Project Report

Date	12 November 2022
Team ID	PNT2022TMID41429
Project Name	Real-Time Communication system Powered By AI for Specially Abled

1. INTRODUCTION:

1.1 Project Overview:

In our society, we have people with disabilities. The technology is developing day by day but no significant developments are undertaken for the betterment of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

1.2 Purpose:

The project aims to develop a system that converts the sign language into a human hearing voice in the desired language to convey a message to normal people, as well as convert speech into understandable sign language for the deaf and dumb. We are making use of a convolution neural network to create a model that is trained on different hand gestures. An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.

2.LITERATURE SURVEY:

1. TITTLE: Sign Language Recognition System
AUTHOR: Er. Aditi Kalsh, Dr N.S. Garewal
YEAR: 2013
Abstract:

Communication is the process of exchanging information, views and expressions between

two or more persons, in both verbal and non-verbal manner. Hand gestures are the non-verbal method of communication used along with verbal communication. A more organized form of hand gesture communication is known as sign language. In this language each alphabet of the English vocabulary is assigned a sign. The physically disabled person like the deaf and the dumb uses this language to communicate with each other. The idea of this project is to design a system that can understand the sign language accurately so that the less fortunate people may communicate with the outside world without the need of an interpreter. By keeping in mind, the fact that in normal cases every human being has the same hand shape with four fingers and one thumb, this project aims at designing a real time system for the recognition of some meaningful shapes made using hands. Limitations: The background of an image must be free from external objects. Also, the distance between the image and the camera is kept fixed.

2. **TITTLE:** Full Duplex Communication System for Deaf & Dumb People
   AUTHOR: Shraddha R. Ghorpade, Surendra K. Waghamare
   YEAR: 2015
   Abstract:

One of the important problems that our society faces is that people with disabilities are finding it hard to cope-up with the fast-growing technology. The access to communication technologies has become essential for the handicapped people. Generally deaf and dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. Sign language is an expressive and natural way for communication between normal and dumb people (information majorly conveyed through the hand gesture). So, we need a translator to understand what they speak and communicate with us. sign language to speech and hence makes the communication between normal person and dumb people easier. But the question arises, how the deaf person understands the speech of a normal person and hence we need a system which converts the speech of normal person to text and the corresponding gesture is displayed on display. So, the whole idea is to build a device that enables two-way communications between deaf-mute person and a normal person. Limitations: Gloves are mandatory. Without them, the system would not work. It is not feasible to carry gloves all the time.These are expensive as well.

3. TITTLE: A Communication System for Deaf & Dumb
   AUTHOR: Anchal Sood , Anju Mishra
   YEAR: 2016
   Abstract:

The paper proposes a framework for recognizing hand gesture which would serve not only as a way of communication between deaf and dumb and mute people, but also, as an instructor. Deaf and dumb individuals lack in proper communication with normal people and find it difficult to properly express themselves. Thus, they are subjected to face many issues in this regard. The sign language is very popular among them and they use it to express themselves. Thus, there is a need of a proper translator. The deaf and dumb are not idle as past, they are

working outside and doing great at it. So, an efficient system must be set up, to interact with them, to know their views and ideas. The framework here, act as a communication system for deaf and dumb individuals. It would take the sign language as an input which would display the result not only in the form of text but also in the form of audio. Similarly, if there is any input in the form of text, it would display the corresponding image.
Limitations: The proposed framework is good for recognizing hand gestures. But it is not feasible in every environment.

4. TITTLE: Artificial Intelligence enabled virtual sixth sense application for the disabled.
AUTHOR: Muhammad Usman Tariq
YEAR: 2020
Abstract:

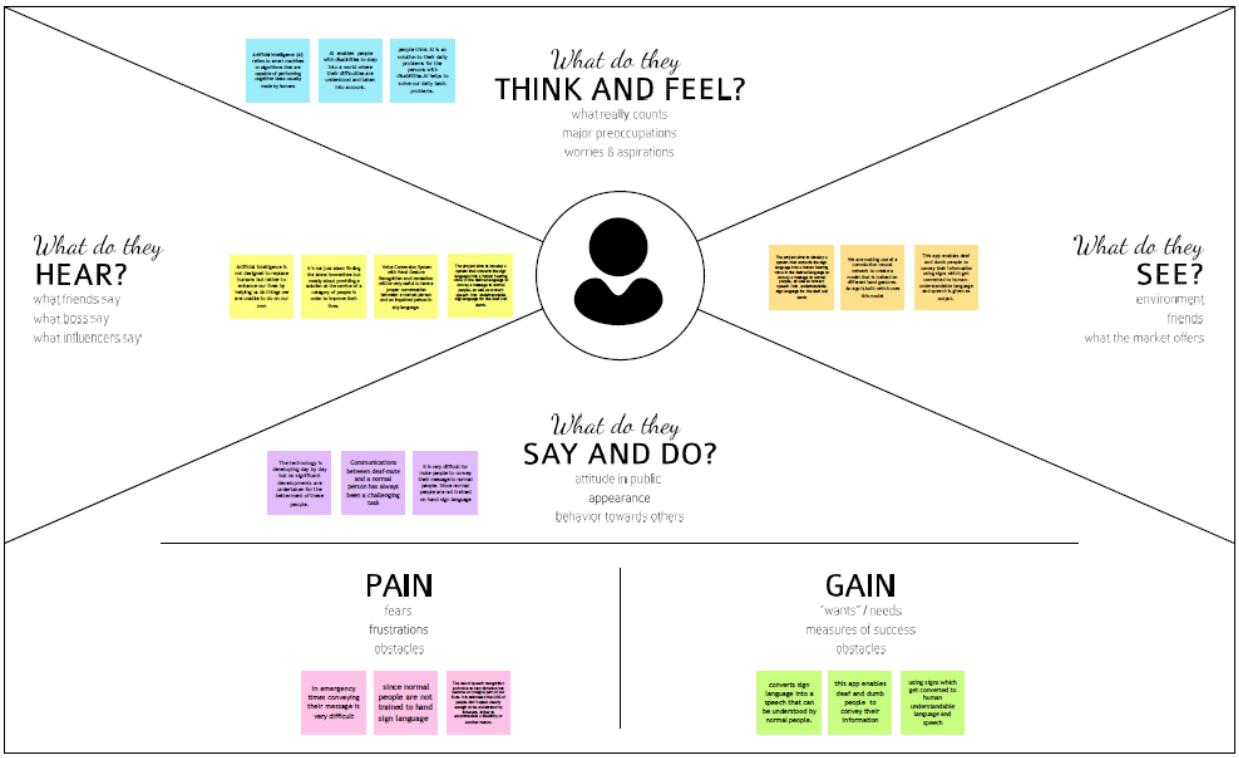
The main purpose of this research is to enhance the communication of the disabled community.The author of this chapter propose an enhanced interpersonal human interaction disabilities. The proposed model comprises of automated real time behavior monitoring designed and implemented with the ubiquitous and affordable concept in mind to suit the under privileged.In this chapter ,the authors present the prototype which encapsulates an automated facial expression recognition system for monitoring the disabled equipped with a gesture to send short messaging system(SMS) for notification purposes.The authors adapted the viola-jones face depression algorithm at the face detection stage and implemented template matching technique for the expression classification and recognition stage.They tested their model with a few users and achieved satisfactory results.The enhanced real time behavior monitoring system is an assistive tool to improve the qualify of life for the disabled by assiting them anytime and anywhere when needed. They can do this own tasks more independently without constantly being monitored physically or accompanied by this care takers teachers or even parents.The rest of this chapter is organized as follows.The background of the facial expression recognition system is reviewed .

CONCLUSION:

From the above literature survey, we can conclude that all those papers follow a more or less similar methodology. We also like to follow that methodology with some improvements to overcome some of the limitations mentioned above. The input image is processed to isolate the hand. Then it is passed to a trained convolution neural network to identify the gesture with greater accuracy.

3. IDEATION & PROPOSED SOLUTION :

3.1 Emathy Map Canvas:


What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
What do they
HEAR?
what friends say
what boss say
what influencers say
What do they
SEE?
environment
friends
what the market offers
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
PAIN
fears
frustrations
obstacles
In emergency times conveying their message is very difficult
since normal people are not trained to hand sign language
GAIN
"wants" / needs
measures of success
obstacles
converts sign language into a speech that can be understood by normal people.
this app enables deaf and dumb people to convey their information
using signs which get converted to human understandable language and speech

3.2 Ideation and Brainstorming

Template

Brainstorm & idea prioritization

a group problem-solving technique that involves the spontaneous contribution of ideas from all members of the group is discussed.

10 minutes to prepare
1 hour to collaborate
4 persons

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Members of our team to be gathered

B **Set the goal**
our problem statement is set as goal

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

to reduce the disabilities and difficulties faced by visually abled people using artificial intelligence.

5 minutes

PROBLEM

How might we [reduce the disabilities and difficulties faced by visually abled people] ?

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil (switch to sketch) icon to start drawing!

Person 1

- THE PROJECT TO BE DEVELOPED MUST BE A GOOD INNOVATION IN THIS TECH INDUSRY
- MOREOVER IT MUST LEAD THE VISUALLY ABLED PERSON TO WORK AND MOVE ON THEIR OWN
- INVOLVEMENT OF FACE REGONITION WILL IMPROVE THE PROJECT IN HIGH LEVEL
- EASILY ACCESSIBLE HANDHOLD DEVICE

Person 2

- GPS TRACKING SYSTEM CAN BE INVOLVED IN THIS PROJECT
- BY THIS THE LANDMARK CAN BE DETECTED AND THE BLIND PERSON CAN BE GUIDED TO THE MARKED PLACES
- THE INSTRUCTION MUST BE GIVEN AS A VOICE OUTPUT TO THE USER
- NO MANUAL INVOLEMENT

Person 3

- TEXT RESONITION CAN BE INVOLVED.
- BY THIS THE USER CAN BE ABLE TO READ OUT THE TEXT DETECTED
- PARTICULAR DISTANCE MUST BE PROGRAMMED
- POINTING THE DATA IS NEEDED.

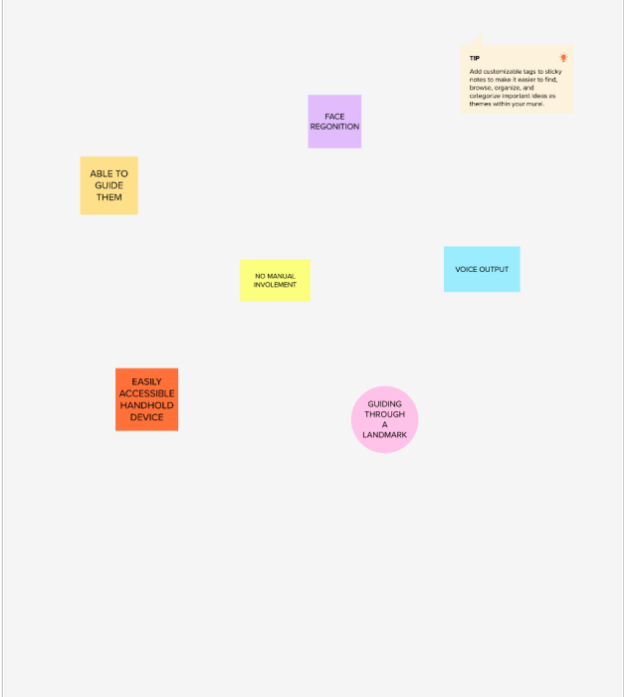
Person 4

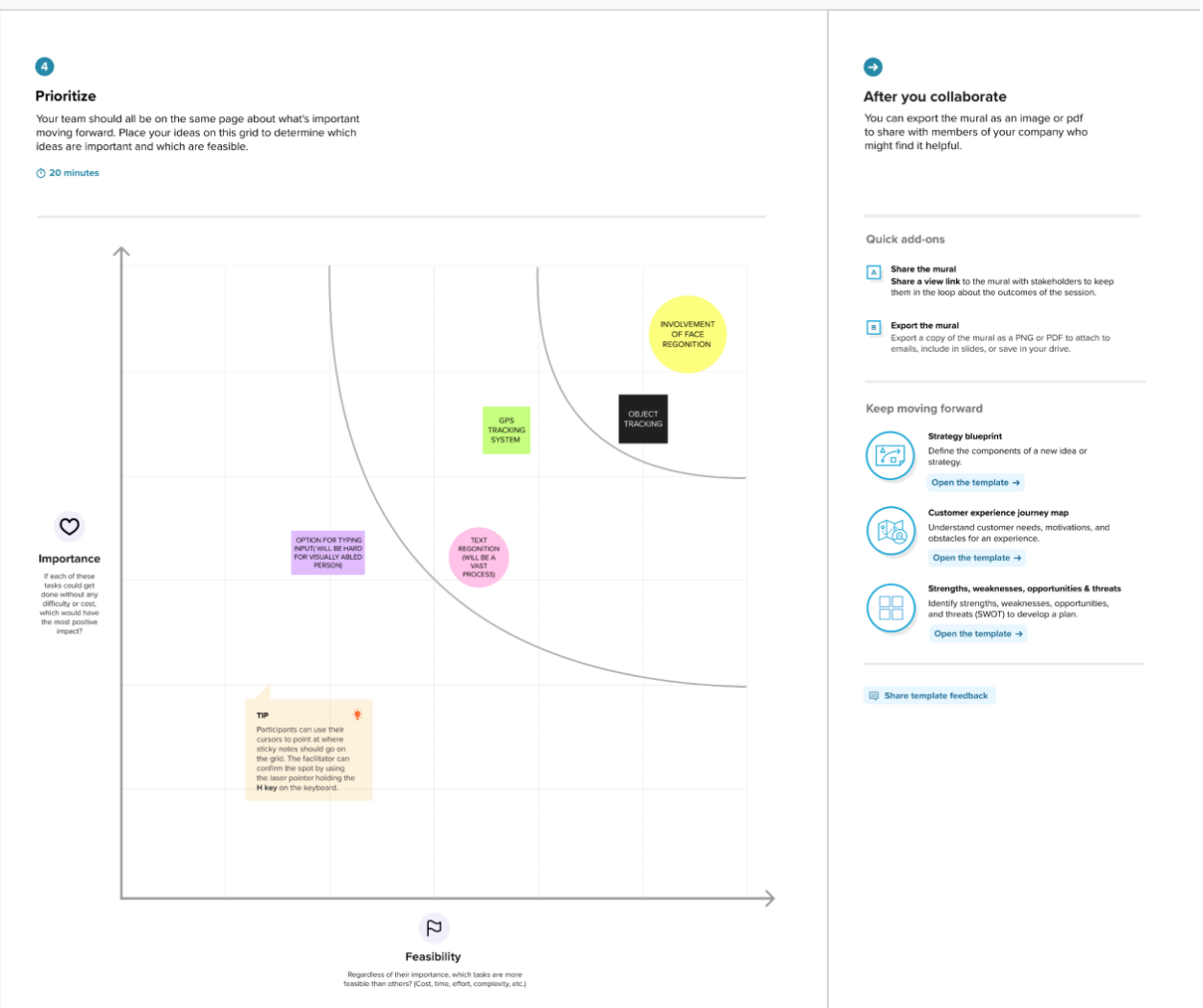
- TYPING INPUT CAN BE INVOLVED.
- BY THIS THE DATA CAN BE ACCURATELY GIVEN AS THE INPUT
- THE TYPED INPUT USING PROCESSING AND CORRESPONDING OUTPUT CAN BE GIVEN TO THE USERS
- MULTI LANGUAGES CAN BE USED

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes





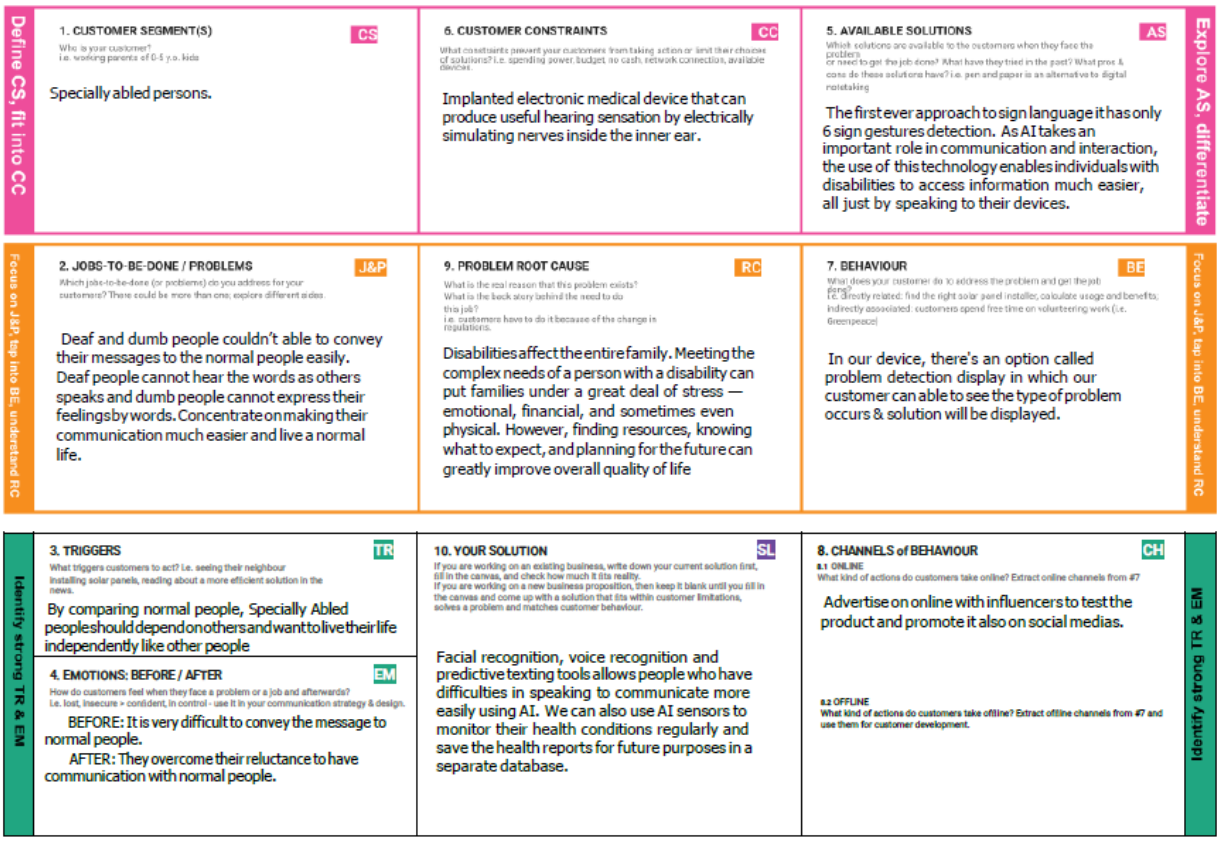
3.3 Proposed Solution:

S.No	Parameter	Description
1.	Problem Statement(problem to be solved)	**Statement-**Communication between deaf- mute and a normal person has always been a challenging task. **Description** : It is very difficult

		for mute people to convey their message to normalpeople in emergency times as well as in normal times.
2.	Idea/Solution Description	1.The ideas consisted of designing and implement a system using artificial intelligence, image processing and data miningconcepts to takeinput as handgestures. 2. It generates recognizable outputs in theform of text and voice with 91% accuracy
3.	Novelty/Uniqueness	1. Artificial Intelligence developed the app called **GnoSys** uses neural networks andcomputer. 2. It recognizes the video of sign language speaker, and then smartalgorithms translateit into speech.
4.	Social Impact/Cutomer Statisfication	1. About two thirds of People with a mobilityand dexterity disability are most likely to experience a great deal of difficulty with everyday activities. 2. The main purpose of this application is to makedeaf-mute people feelindependent andmoreconfident.
5.	Business Model (RevenueModel)	1. AI can generate revenue through direct customers and collobrate with health caresector and generate revenue from their customers.

		2. B2B setting uses to employ deaf and mute employees can use to convey messages according to the company.
6.	Scalability Solution	1. AI technology helping disabled people opensup new opportunities for accessibility inclusion insociety and independent living. 2. It could unlock more advanced and innovative solutions for addressing the most complex challenges facedby disbled peoples.

3.4 Problem Solution Fit:



4. REQUIREMENT ANALYSIS

4.1 Functional Requirement:

FR.No	Functional Requirement(Epic)	Sub Requirement (Story/Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation through Gmail
FR-3	Registration for test and train folders	The user must be confirmed with the test and train folder which is to be recognised.
FR-4	Registration for GPS location	The location must be registered.
FR-5	Input must be given	By Image Processing
FR-6	Location must be given	Location can be given as voice messagae for tracking the location.
FR-7	Functional Requirement done	Voice outputs will be given.

4.2 Non Functional Requirements:

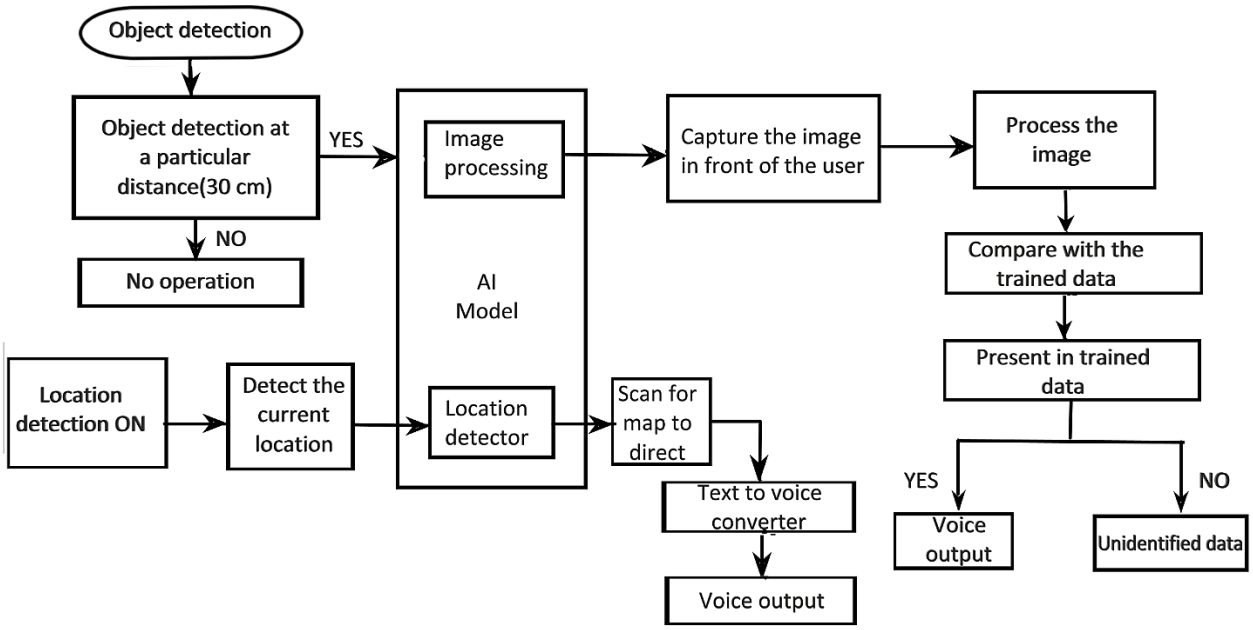
NFR.No	Non-Functional Requirements	Description
NFR-1	usability	This device can be helpful to the blind peoples to know about their surroundings and environment
NFR-2	Security	The device will be only accessible by the user through Gmailconfirmation and the data willnotbe hackedin ease.
NFR-3	Reliability	The device will be more reliable because we use accurate sensorsand GPS systems.
NFR-4	Performance	The performance of the device is high in speed and low power usage so that the user

		can use without interruptions.
NFR-5	Availability	The devicewill be available in the marketto buy it.
NFR-5	Scalability	The scalability of the device is high in terms ofnetwork and GPS issues.

5.PROJECT DESIGN

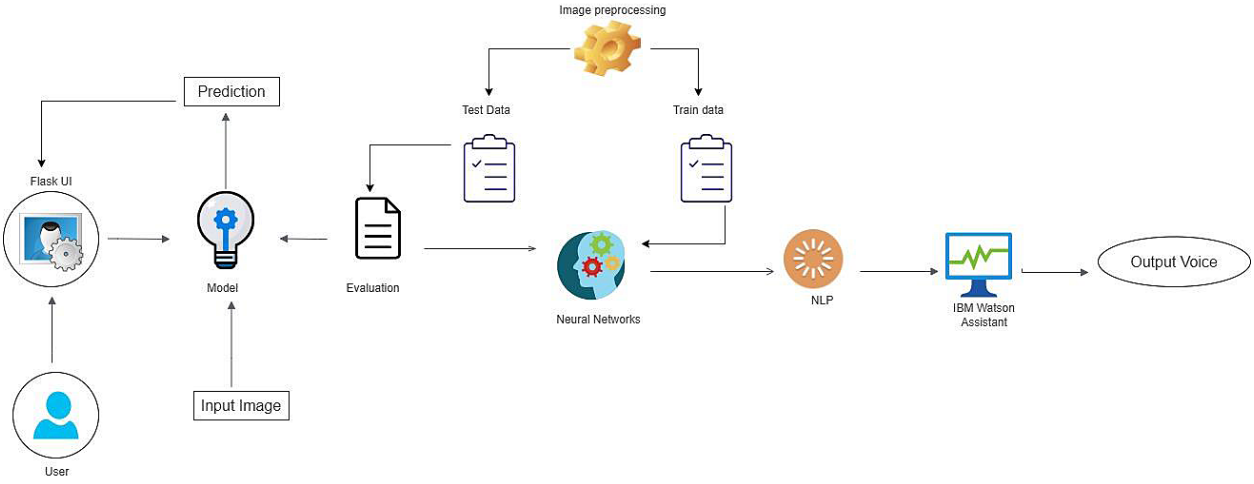
5.1 Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



Here the device detects the object and if the object is detected at a particular distance of 30 cm, image processing takes place by capturing ,processing and comparing the detected image with the trained data. If the image is present in the trained data, then the device provides the output in the form of a voice signal. If the image does not match with the trained data, then the device gives the output as unidentified data. The location detector in the AI model is used to detect the current location of the user and provide the data in the form of a voice signal.

5.2 Solution Architecture:



5.3 User Stories:

User Type	Functional Requirement	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account /dashboard	High	Sprint-1
			As a	I can		

		USN-2	user,I will receive confirmation email once I have registered for the application	receive confirmationemail &click confirm	High	Sprint-1
		USN-3	As a user,I can register for the application through Gmail.	I can receive verificationcode and invitation	Medium	Sprint-1
Administrator	Login	USN-4	As a user, I can loginto the application byentering email &password	I can loginto my account	High	Sprint-1
Customer Service	Training data	USN-5	Ask for thetrained data to be added.	I am adding the trained data to get the image recognized.	High	Sprint-1
Customer	Object Detection	USN-6	Detecting the object within	I can sense any objects	High	Sprint-2

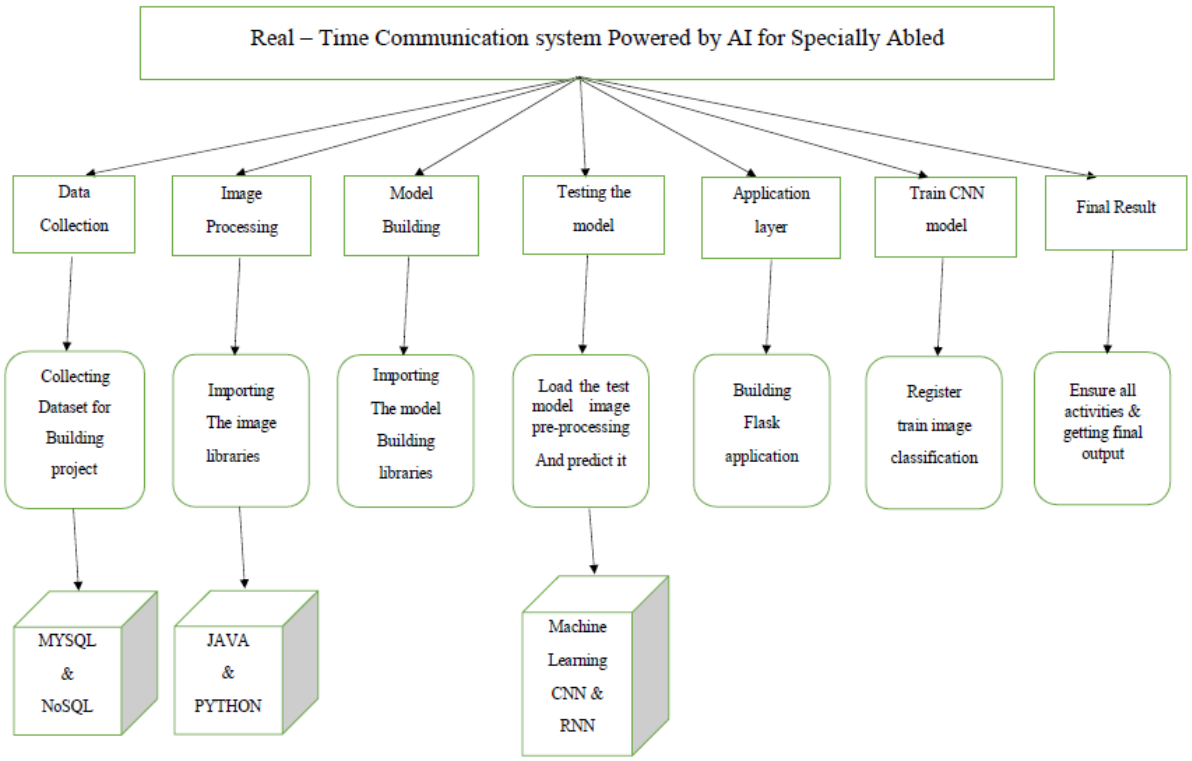
			30 cm distance	that are at a distance of 30 cm.		
Customer	Location detection	USN-7	Detecting the location in the map.	I can set the destination to be reached.	High	Sprint-2
Customer Service	Capture the Image	USN-8	Captures the image and detects the image using image processing.	I can check for the image in trained data	High	Sprint-3
Customer Service	Location fix	USN-9	The path will be fixed.	I can know the direction which will be given as voice output.	High	Sprint-4
Customer Service	Person/Object fix	USN-10	The name of the person or the object is detected.	I can get a voice output if the name is registered in the trained data.	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation:

Milestone	**Functional Requirement(Epic)**	**Milestone Story number**	**Milestone Story and Task**
Milestone-1	Data Collection	M1	We are collecting dataset for building our project and creating to folders, one for training and another one for testing
Milestone-2	Image Processing	M2	Importing image data generator libraries and applying image data generator functionally to train

			the test set.
Milestone-3	Building Model	M3	Importing the model building libraries, Insulation the model, Adding Convolution layers, Adding the Polling layers, Adding the Flatten layers, Adding Dense layer, Compiling the model Fit and Save the model.
Milestone-4	Testing Model	M4	Import the packages first. Then we save the model and Load the test image. Pre-progress it and predict it.
Milestone-5	Application layer	M1	Build the flask application and the HTML pages.
Milestone-6	Train Conversation Engine	M2	Register for IBM cloud and train image classification model
Milestone-7	Final Result	M3	To ensure all the activities and resulting the final output.



6.2 Sprint Delivery Schedule:

sprint	Functional Requirement (Epic)	User Story Number	User Story/ Task	Story Points	Priority	Team Member
Sprint-1	Registration	USN-1	As a user, I will receive confirmation email once I have registered for the application	2	High	Subashini
Sprint-2	Registration	USN-2	register for the application	1	High	Deepa

			through phone number			
Sprint-2	Registration	USN-3	Professional responsible for user requirements & needs	2	Medium	Arunadevi
Sprint-2	User Interface	USN-4	As a user, I can log into the application by entering email & password	2	Medium	Susmitha
Sprint-3	Login	USN-5	As a user, I should get notification about the progress and any updates via email or sms	1	High	Arunadevi
Sprint-4	Privacy	USN-8	The developed application should be secure for the users	2	High	Deepa

Real-Time Communication System Powered by AI for Specially Abled- PNT2022TMID41429

Team Leader: Subashini S

Team Members:

Arunadevi K

Deepa K

Susmitha M

7.CODING AND SOLUTIONING

import os
import cv2
import numpy as np
import matplotlib.pyplot as plt
from keras.preprocessing.image import ImageDataGenerator

Define DATA FILES

In [ ]:

```
def rename_imgs(file_name):
    folder_path = r'test_dataset/'+file_name
    num = 0
    for file in os.listdir(folder_path):
        # if num%10 == 0:
        #     print(f'Renamed {num} files...')
        # os.rename(folder_path+'\\'+file,
folder_path+'\\'+file_name+'_'+str(num)+'.jpeg')
        num += 1
```

ile_names = '0123456789'+'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
for fn in file_names:
  rename_imgs(fn)

SAMPLE IMAGES FROM DATASET

In [ ]:

```
train_data_path = 'train_dataset/'
test_data_path = 'test_dataset/'
```

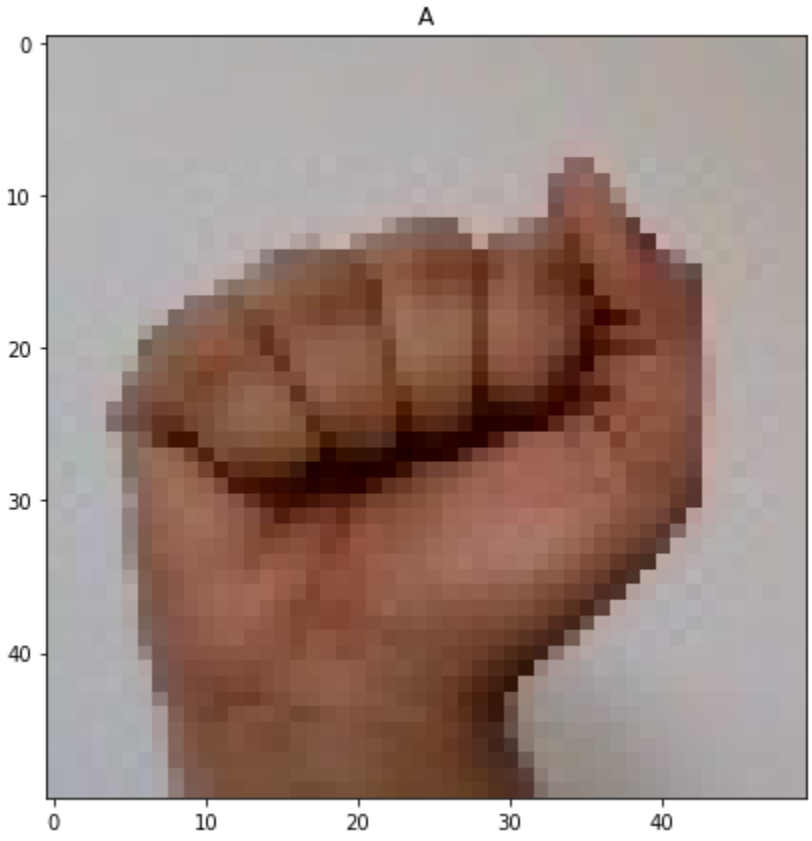
In [ ]:

```
def display(img,sign=None):

    img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
    fig = plt.figure(figsize=(7,7))
    ax = fig.add_subplot(111)
    plt.title(sign)
    ax.imshow(img)
```

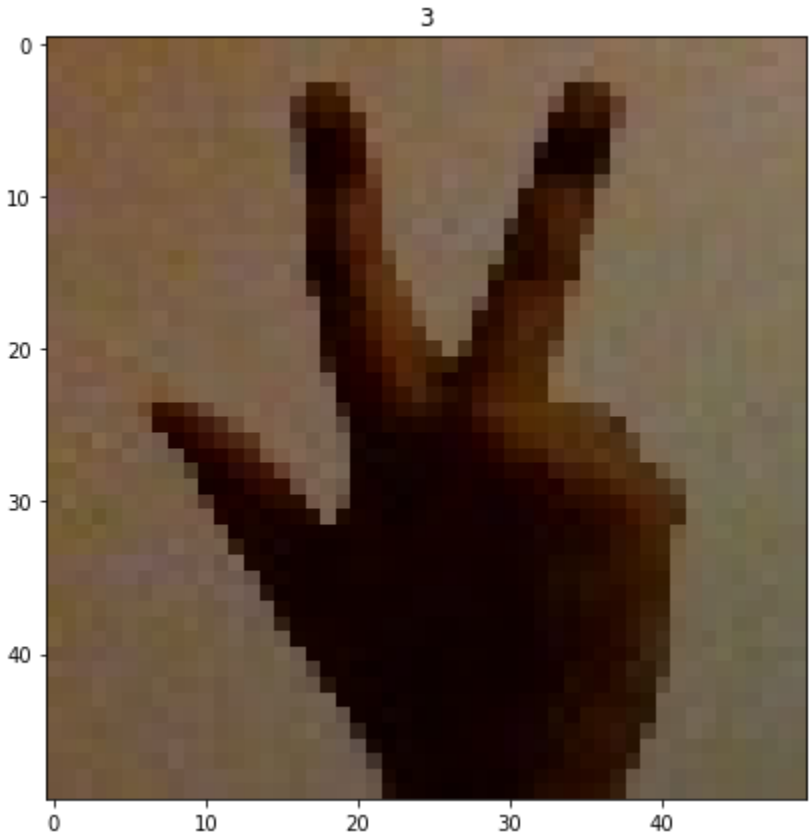
Training Data Set

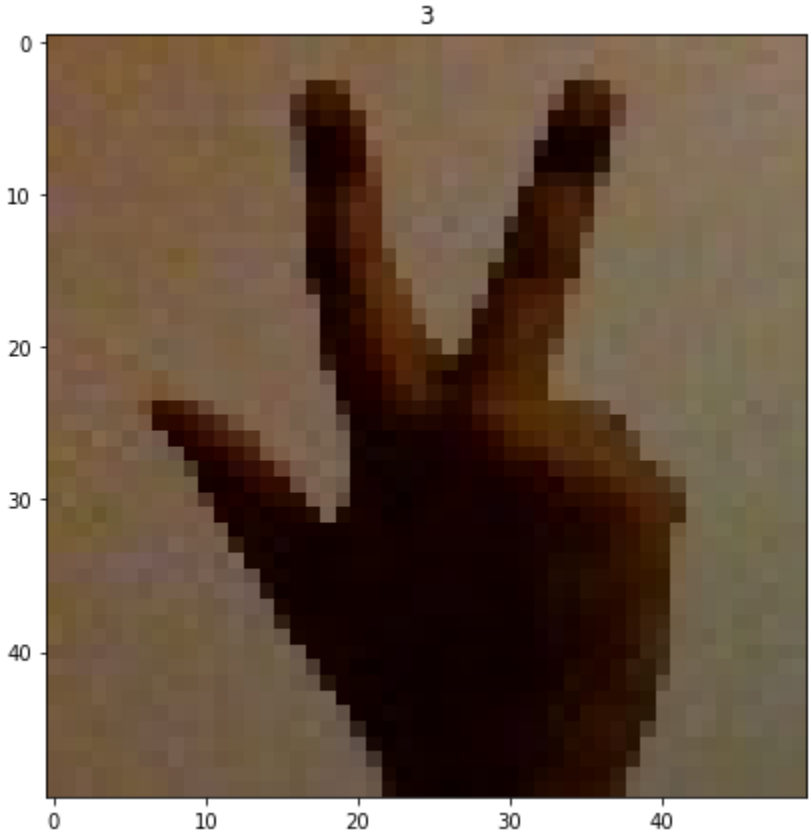
```
sign_img = cv2.imread(train_data_path+'A/A_204.jpeg')
display(sign_img,'A')
```



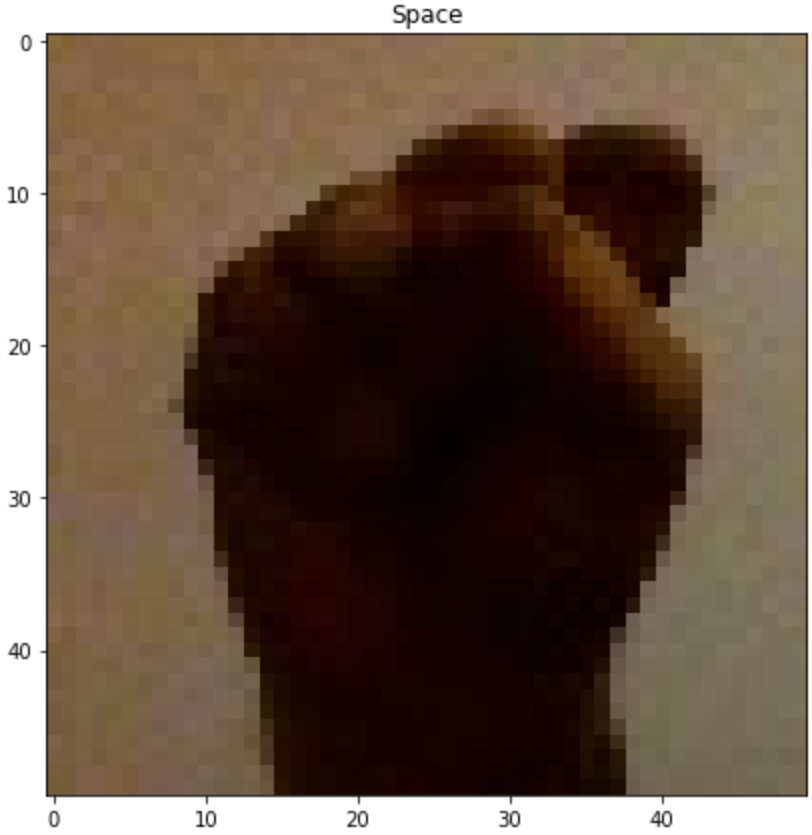
In [ ]:

```
sign_img = cv2.imread(train_data_path+'3/3_340.jpeg')
display(sign_img,'3')
```


3
0
10
20
30
40
0
10
20
30
40

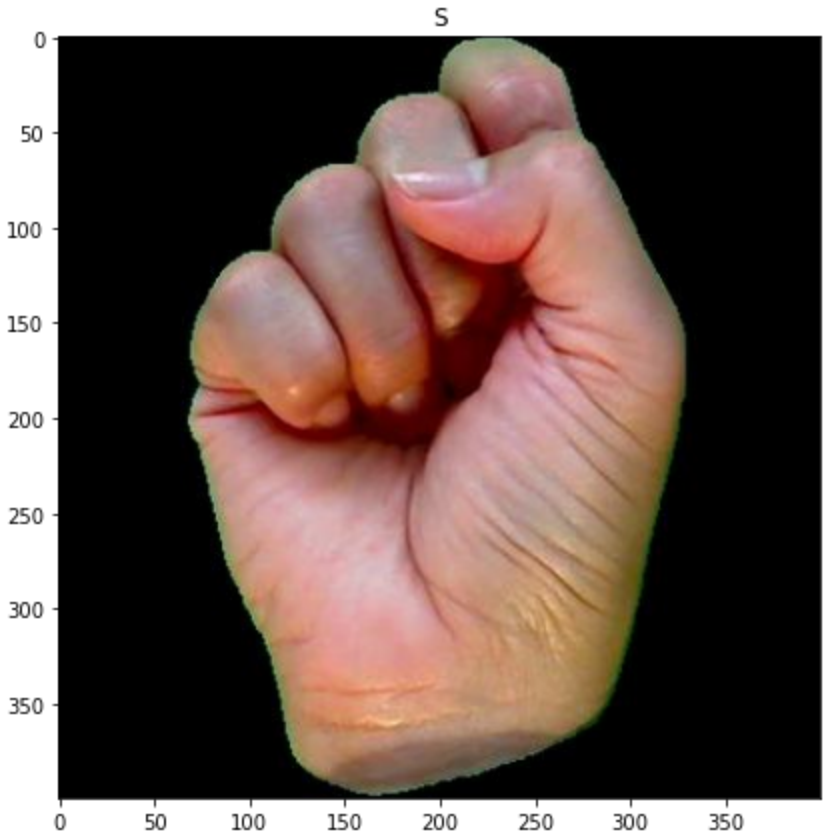

3
0
10
20
30
40
0
10
20
30
40

```
sign_img = cv2.imread(train_data_path+'S/S_10.jpeg')
display(sign_img,'Space')
```



TEST DATA SET

```
sign_img = cv2.imread(test_data_path+'S/S_15.jpeg')
display(sign_img,'S')
```




```
sign_img = cv2.imread(test_data_path+'Z/Z_1.jpeg')
display(sign_img,'Z')
```

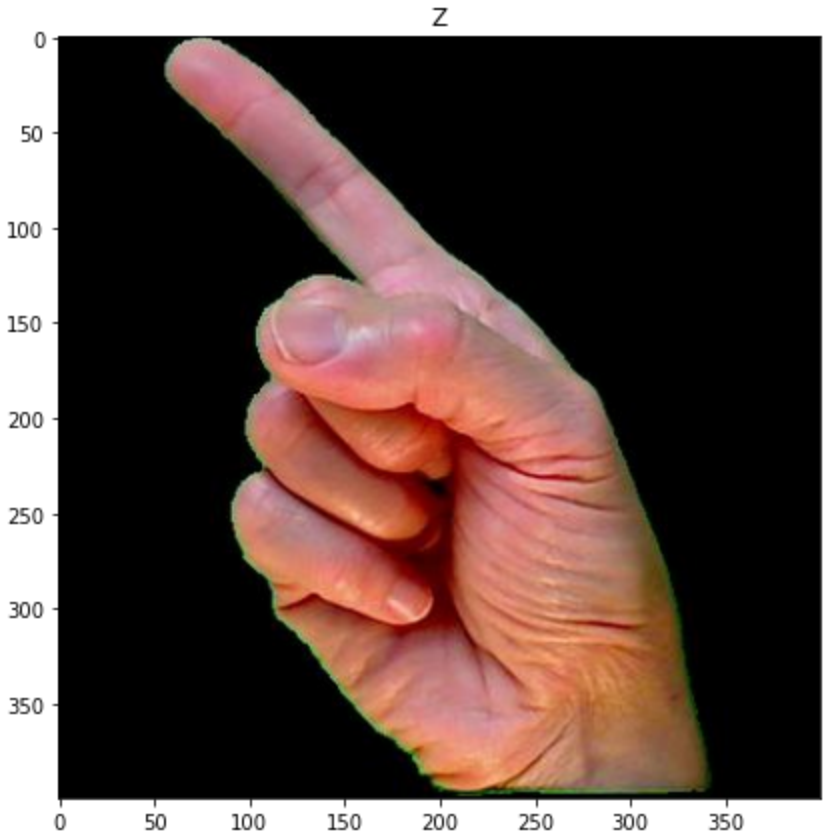
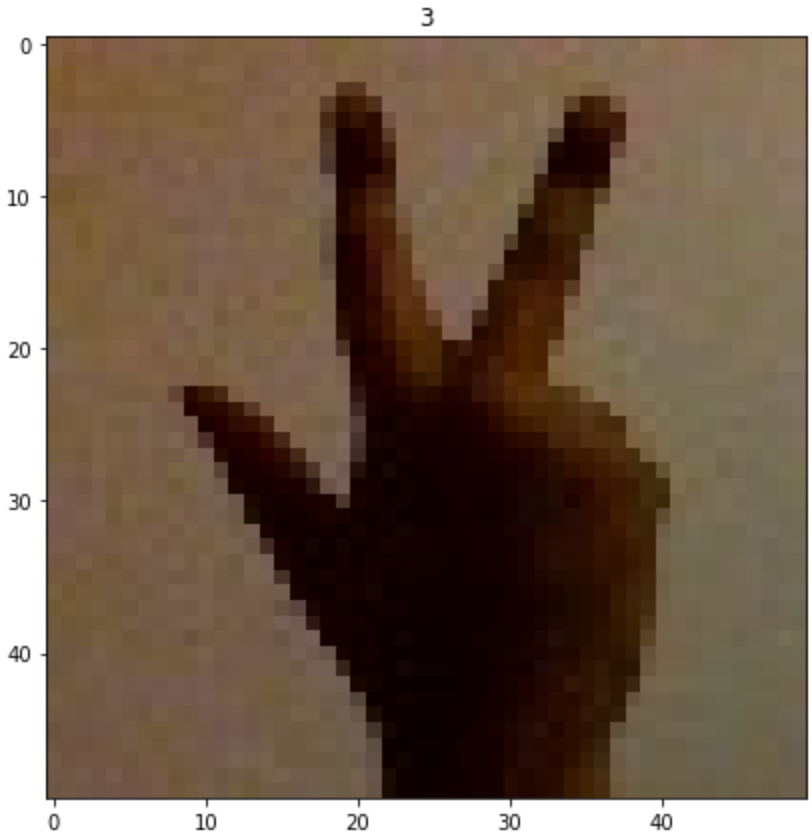


IMAGE DATA GENERATOR

```
image_gen = ImageDataGenerator(rotation_range=30,
                               width_shift_range=0.1,
                               height_shift_range=0.1,
                               shear_range=0.2,
                               zoom_range=0.2,
                               rescale=1/255,
                               horizontal_flip=True,
                               fill_mode='nearest',
                               validation_split=0.25)
```

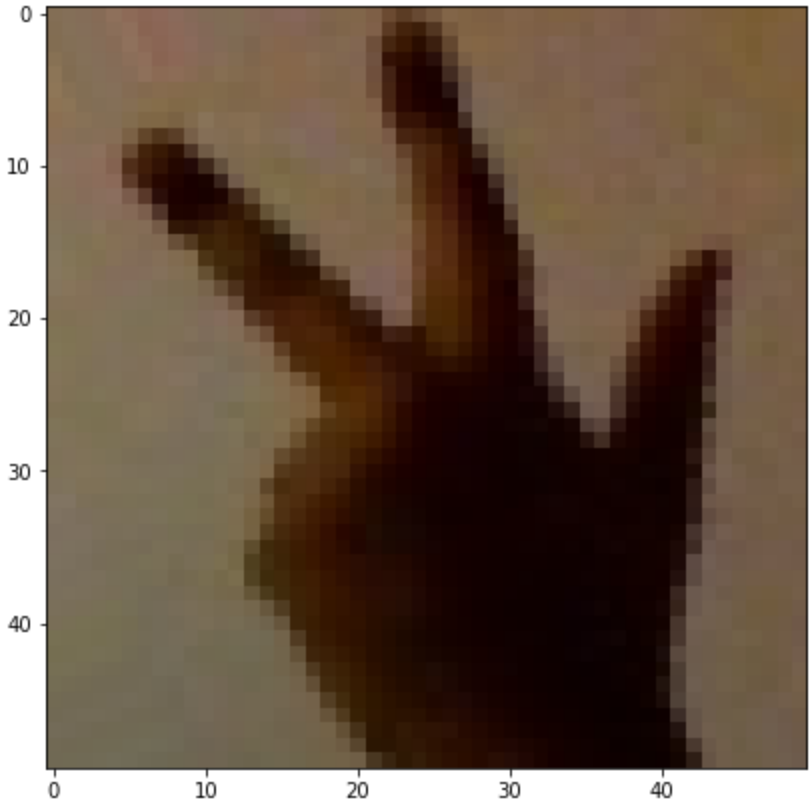
ORIGINAL IMAGE

```
sign_img = cv2.imread(train_data_path+'3/3_100.jpeg')
display(sign_img,'3')
```



AUGMENTED IMAGE

display(image_gen.random_transform(sign_img))



SPLIT INTO TEST AND VALIDATION DATASET

TRAIN DATA GENERATOR

```
train_data_gen = image_gen.flow_from_directory(train_data_path,
                                               target_size=(250,250),
                                               batch_size=16,
                                               shuffle=True,
                                               class_mode='binary',
                                               subset='training')
```

```
Found 41625 images belonging to 37 classes.
```

Validation Data Generator

In [ ]:

```
validation_data_g
```

```
validation_data_gen = image_gen.flow_from_directory(train_data_path,
                                               target_size=(250,250),
                                               batch_size=16,
                                               shuffle=True,
```

```
                        class_mode='binary',
                        subset='validation')
```

```
Found 13875 images belonging to 37 classes.
```

TEST DATA GENERATOR

```
test_data_gen = image_gen.flow_from_directory(test_data_path,
                        target_size=(250,250),
                        batch_size=8,
                        shuffle=True,
                        class_mode='categorical',
                        )
```

```
Found 2586 images belonging to 37 classes.
```

In [ ]:

```
train_data_gen.class_indices
```

```
{'0': 0,
 '1': 1,
 '2': 2,
 '3': 3,
 '4': 4,
 '5': 5,
 '6': 6,
 '7': 7,
 '8': 8,
 '9': 9,
 'A': 10,
 'B': 11,
 'C': 12,
 'D': 13,
 'E': 14,
 'F': 15,
 'G': 16,
 'H': 17,
 'I': 18,
 'J': 19,
 'K': 20,
 'L': 21,
 'M': 22,
 'N': 23,
 'O': 24,
 'P': 25,
 'Q': 26,
```

```
 'R': 27,
 'S': 28,
 'Space': 29,
 'T': 30,
 'U': 31,
 'V': 32,
 'W': 33,
 'X': 34,
 'Y': 35,
 'Z': 36}

test_data_gen.classes
array([ 0,  0,  0, ..., 36, 36, 36])

len(train_data_gen.classes)
41625
```

8.TESTING
8.1 Test Cases:

```
#import imagedatagenerator
from keras.preprocessing.image import ImageDataGenerator

##import imagedatagenerator
from keras.preprocessing.image import ImageDataGeneratortraining datagen
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizonta
l_flip=True)
#testing datagen
test_datagen=ImageDataGenerator(rescale=1./255)
```

IMPORTING tensorflow

```
#testing datagen
test_datagen=ImageDataGenerator(rescale=1./255)import tensorflow as tf
import os
```

INITIALIZE THE MODEL

```
#create model
from keras.models import Sequential
from keras.layers import Dense
```

```
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten
from tensorflow.keras.preprocessing.image import ImageDataGenerator

import numpy as np
import matplotlib.pyplot as plt #to view graph in colab itself
import IPython.display as display
from PIL import Image
import pathlib
```

Unzipping the dataset

```
!unzip '/content/conversation engine for deaf and dumb (1).zip'
```

Applying ImageDataGenerator to training set

```
x_train=train_datagen.flow_from_directory('/content/Dataset/training_set',target_size=(64,64),batch_size=200,
                                          class_mode='categorical',color_mode="grayscale")
```

```
Found 15750 images belonging to 9 classes.
```

Applying ImageDataGenerator to test set

```
x_test=test_datagen.flow_from_directory('/content/Dataset/test_set',target_size=(64,64),batch_size=200,
                                          class_mode='categorical',color_mode="grayscale")
```

```
Found 2250 images belonging to 9 classes.
```

In [ ]:

```
a=len(x_train)
b=len(x_test)
Length of training set

print(a)
79

Length of Test Set
print(b)
12

Add Layers
#create model
model=Sequential()
```

```
Add the Convolution Layer

model.add(Convolution2D(32,(3,3),input_shape=(64,64,1),activation='relu'))

Add the Pooling Layer

model.add(MaxPooling2D(pool_size=(2,2)))



Add the Flatten Layer
model.add(Flatten())

Adding the Dense layer
#1st hidden layer
model.add(Dense(units=512,activation='relu'))
#2nd hidden layer
model.add(Dense(units=261,activation='relu'))

#output layer
model.add(Dense(units=9,activation='softmax'))
```

COMPILE THE MODEL

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['a
ccuracy'])
Fit the Model

model.fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,validati
on_data=x_test,validation_steps=len(x_test))

Epoch 1/10
79/79 [==============================] - 90s 1s/step - loss: 0.3965 -
accuracy: 0.8746 - val_loss: 0.2797 - val_accuracy: 0.9529
Epoch 2/10
79/79 [==============================] - 86s 1s/step - loss: 0.0419 -
accuracy: 0.9884 - val_loss: 0.2846 - val_accuracy: 0.9751
Epoch 3/10
79/79 [==============================] - 84s 1s/step - loss: 0.0195 -
accuracy: 0.9947 - val_loss: 0.3436 - val_accuracy: 0.9751
Epoch 4/10
```

```
79/79 [==============================] - 87s 1s/step - loss: 0.0083 -
accuracy: 0.9982 - val_loss: 0.3722 - val_accuracy: 0.9751
Epoch 5/10
79/79 [==============================] - 83s 1s/step - loss: 0.0066 -
accuracy: 0.9983 - val_loss: 0.4095 - val_accuracy: 0.9756
Epoch 6/10
79/79 [==============================] - 88s 1s/step - loss: 0.0072 -
accuracy: 0.9979 - val_loss: 0.3874 - val_accuracy: 0.9756
Epoch 7/10
79/79 [==============================] - 86s 1s/step - loss: 0.0059 -
accuracy: 0.9985 - val_loss: 0.3891 - val_accuracy: 0.9747
Epoch 8/10
79/79 [==============================] - 86s 1s/step - loss: 0.0027 -
accuracy: 0.9992 - val_loss: 0.4429 - val_accuracy: 0.9756
Epoch 9/10
79/79 [==============================] - 84s 1s/step - loss: 0.0073 -
accuracy: 0.9981 - val_loss: 0.4907 - val_accuracy: 0.9756
Epoch 10/10
79/79 [==============================] - 85s 1s/step - loss: 0.0048 -
accuracy: 0.9987 - val_loss: 0.4866 - val_accuracy: 0.9702
```

Out[23]:

```
<keras.callbacks.History at 0x7f445adcd7d0>
```

```
Save the Model
model.save('aslpng2.h5')
```

Import The Packages And Load The Saved Model

```
from tensorflow.keras.models import load_model
import numpy as np
import cv2
from tensorflow.keras.preprocessing import image

#load the model
model=load_model('aslpng2.h5')

img=image.load_img('/content/Dataset/test_set/A/10.png',target_size=(400,500))
img
```

8.2 User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51

Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9.RESULTS

Performance Metrics

Model Performance Testing

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1	Accuracy	Training Accuracy validation Accuracy	
2	Confidence Score Only yolo Project	Class Detected Confidence Score	

10.ADVANTAGES & DISAVANTAGES

Advantages

- Identifying a Disability Helps You Help Your Student.
- By Law, Kids With Labels Have Access to Special Services.
- **reliable – people with disability generally take fewer days off, take less sick leave, are more loyal and stay in jobs longer than other workers**. productive – in the right job with the right support, disabled people perform just as well as other employees.

Disadvantages

- Teachers Can Stereotype Students Based on the Label.
- Special Education Services May Be Costly.
- **Difficulty With Transportation**: Most people who have disabilities do not have a car, so they must rely on public transportation, which can be difficult for them to navigate. Even getting to a job interview can be tough.

11.CONCLUSION

The input image is processed to isolate the hand. Then it is passed to a trained convolution neural network to identify the gesture with greater accuracy.

12.FUTURE SCOPE

1. Digital Photography: Instead of using films and paper sheets to produce pictures, students are taught how to click pictures using a digital camera, and even specific smartphones and how to edit, store and share them using a computer. Students are taught how to use photography software and publish these photographs on different platforms.

2. Graphic Design: A graphic designing course includes studio art, principles of design, computerized design, commercial graphics production, printing techniques, and website design. Students should also have beforehand knowledge of writing. A flair for creativity is required to become a graphic designer, a profession that has become really popular in the last few years.

3. Management Accounting: The course helps students learn about commerce, financial services at consultancies, government public sector or manufacturing industry. Students learn about evaluating business activities and analyzing stakeholders and regulators.

4. App Development: Apps are a significant part of every smartphone and given the increasing number of smartphone users, app development is becoming an important course to reach out to specifically Indian

audiences. Students are taught the basics of creating apps and what goes into the making of them.

13.APPENDIX

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