An Intelligent Assistive System for Healthcare Support to Blind and Alzheimer's Patients

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Abstract— Pain and suffering are almost inevitable and part of every human being's life cycle. Blind and Alzheimer's patients are no different.; they face multiple obstacles daily, including vision, memorization, and accessibility hardships. Despite the development of contemporary tools such as smart canes and personal assistant robots that help them meet their needs, these devices do not suffice those needs in terms of both: the level of assistance and cost-effectiveness. Fortunately, among the recent inventions, smart glasses are one of the wearable devices that are capable of handling not only an extensive range of computing activities but also an immense support to patients. But, the main drawback of smart glasses is that their features are limited to their design. Hence, this project proposes a new, insightful design for assistive smart glasses called 'Nour', offered for blind and Alzheimer's patients with an external mobile application and an additional study for the glasses' commercial availability.
Keywords—Face recognition, Object detection, Text detection, Yolo, OpenCV.

I. INTRODUCTION

Blind and Alzheimer's patients face many different problems in their daily lives, despite the development of modern devices that help them meet their needs. Navigation has an important role in the life of all people; it is one of the basic things where people need it in a lot of fields as education, work, shopping and other purposes, so the vision and communications challenges are necessary in navigation to facilitate movement from one place to another. It is easy to imagine movement in the environment around us, such as home or office, but it is different in unfamiliar places specially with strangers. The statistics from the World Health Organization (WHO) shows that approximately 2.2 billion people live with some forms of vision impairment globally [1]. The increasing graying of the world's population has led to many challenges at all levels, whether at the social or economic level, in order to provide appropriate health care for Alzheimer's patients. Statistics show that almost 28 million people worldwide suffer from dementia. The cost of health care for Alzheimer's disease in 2020 is estimated to total about 305 billion dollars [2], and by mid-century the cost of medical and health care will exceed 1 trillion dollars annually Being limited vision or having Alzheimer's disease does not mean losing the independence of getting to and from places whenever we wanted. They can travel independently daily with their means best suited for them. One of the biggest challenges to independence for them is associated with safe and efficient navigation. However, it also should be noted that to facilitate safe and efficient navigation, it is good to acquire travel skills and use sources of non-visual environmental information that are rarely considered by people who rely on their vision. But still, there exist some challenges that are faced by people who are visually impaired during daily navigation [3]. People who are blind or impaired started using conventional navigation aids such as white canes, guide dogs' assistance by a trained guide or volunteer [4] since long time back. Research shows that people who become blind in their early life often learn to use them acoustic skills such as echolocation in an efficient way for navigation [5]. Landmarks and clues also play a vital role in way finding and navigation. Current research has demonstrated the great role of assistive tools to help people with disabilities, especially in navigation [6]. such as way find, Envision [7], etc. With the great development of mobile devices, it has sufficient computational capabilities and sensing capabilities and provides various possibilities that help to develop the navigation system. The development of video and audio technology, environmental sensors and the development of cognitive aids and integrated sensor systems to provide adequate health care for those them and provide a better life for elderly and their families without the need to (i.e., nursing homes). It is estimated that a month-long delay in nursing home placement for the elderly could reduce health care expenses by 1.2$ billion annually. Remote mobile health monitoring, is predicted to be the next major wave in the reform of healthcare delivery systems, whatever nascent its present capacities, this enables elderly to be more independent, no matter how disabled they become. Moreover, proactive involvement of the elderly within the design and implementation of these smart assistive technologies will maximize the prospect in their popularity of the technology. After the great technological development in the design of everyday products, people have tended to use this technology to make tools that help people with disabilities to help them in their daily lives. Later such assistive tools collectively known as Assistive Technologies. Although a variety of assistive technologies to catch up on physical and cognitive impairments have emerged in recent decades, the scientific literature has remained largely confined to the engineering and computer science domains with few exceptions. Moreover, the physical and rehabilitation medicine literature so far has primarily addressed the utilization of assistive devices for physical disability, typically in younger adults, and not the cognitive, functional, and behavioral sequelae of dementia in particular. Thus, the main goal of this manuscript is to systematically review for clinicians and clinical researchers alike the present availability, capabilities, and developmental stage of technologies that with continued research may find applications in dementia care. However, the technological aspects that develop these tools and the development authors of claim that it is very difficult to describe or capture the essence of this field in one shot. Hence, there are numerous navigation systems proposed for blind and visually impaired people, however just a few can provide dynamic interactions and adaptableness to changes and none of these systems works seamlessly on each indoors and outdoors. Moreover, in the case of a system can work well in all cases, it tends to be complicated and don't care about the needs of the person blind from the ease-of-Use, and provide a simple interface, and also less complicated as that its price is high and not commensurate with all the people. With a significant increase in the numbers of blind and Alzheimer's patients.

Table.1 models of smart glasses

Devices	eSight 3 [12]	Oton glass [13]	Aira [14]	Eyesynth [15]	Google glasses [16]
Developer	CNET's	Keisuke Shimakage, Japan	Suman Kanuganti	Eyesynth, Spain	Google Inc.
Conceptual design	High resolution camera for image and video capture for low vision people	Support for dyslexic people. Converts images to words and then to audio	Aira uses smart glasses to scan the environment	Eyesynth is consist 3D cameras, which turns the scene to sound signal (non-verbal) to provide information about of position, size, and shape. It is language independent.	Google Glasses show information without using hands gestures. Users can communicate with the Internet via normal voice commands
Benefits	Helps low vision people, avoiding surgery	Symbols to audio conversion, normal looking glasses, supports English and Japanese languages	Aira agents help users to interpret their surroundings by smart glasses.	Allows blind/limited sight people to 'feel the space' through sounds. It converts spatial and visual information into audio.	Can capture images and videos, get directions, send messages, audio calling and real- time translation using word lens app.
Drawbacks	Does not improve vision as it just an aid	For only people with reading difficulty and no support for blind people	Waiting time connected to the Aira agents in order to be able to sense	It is expensive (575.78$) and it Only recognizes the objects and directions.	It is expensive (1,349.99$) and the glasses are not very helpful for blind people.
Improvements	Water proof versions are under development	Can be improved to support blind people also, by including proximity sensors	To include language translation features	Can use verbal audio for better feel and navigation services	Reduce costs to make it more affordable for the consumers

II. LITERATURE SURVEY

People with visual impairments or Alzheimer face a lot of challenges in social and their life. Many people and companies made a lot of research and products to help them in face this challenge and make their life better. This paper listed some of the researches and products as table.1 with their advantages and disadvantages. In January 2016, a smart glasses model was introduced [8], which was designed based mainly on processing unit Raspberry Pi2. The main purpose of this glass is to recognize the text, after confirming the selected text, the display is processed in real time to get the image sent to Optical Character Recognition (OCR) software to extract the text and subsequently redirected to text-to-speech synthesizer and then the text is read through the audio output port. The hardware part consists of a Linux based ARM processor, SD card, a raspberry pi camera and flex cable. Some of its advantages are: (i) the weight of the device is light with natural look, (ii) it coasts ($100-$150) so can be afforded, proposed as reading, and (iii) it has the capacity to be multitask as it offers a hands-free access to information through the connected computer. However, Google glasses have been used as a design base, and implementing an algorithm to identify the social expression captured by the camera installed on the glasses and comparing it with the expressions on its database, therefore it can tell the user if you are smiling to him, yawning or any other stored. Another example is an alternative vision system designed to help the blind navigate without assistance from people in [9]. The idea of this smart glasses is based on the process of "image to sound "conversion. The vision sensor captures the image in front of the Blind user, and then transfers this image to MATLAB for processing. The processor senses the captured image and then adds the important image data, then compares the processed image with the database previously saved in microcontroller. The processed information is then presented as a structured form of audio signals and transmitted to the Blind user using a set of earphones. In [10], a new form of smart glasses with the use of ultrasonic sensor appeared which has the ability to identify the elements and know the distance between the obstacle and the person using the glasses. The hardware part consists of three ultrasonic sensors, SD card module, headset, LED indicator, switch and GPRS SIM900A module with atmega328p microcontroller. Three ultrasonic sensors are placed left side, front side and right side of the wearable device for perfect detection. In this way, an obstacle can be detected from three sides. The system algorithm can detect obstacle and measure distance perfectly using ultrasonic sensor and microcontroller. Also, if the front and right sensor finds an obstacle within 151 CM and the left sensor finds nothing, it makes the decision to move to the left. So the final movement depends on the Left, Front and right ultrasonic sensor values. The proposed system in [11] of this type of smart glasses is based on the obstacle avoidance algorithm using both the ultrasonic sensor and the depth sensor to detect small obstacles. The hardware part consists of a depth camera, an ultrasonic rangefinder consisting of an ultrasonic sensor and a MCU, an embedded CPU, AR rendering, a pair of AR glasses and an earphone. The average computational time for each step of the proposed system is calculated the cost of measuring the ultrasonic sensor depends on the obstacle distance, which takes a maximum of about 26.5 ms algorithm takes while integrating the ultrasonic sensor is about 1.33 ms. The AR submission takes about 2.19 ms. Table 1 shows some of the smart glasses models that have been implemented.

III- THE PROPOSED FRAMWORK

Smart eyewear design combines between hardware and software. Fig.1 shows the process diagram of the proposed system.

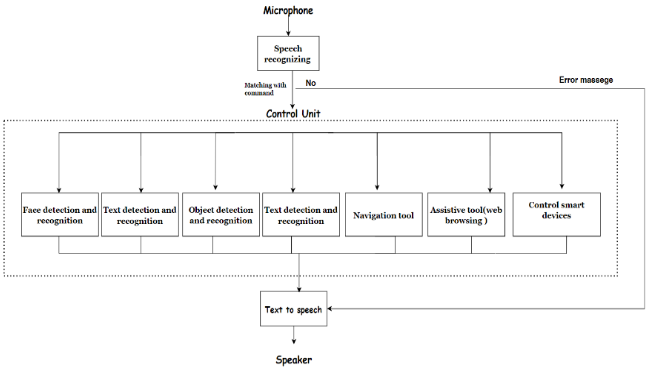


Fig. (1) The Block Diagram of the Proposed System

A.THE HARDWARE IMPLEMENTATION

The various sub-components of the hardware that have been used to make the smart glasses system are mentioned as shown in fig (2).

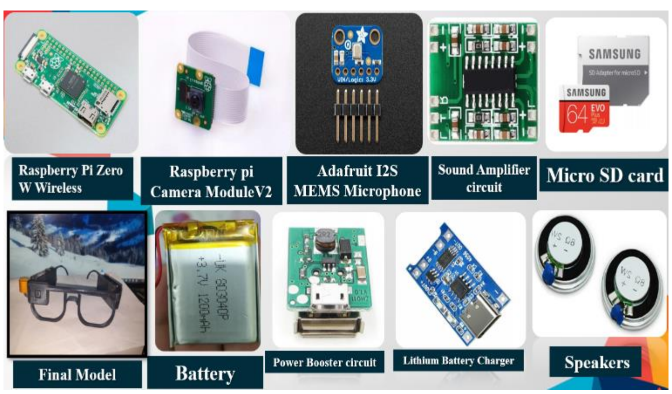


fig (2). The main component

1. Raspberry Pi Zero W Wireless with WIFI and Bluetooth

Raspberry pi zero is a low-cost single board computer that is capable of doing everything expected from a desktop computer. To implement such a project, finding the hardware to use for the device is the important step. A lot of researches have been done, and compared elements in different microcontrollers, such as “cost, processing, and user friendliness”, finally Raspberry pi zero has been chosen. The device uses Linux as an operating system, which has access to a large number compatible libraries and applications. It offers 802.11n wireless LAN and Bluetooth 4.0 connectivity. This provides up many of the connections that would have been made over USB, HDMI port giving us access to the interface of the operating system installed. The below table (2) describes the raspberry pi zero technical specifications.

Table. (2) Raspberry Pi Zero W Wireless with WIFI and Bluetooth

Dimensions:	65mm × 30mm × 5mm
CPU	ARM11 running at 1GHz
RAM	512MB
Wireless	2.4GHz 802.11n wireless LAN
Bluetooth	Bluetooth Classic 4.1 and Bluetooth Low Energy (LE)
Power	5V, supplied via micro-USB connector
Storage	Micro SD card

2.Raspberry Pi Camera ModuleV2

The Raspberry Pi Camera Module v2 replaced the original Camera Module in April 2016. it has a Sony IMX219 8-megapixel sensor (compared to the 5-megapixel Omni Vision OV5647 sensor of the original camera). It can be used to take high-definition video, as well as stills photographs. It supports 1080p30, 720p60 and VGA90 video modes, as well as still capture.Table (3), shows Raspberry Pi camera technical specification.

Table. (3) Raspberry Pi Camera

Dimensions:	65mm x 30mm x 5mm
Power:	5V,
Operating System	Linux, installed via NOOBS
Video Capture Resolution	1080p
Lens Type	Prime
weight	3g

3. Adafruit I2S MEMS Microphone Breakout SPH0645LM4H

The microphone is a single mono element. You can select whether you want it to be on the Left or Right channel by connecting the Select pin to power or ground. If you have two microphones, you can set them up to be stereo by sharing the Clock, WS and Data lines but having one with Select to ground, and one with Select to high voltage. This I2S MEMS microphone is bottom port d.

4. Micro SD card

Micro SD is electrically and software compatible with the full-size SD card. The Pi Zero gets its storage space from a MicroSD card to install the operating system and all modules.

5. Speakers

It delivers the audio output to the user. The speakers are going to be small, light and attached to the glasses, so the user will not be worry about losing the headphones or bothered by wearing them.

6. Battery

The power is provided as the requirement of the circuit. Lithium Polymer Rechargeable Battery is powerful and lightweight.it can be very easily to plug to raspberry pi. Once completely charged, it can deliver up to 4.2 V for a capacity of 1200 mA

IV. SYSTEM DESIGN

The specifications of the design are shown in table (5) We admit that this is not very comfortable but it has other benefits like low cost ($200), open-source hardware (Raspberry Pi zero software (OpenCV, Tesseract and Python).and the design will be

Table 5. Design Specifications

Components	Specifications		
Left/Right cover	70 mm	34 mm	4.2 mm
Main Frame	162 mm	30.4 mm	48.6 mm
Left Speaker Cover	125.2 mm	34 mm	30.4 mm
Right Speaker Cover	124.8 mm	34 mm	30.9 mm
Weight without any components	45 g		
Weight with components	100g		

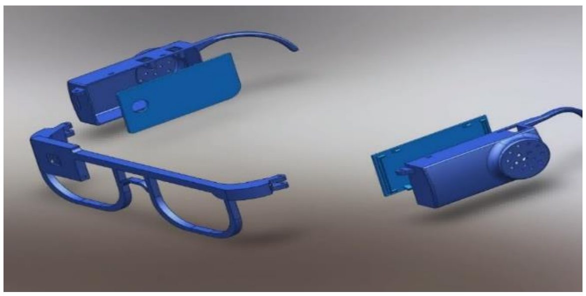


fig (3) The design model

fig (4) The final design model

B. FEATURES OF THE SYSTEM

The smart glasses prototype provides a variety of features to the patient such as (i) face recognition, (ii) object detection, (iii) texts detection and recognition, (v) Navigation tool, (vi) Smart connection. Each feature of them will be explained in the next part.

1. Face detection and recognition

It is one of the most efficient systems of all existing ones for the identification of people. Face detection is a computer technology used in a variety of applications that identify human faces in digital images. face detection also refers to the psychological process by which humans locate an object in a visual scene. The first step is when the faces are detected and simultaneously compares them with the predefined database and also procedure may be divided into 3 steps- put together schooling facts, educate face recognizer, prediction.[17]

1.1How Face Recognition works

Machine Learning algorithm takes a dataset as input and learns from this data. The algorithm goes through the data and identifies patterns Within the data. For instance, suppose we wish to identify whose face is present in a given image, there are multiple things we can look at as a pattern :(i) Height/width of the face, (ii) Color of the face, (iii) Width of other parts of the face like lips, nose, etc. The challenging part is to convert a particular face into numbers – Machine Learning algorithms only understand numbers. This numerical representation of a "face" (or an element - subset to train a model - in the training set) is termed as a feature vector. A feature vector comprises of various numbers in a specific order. The following block diagram shows the facial recognition mechanism fig. (5) with an explanation of the steps.

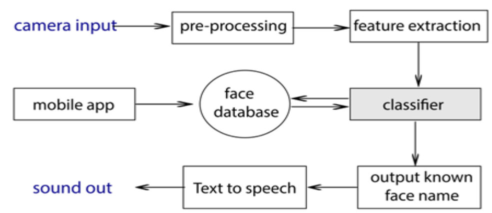


Fig. (5) Face Recognition system and flow chart

1.2 Face recognition database:

Data will be collected from the website and 3rd eye application then it will be saved into the database. The face print is compared against a database of other known faces. Face databases are imagery data that are used for testing face processing algorithms. In the contents of biometrics, Face databases are collected and used to evaluate the performance of face recognition biometric systems.

1.3 Steps of process:

Step 1: Finding all the Faces

First it identifies the face in the image and then we make the image in black and white. Then drawing an arrow called gradients showing in which direction the image is getting darker and they show the flow from light to dark across the entire image. Pixels are replaced with gradients because if we analyze pixels directly, really dark images and really light images of the same person will have totally different pixel values. But by only considering the direction that brightness changes, both really dark images and really bright images will end up with the same exact representation. After that the image will be broke up into small squares of 16x16 pixels each, then the square in image is replaced by the arrow directions. In the end the original image is transformed into a very simple representation that captures the basic structure of the face in a simple way by finding a part of our image that looks more similar to the well-known Hog pattern fig (6) that has been extracted from a host of other training faces [18].

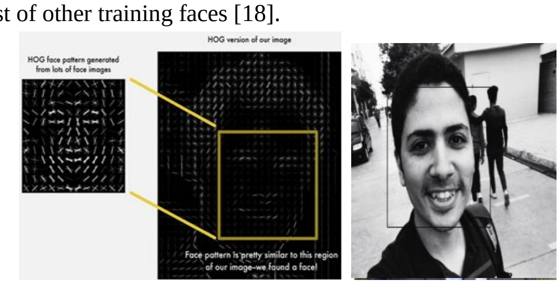


Fig. (6) Hog version of our image

Step 2: Posing and Projecting Faces:

A set of rules are used to be referred as face landmark estimation. The fundamental concept is to give you sixty-eight unique factors (referred to as landmarks) that exist on each face the pinnacle of the chin, the out of doors aspect of every eye, the internal aspect of every eyebrow, etc. Then the system can be educated for studying a set of rules that allows you to discover those sixty-eight unique factors on any face: Here's the result of locating the 68 face landmarks on our test image in fig (7).

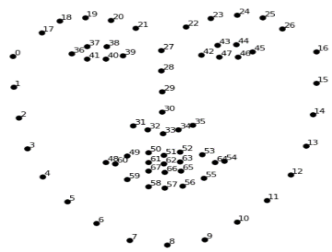


Fig. (7) 68 face landmarks in our image

Step 3: Encoding Faces

This process of training a convolutional neural network to output face embedding requires a lot of data and computer power. Even with an expensive NVidia Tesla video card, it takes about 24 hours of continuous training to get good accuracy. But once the network has been trained, it can generate measurements for any face, even ones it has never seen before! So, this step only needs to be done once so all we need to do for ourselves is run our face images through their pre-trained network to get the 128 measurements for each face. Here's the measurements for our test image in fig(8).

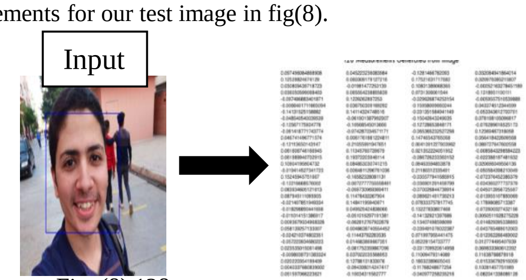


Fig. (8) 128 measurements in our image

Step 4: Finding the person's name from the encoding

Find the person in our database of known people who have the closest measurements to our test image fig.9. All we need to do is to train a classifier that can take in the measurements from a new tested image and tells which known person is the closest match. Running this classifier takes milliseconds. The result of the classifier is the name of the person.

Fig. (9): The Applied face Recognition

2. Text detection and Recognition

Text detection works to detect the text in the image uploaded by the user. While the text recognition phase works to convert the text obtained into words and letters. Classified methods to complete this purpose are stepwise methods and integrated methods. Stepwise methods have separate stages of detection and recognition and they proceed through detection, classification, segmentation, and recognition.[19] Through the size of independent images can be used to recognize the size of the text. Integrated methods involve sharing information between detection and recognition stages and are intended to recognize words from the available text. The following table 6, 7 show the difference between text detection and text recognition

Table.6 Text Detection and Localization

Approach for processing	
1. Region based methods	**2. Connected Components analysis**
• Graph based method High speed • Uses color or edge features • Not efficient for noisy mages	• Windowing based approach • Less speed • Use texture features or morphological operations • Efficient for noisy images also

2.1How text detection and recognition work?

There are three modules: Preprocessing, Text Detection, and Text Recognition. The input is passed as an image format of any type to the proposed system. The following Block Diagram and flowchart explain the mechanism of the process as shown in fig. (10), (11). It will be fully introduced in detail in the next paragraph.

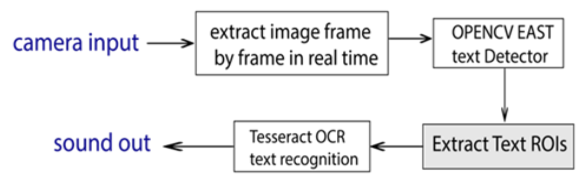


Fig. (12) Text detection and recognition Block Diagram

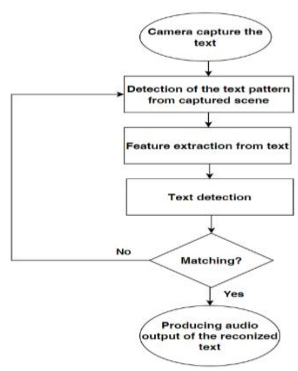


Fig. (11) Text Detection and Recognition flow chart

2.1.1 Text Detection and Extraction using OpenCV and OCR

(Open-source computer vision) is a library of programming functions mainly aimed at real-time computer vision. OpenCV in python helps to process an image and apply various functions like resizing image, pixel manipulations, object detection, etc. OpenCV package is used to read an image and perform certain image processing techniques. Python-tesseract is a wrapper for Google's Tesseract-OCR Engine that is used to recognize text from images. OCR is the technology which is used to convert the scanned image, paper document images captured by digital camera and extract the text from images which automatically updated in the database. OCR can read text from scanned documents as images. It can convert all formats of images containing text in handwritten or printed. The OpenCV and OCR is the powerful technique in this field to extract the text from image. The image is processed using OpenCV libraries as shown in fig (12). [20].

Table.7 Text Recognition

Approach for processing	
1. Character Recognition	**2. Word Recognition**
• Divide text into cut-outs of single characters	• Identifies word from text image
• Independent of lexicon	• Recognizes small number of words provided by lexicon
• Used when number of words to be recognized are not limited	• Suitable only for recognizing limited number of words

2.1.2 Tesseract OCR

It will recognize and "read" the text embedded in images Python-tesseract is a wrapper for Google's Tesseract-OCR Engine. It can read all image types supported by the Python Imaging Library, including (jpeg, png, gif, bmp, tiff, and others). It can read different types of languages including English, French, etc. also it can read and convert mathematical formulas.

2.1.3 Text to Speech by using pyttsx3

Pyttsx3is used in order to be able to read the text [21]. it is a text-to-speech conversion library in Python as shown in fig. (10). Unlike alternative libraries, it works offline and is compatible with both Python 2 and 3. An application invokes the pyttsx3.init factory function to get a reference to a pyttsx3. It is very easy to be used the tool which converts the entered text into speech fig. (13), (14). The pyttsx3 module supports two languages (Arabic and English) and two voices (male and female) which is provided by "sapi5" for windows.

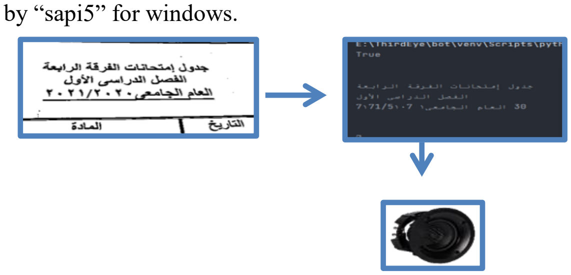


Fig. (13) Model of text detection and recognition

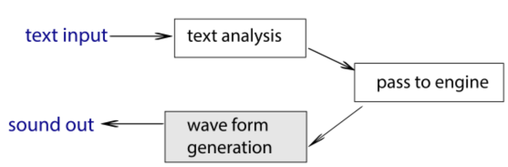


fig.(14) Text to speech Block Diagram

3. Object detection

Object detection is a computer vision technique in which a software system can detect, locate, and trace the object from a given image or video. The special attribute of object detection is that it identifies the class of object (person, table, chair, etc.) and their location-specific coordinates in the given image. There are many different methods that can be used to detect objects [22]. Two popular methods are called SSD, YOLO. The software in this project consists of scripts written in the Python programming language which is one of the most popular language used for machine learning tasks. There exist several open-source deep learning frameworks that can be used for object detection such as TensorFlow. The block diagram in fig (15) shows how it works. First, we need to train the model to run the input data through the algorithm to correlate the processed output against the sample output. The result from this correlation is used to modify the model. Around 150 images are downloaded and then - about object - divided into two groups the first group is for training and the other one is for testing then we labeled all of them using the labeling [23] application then using SSD and Tensor Flow algorithms. we can locate the path of images and the XML file including the object we need to determine. The camera determines the object frame by frame in real time then doing pre-processing images after that it loads a pre-trained SSD model and matching image data with model data which is collected from our website and 3rd eye application.

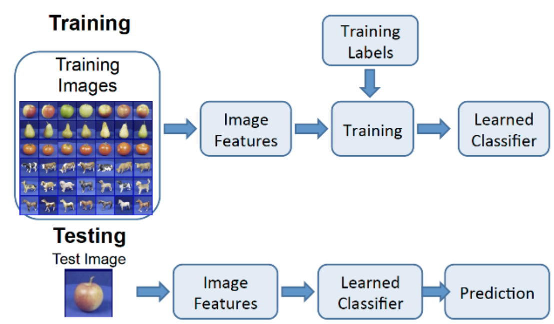


fig. (15) Object detection Block Diagram

Algorithms used to train the model

3.1.1 Tensor Flow

Tensor Flow is an open-source library developed by Google primarily for deep learning applications [25]. It also supports traditional machine learning. Tensor Flow was originally developed for large numerical computations without keeping deep learning in mind. However, it proved to be very useful for deep learning development as well, and therefore Google open-sourced it. It has great advantages such as: (i) Offers Both C++ and Python API's, (ii) Supports Both CPUs and GPUs Computing Devices. fig 16

3.1.2 OpenCV with DNN module

For this project, the open-source computer vision library OpenCV has been chosen to handle the task [26]. OpenCV includes a large selection of algorithms aimed at real-time computer vision, including a DNN module which enables the use of pre-trained models for inference from the previously mentioned frameworks. It has been shown that the models in the CPU implementation of this module perform better than the ones in the frameworks they were ported from. OpenCV was compiled with NEON and FPV3 support to fully take advantage of hardware optimizations in the Raspberry Pi ARM processor. The output of the model is shown in fig (17).

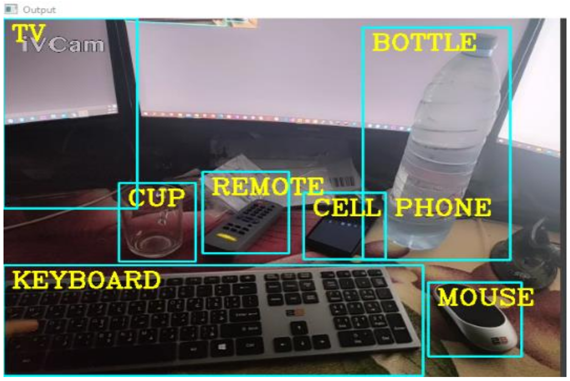


Fig. (17) Our Model for Object Detection

4. Assistive tool (web scraping)

Web scraping is the process of extracting data from the web programmatically and transforming it into a structured dataset. Natural Language Processing (NLP) has been used to understand the input audio which is converted to the text [27] which deals with building computational algorithms to automatically analyze and represent human language. NLP-based systems have enabled a wide range of applications such as Google's powerful search engine and Amazon's voice assistant named Alexa. NLP is also useful to teach machines the ability to perform complex natural language-related tasks such as machine translation and dialogue generation.

4.1 Web scraping works

First, the web scraper will be given one or more URLs to load before scraping. The scraper then loads the entire HTML code for the page requested. More advanced scrapers will render the entire website, including CSS and JavaScript elements. Then the scraper will either extract all the data on the page or specific data selected by the user before the project is run. Ideally, the user will go through the process of selecting the specific data they want from the page in fig (18).

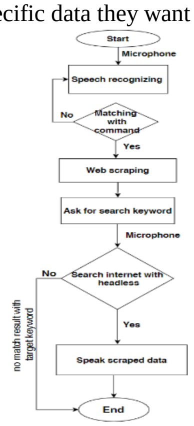


Fig. (18) Web Scraping flow chart

4.2 Beautiful Soup

Beautiful Soup is a pure Python library [28] for extracting structured data from website. It allows you to analyze data from HTML and XML files. It acts as a helper module and interacts with HTML in a similar and better way as to how you would interact with a web page using other available developer tools. Some of the advantages: (i) It usually saves programmers hours or days of work since it works with your favorite parsers like lxml and html5lib, (ii) its intelligence to convert the documents being fetched to Unicode and outgoing documents to UTF-8, (iii) faster when compared to other general parsing or scraping techniques in fig (19).

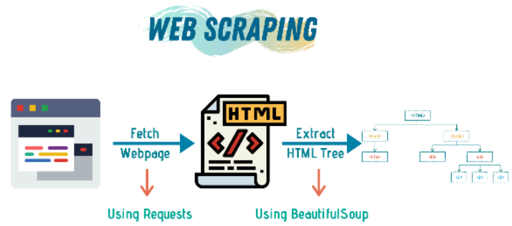


Fig. (19) Web scraping process

5. Video navigation

For making a video call app, it is required that the client sends his video and audio stream to another client. [29] So for this purpose, WebSocket is being used as it considered to be a persistent connection between a client and server. WebSocket provide a bi directional [30], full-duplex communications channel that operates over HTTP through a single TCP/IP socket connection. At its core, the WebSocket protocol facilitates message passing between a client and server. The video navigation process is shown in fig (20), (21).

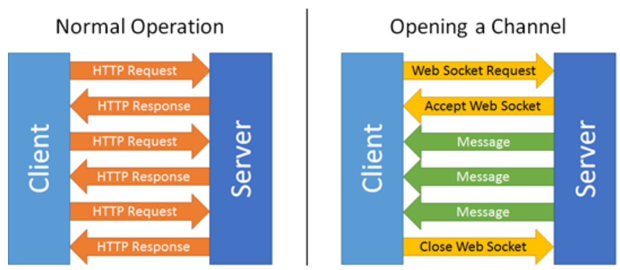


Fig. (20): Navigation

Fig. (21) Navigation flow chart

V-THE SOFTWARE & IMPLEMENTATION

A- MOBILE APLLICATION

The Third Eye (3rd eye) (Android & iOS) App is built using Flutter framework to help many of blind and Alzheimer's patients to keep in touch with their activities such as medicine reminder with local notifications, current location, To-Do list, contacts, QR scanner and emergency. On the other hand, face recognition interface is designed to get name, time and date through the camera and store it in data table. The main interfaces of the introduced applications will be explained in detail in the next part.

1. THE PROPOSED 3rd EYE APPLICATION

The smart phone application for the proposed system has been implemented for users of the project as blind, Alzheimer's and any one is related to patient. The mobile application has been developed including important features in order to help them such as keep tracking blind people, reminding Alzheimer's people with their important activities like their medication schedule and important meetings, also the application was developed with an intelligent, simple and stylish user interface to make it easier for users to deal with it. The related functions of the proposed mobile application is explained as follows. The Android application is known as 3rd Eye app (The Third Eye Application) as shown in fig (22).

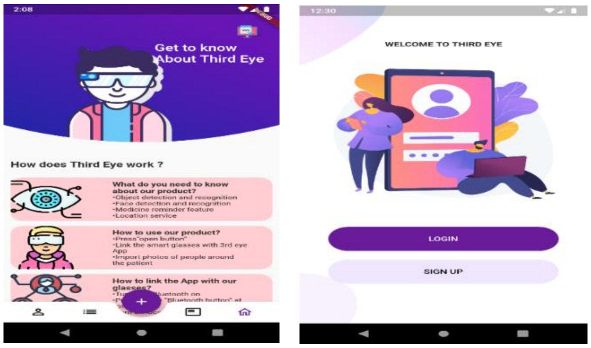


fig. (22) The proposed software application

1.1 The Main Features of the Third Eye Interface

I. Sign Up & Sign In Features

The layout of sign-up features screen is shown in Fig. (23) If it's the first time for the user to install our application then user has to create an account with his/her email and password to use our software. On the other hand, the layout of sign in features manage the user to login with his/her previous signed up email and password to be able to fully completely use our product.

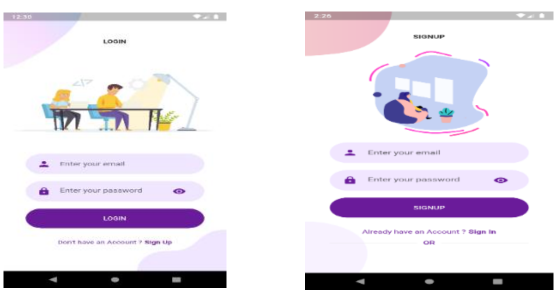


Fig (23). sign up & sign layouts

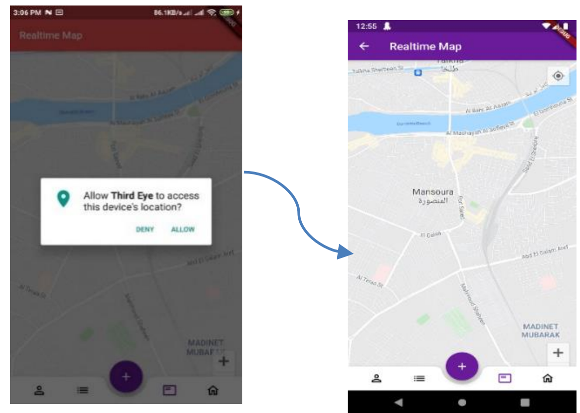
II.Features layout

The layout of features screen is shown in fig (24) through this screen you can open all features which we have in our project such as (Locations, Medicine reminder, To-Do list, QR scanner and settings).

fig. (24) Features layout

2.1. Real-time location

The layout of Real-time location is shown in fig. (25). Our application keeps Track the patient by using GPS location service to determine if he/she went to an unusual path and the guide can get his patient Real-time location by using the website interface.

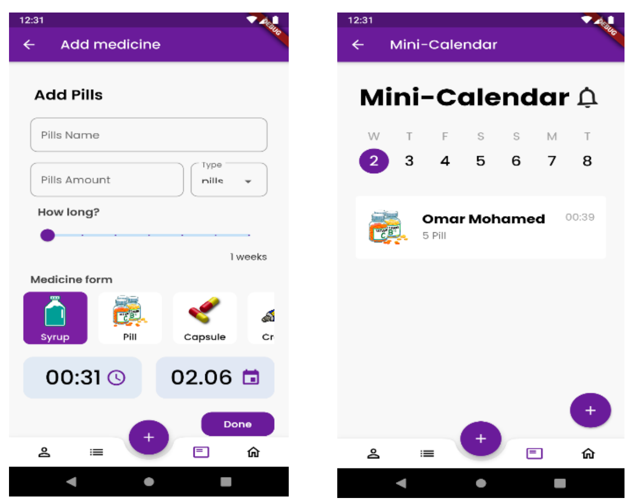


(a) (b)

Fig (25). Permissions requested from user to access their locations(a) Real-time location(b)

2.2. Medicine Reminder

The layout of medicine reminder screen is shown in fig (26). It helps in reminding about the medicines. User can add details of his dose schedules. Using the date field user can enter the starting and ending dates between which, he has to take medicines. The time field shows the time of dose and on that time the phone push notification to patient. The user can add the description of the medicine, including name, purpose and other related description.



(a) (b)

fig. (26) Medicine Reminder layout

2.3 QR Code Scanning

Through the features screen you can open QR scanner as shown in fig (27) to obtain medication information by scanning the QR code on a drug package. Once the drug information has been successfully scanned it shows to Alzheimer's patient. It reminds him all time about his drugs information.

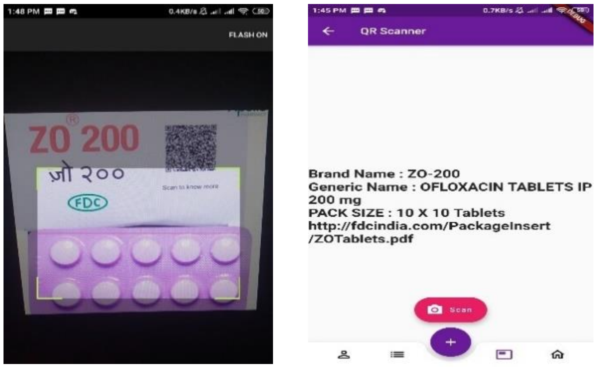
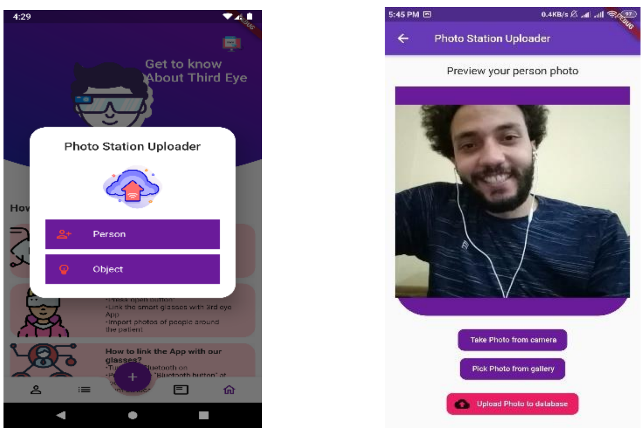


fig. (27) QR Scanner

III. Photo Station Uploader

The alert dialog of adding person or object photo open when the FAB (Floating Action Button) is clicked on the bottom navigation bar. The guide of blind person/Alzheimer patient can add new people or object into the database(firebase) through a third eye application as shown in fig. (29)



(a) (b)

Fig. (29) Photo Station Uploader (a) Preview your photo before upload

B- THIRD EYE WEBSITE

We built a linked website with the glasses : " https://thirdeye.7-array.com/". we designed it to be a means for promoting our product also users can sign up or sign in through the website and of course, we included all the information and tips for our product as shown as in Fig. (28) and to inform the public about all the features of our smart glasses. After the welcome page When the user scrolling down, he/she will see a simple instruction and our project video screen as shown in Fig. (31)

Figure 31: landing page

I-Main Features of the Third Eye Interface

1. Sign up feature: The user can create an account through the application and can sign in from the website as both data from the application and website are linked in the Firebase.
2. Sign in feature: In Figure (33) if the user already has an account, then it's easy to access the user information using the dataset from the firebase and now both the website and application are linked together.

Figure 33: Sign-In page

Profile Screen: The user can easily customize the profile such as adding or changing profile picture also included a small button to the exact location of the patient.

3. Information Screen No.1: When the user scrolling down he/she after the first open of website, he/she will see a simple instructions and our project video screen.

4. Information Screen No.2: We also added a page when scrolling down once more, that include how third eye glasses works.

5. Information screen No.3: We also added a page when scrolling down twice more, that include the specifications of third eye glasses.

6. Information Screen No.4: the user can see the full specs of our third eye application, how it works and the introduce the stylish design.

7. Information Screen No.5: Through this screen, we talked about the members of the third eye group by displaying their names next to a picture of each of them.

8. Developer Documentation: You can go to this screen at the button on the left bottom of our website to give developers more information about our project.

9. Development Section: Third eye motivates every developer to make extensions to keep our system up-to-date.

VI. RESULTS AND TESTS

The performance of the proposed system has found to be effective. The camera can detect person or object in the range 2cm to 200cm and alert the user with a sound via speaker. With the press of a button, the user can perform various functionalities. The user can web searching with any information which he/she needs. Another function is to ask about current date, time, current weather, current location, and calculator. Our smart glasses have also successfully achieved 91.33% face recognition, and 96.02% and 97% for object and text detection, respectively. On the other hand, our mobile application is working effectively, and our assistance provides a relatively rapid response with only 3 seconds delay. Overall, our smart glasses are cheap, multi-featured, and indispensable for Blind and Alzheimer's patients.

VII.CONCLUSION

The smart assistive glasses model was created to help Blind and Alzheimer's patients to turn out to be more free, independent and decrease the providing care costs The smart glasses model was successful in detecting the place of the patient to their last seen area , recognizing the items and objects are there around the patient, detecting and recognizing the faces of friends and family members and show their names, recognizing the item are there around the patient , convert text to speech And remind the patient of the dates and types of treatment the contribution of this project towards developing a practical solution that would have a critical effect in the lives of Blind and Alzheimer's patients.

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