it much easier. It not only makes it possible to build programs using drag- and-drop, it standardizes the connection of devices such as sensors and motors and makes sure that drivers are in place. In this sense it makes the programming and the hardware much easier.

## Step 1-Write the program on the page



```
sketch_mar23a | Arduino 1.8.10
File Edit Sketch Tools Help

sketch_mar23a$

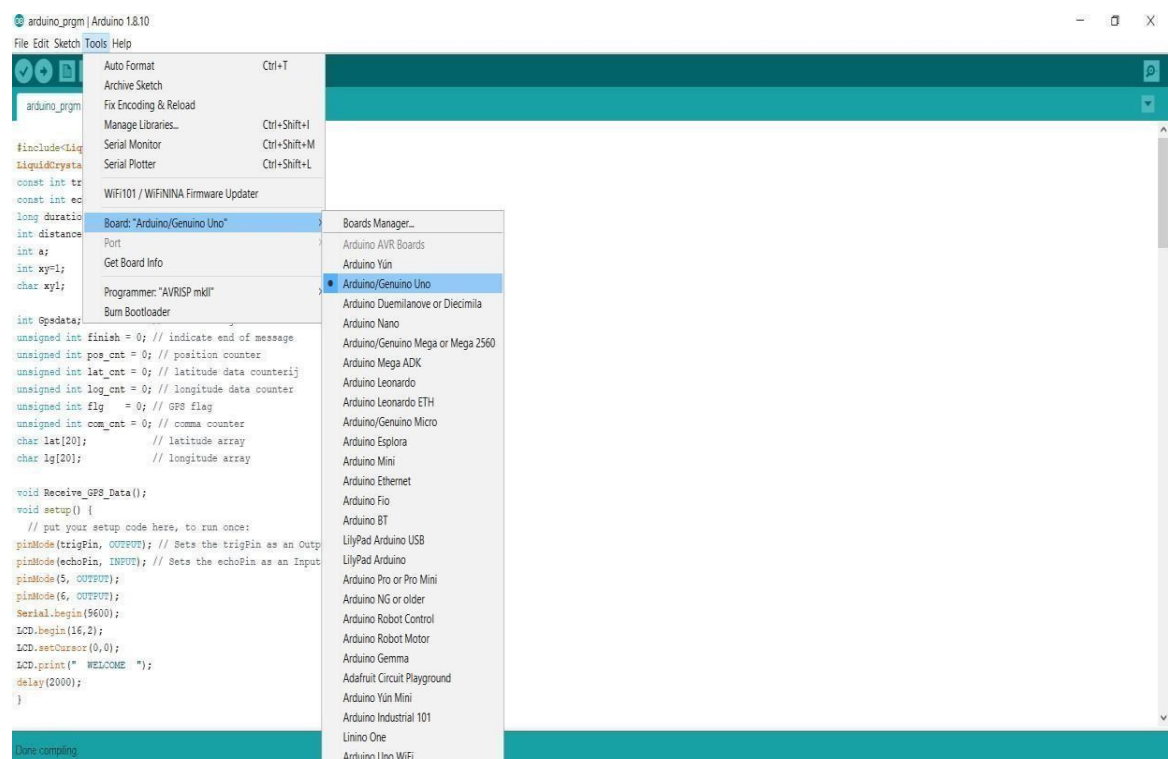
#include<LiquidCrystal.h>
LiquidCrystal LCD(8,9,10,11,12,13);
const int trigPin = 3;
const int echoPin = 4;
long duration;
int distance;
int s;
int xy=1;
char xy1;

int Gpsdata;          // for incoming serial data
unsigned int finish = 0; // indicate end of message
unsigned int pos_cnt = 0; // position counter
unsigned int lat_cnt = 0; // latitude data counter
unsigned int log_cnt = 0; // longitude data counter
unsigned int flag = 0; // GPS flag
unsigned int com_cnt = 0; // comma counter
char lat[20];          // latitude array
char lg[20];           // longitude array

void Receive_GPS_Data();
void setup() {
  // put your setup code here, to run once:
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
  Serial.begin(9600);
  LCD.begin(16,2);
  LCD.setCursor(0,0);
  LCD.print(" WELCOME ");
  delay(2000);
}
```

**Fig 4.11** Arduino Program

## Step 2-Select the “Arduino Uno” board from the tool section



**Fig 4.12** Tool Section

## Step 3-Save the program



**Fig 4.13** Save the Program

## Step 4-Verify the program &clear all the errors



**Fig 4.14** Run the Program



## Step 5-After clearing the error, upload the program



The screenshot shows the Arduino IDE interface. At the top, the title bar reads 'arduino\_prgm | Arduino 1.8.10'. Below it is a menu bar with 'File', 'Edit', 'Sketch', 'Tools', and 'Help'. A toolbar contains icons for opening, saving, and uploading files, with the 'Upload' button highlighted. Below the toolbar, a dropdown menu shows 'arduino\_prgm'. The main text area contains the following C++ code:

```
#include<LiquidCrystal.h>
LiquidCrystal LCD(8,9,10,11,12,13);
const int trigPin = 3;
const int echoPin = 4;

long duration;
int distance;
int s;
int xy=1;
char xy1;

int Gpsdata;          // for incoming serial data
unsigned int finish = 0; // indicate end of message
unsigned int pos_cnt = 0; // position counter
unsigned int lat_cnt = 0; // latitude data counter;
unsigned int log_cnt = 0; // longitude data counter
unsigned int flg      = 0; // GPS flag
unsigned int com_cnt = 0; // comma counter
char lat[20];          // latitude array
char lg[20];           // longitude array

void Receive_GPS_Data();
void setup() {
    // put your setup code here, to run once:
    pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
    pinMode(echoPin, INPUT); // Sets the echoPin as an Input
    pinMode(5, OUTPUT);
    pinMode(6, OUTPUT);
    Serial.begin(9600);
    LCD.begin(16,2);
    LCD.setCursor(0,0);
    LCD.print(" WELCOME ");
    delay(2000);
}
```

**Fig 4.15** Upload the Program

## **CHAPTER 5**

### **CONCLUSION AND FUTURE ENHANCEMENTS**

#### **5.1 CONCLUSION**

This paper shows the implementation of the project ‘Reader and Object Detector for Blind’. It was developed to aid blind in everyday life and help them to be independent. The project aimed to cover a broader aspect of life and hence we incorporated both the parts into one. This project aims to assist the blind people in reading the printed text on pamphlets, books, magazines and other printed material. One can be assisted in reading their everyday newspaper with the help of this device. The feature of Object Detection can be used to help the blind people know more about their surroundings without having to move around the place.



## **5.2 FUTURE WORK**

The frame rate for the object detection is very low. With better style object detection. After training the model with other languages we would be able to read several other languages and reach out to more people with a language diversity. The proposed system can be improved through addition of various components. Also the device can be used for face recognition.

Visually impaired person need not to guess people. He can identify them as the camera capture their faces. GSM module can be added to this system to implement a panic button. If the user is in trouble, then he can make use of thepanic button to seek help by sending the location to some predefined mobile numbers. This will increase the safety of blind people.

Recognizing objects like currencies, tickets, visa cards, numbers or details onsmart phone etc could make the life of blind people easier. In the proposed idea portability issue is solved by using Raspberry pi. The MATLAB is replaced with Open CV and it results in fast processing. Open CV which is the latest tool for image processing has more supporting libraries than MATLAB.

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