P

REAL-TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED

A PROJECT REPORT

INDUSTRY MENTOR(S) NAME : DIVYA

Submitted by

TEAM ID : PNT2022TMID44952

TEAMLEADER: UMA.K-811019106037

MEMBER 1: RAKESH.P-811019106030

MEMBER2:GOWTHAMAN.M-

811019106014

MEMBER3: SNEKA.D-811019106035

P

CONTENTS

P

TITLE	REAL-TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED
TEAMID	PNT2022TMID44952
TEAMLEAD	UMA
TEAMMEMBERS	RAKESH GOWTHAMAN SNEKA

INTRODUCTION

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 insituations where other forms like speech cannot be used. 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.

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 asconvertspeechintounderstandablesignlanguageforthedeafanddumb.Wearemaking

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 deafand dumb people to convey the irinformation using signs which get converted to human-understand able language and image is given as output.

PURPOSE

People get to know one another by sharing their ideas, thoughts, and experiences with those around them. There are numerous ways to accomplish this, one of which is the gift of images.Everyone can very convincing lytrans fertheir thoughts and understand each other through images. It will be unjust if we overlook those who are denied this priceless gift :the deaf and dumb. In such cases,the human hand has remained the preferred method of communication. The project's purpose is to create a system that translates sign language in to a human understandable languages that ordinary people may understand it.

P

LITERATURESURVEY

EXISTINGPROBLEM

Some of the existing solutions for solving this problem are :

[1] A Novel Communication System for Deaf and Dump People Using gesture

Human Beings know each other and contact with themselves through thoughts and ideas.The best way to present our idea is through speech. Some people don't have the power of speech; the only way they communicate with others is through sign language.

[2] Design of Communication interpreter for Deaf and Dump person

In this paper, we describe gesture based device for deaf and dumb person as communication for a person, who cannot hear is visual, not auditory. Generally dumb people use sign language for communication, but they find difficulty in communicating with others who don't understand sign language.

[3] AN Assisitive Device for Deaf and Dump People

This system describes a speech enabled hand glove system which aims at translation of sign language to analyze text input and voice. A system is designed that translates the hand finger motion to corresponding letters, using HC -SR04 ultrasonicsensors and an arduino mega board.

[4] Hand Sign recognition for depth images With Multi_scale density features of Deaf mute persons

Among many of the fastest growing research fields, sign language recognition is one of the top. Deaf and dumb community uses sign language to express their ideas or views. Sign Language is a methodical coded language where meanings are assigned to every gestures.

References

1. Pritesh Ambavane, Rahul Karjavkar, Hemant Pathare3, Shubham Relekar4,

P

Bhavana Alte and Neeraj Kumar Sharmar,2020,A Novel Communication System For Deaf And Dumb People using gesture.

2. Pallavi Verma , Shimi S.L. , Richa Priyadarshani ,(2013),Design of Communication Interpreter for Deaf and Dumb Person

3. Gowriswari S.Roshan J, Aadhithyan M, Venkatesh R, (2020),An Assistive Device For Deaf And Dumb People.

4. Taniya Sahanaa , Soumi Paulb, Subhadip Basub ,Ayatullah Faruk Mollaha,(2020),Hand sign recognition from depth images with multi-scale density features for deaf mute persons

Problem Statement Definition

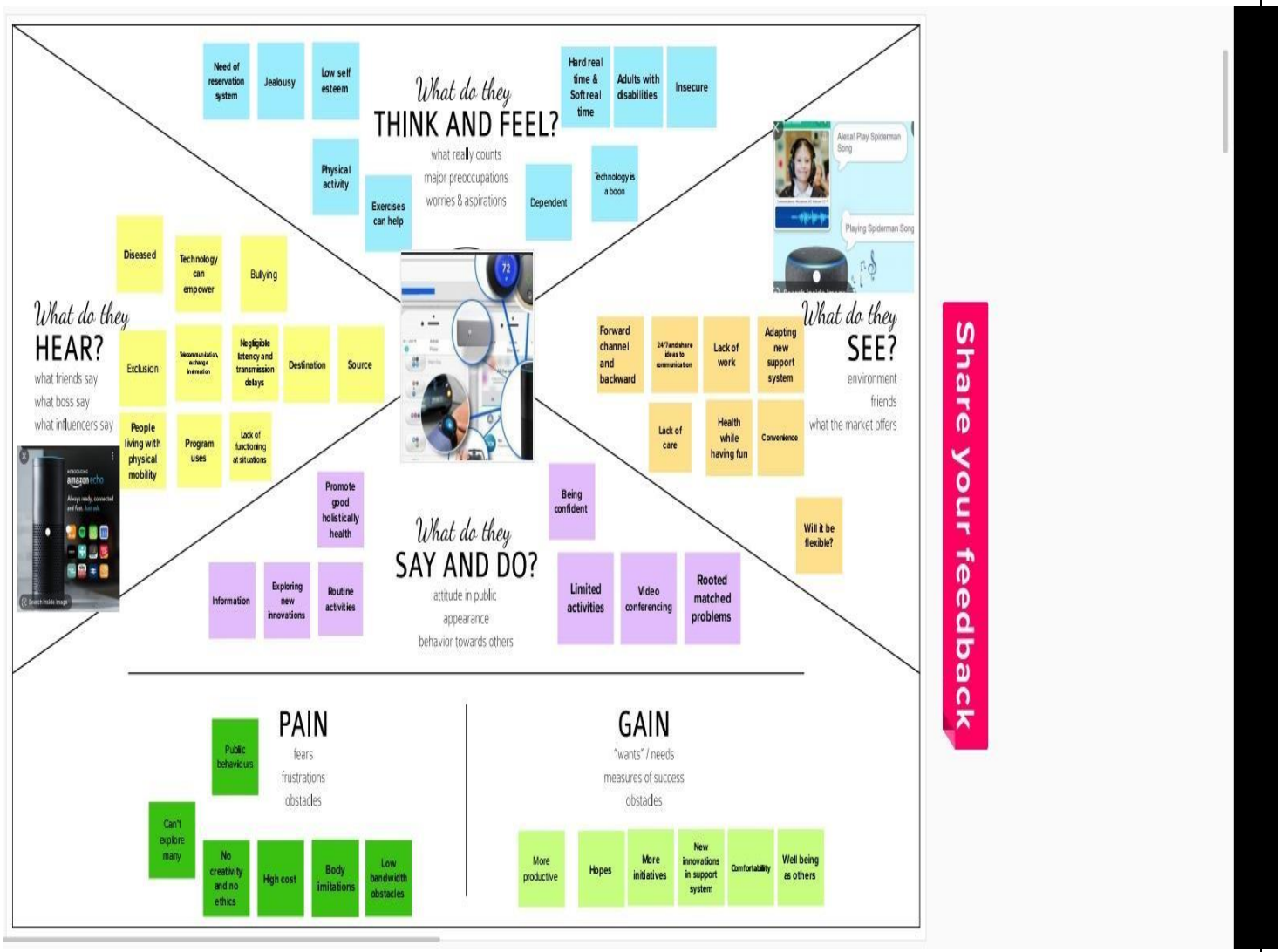
Real time communication system powered by AI for specially abled

P

P

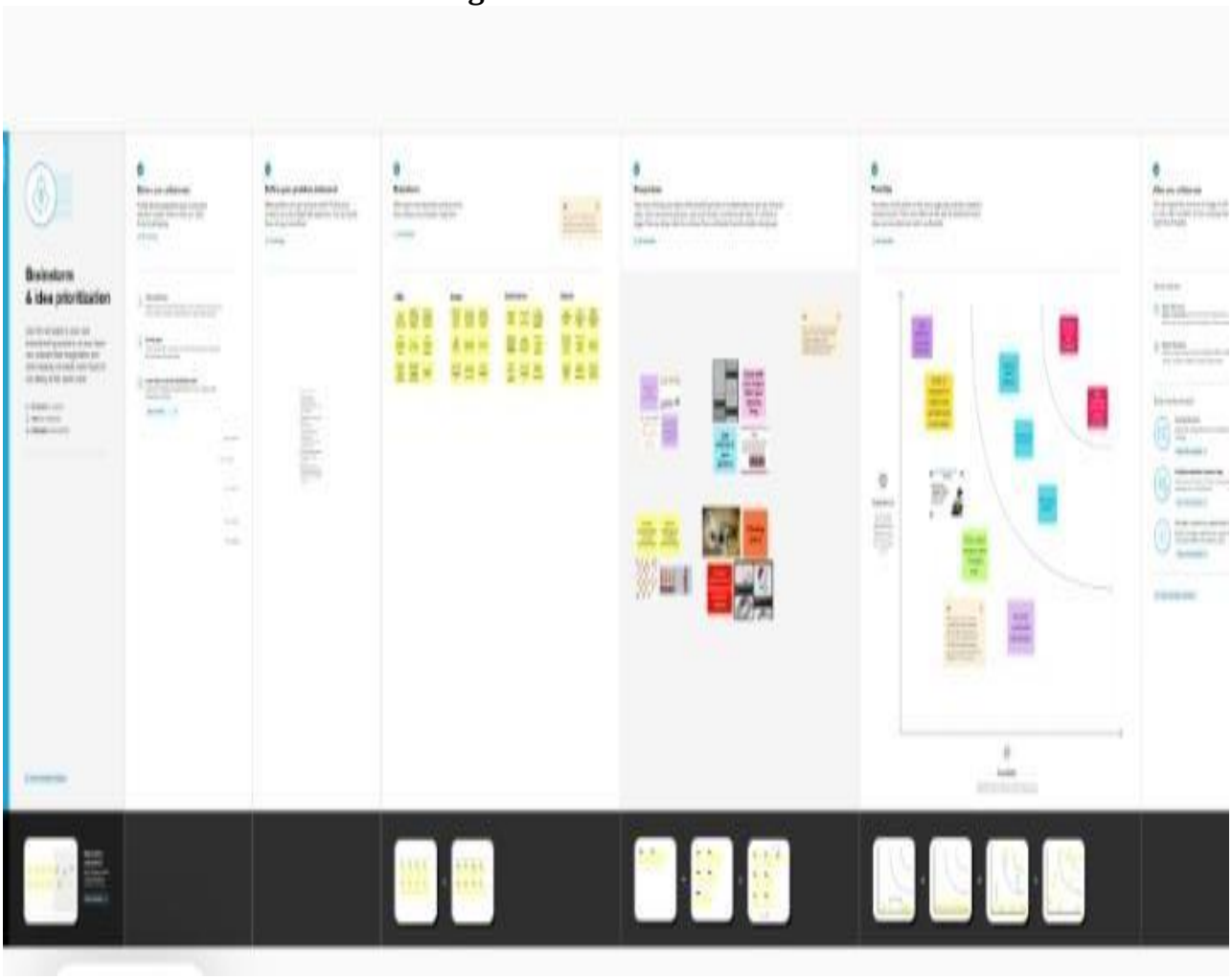
IDEATION & PROPOSED SOLUTION

Empathy Map Canvas



P

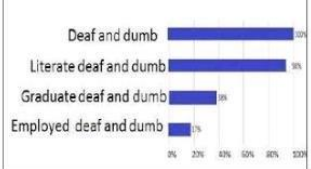
Ideation& Brainstorming



P

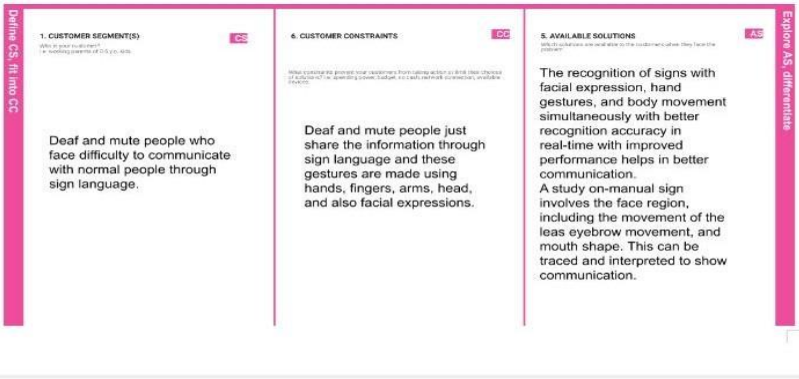
3.ProposedSolution

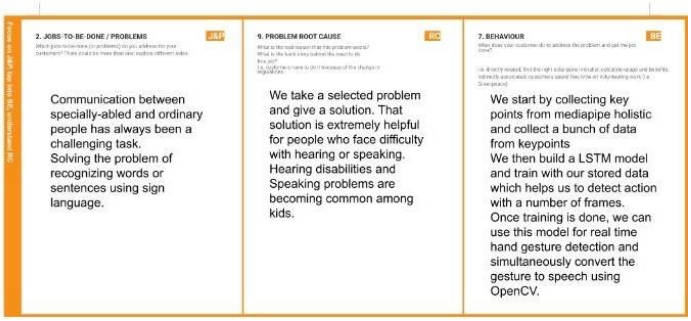
P

S. No.	Parameter	Description
•	Problem Statement (Problem to be solved)	1. how to easily communicate understand sign language for dump and deaf people 2. What is the learn hand gestures 3. Why read facial expression and lip movement for necessary in deaf and dump people 4. Have a new technology for dump and deaf people 5. Why interpret their hand gestures to other from make a hand held device
•	Idea / Solution description	1. sign language INGLT HTK super vector 2. Sign language each country has one or sometimes more sign language 3. Hand gestures system used help with deaf and dump people and input is mapped to determined 4. Memories the finger spelling hand sign and LCD display system 5. Use knowledge of subject feature extraction and key point making
•	Novelty / Uniqueness	FLEX SENSOR: **Flex sensors are attached to the gloves . These flex sensors contains the continues flow of current voltages . These sensors when bend creates a drop in voltage which in turn is recorded in microcontroller .** ACCELEROMETER SENSOR: **Accelerometer sensor measure the dynamic acceleration . When we attach aaccelerometer then we get a access which can be used for every finger direction .**
•	Social Impact / Customer Satisfaction	**Accelerometer** is a device that measures acceleration across three axes (x, y, z) to determine orientation i. e. hand gestures shown in Figl (b). The output of the accelerometer is obtained in terms of angle i. e. orientation in x, y, z directions obtained in the form of analog readings. By the particular gesture of the flex sensor the message will display that we have saved in the Android Application database will display on LCD as well as the Android Phone and sound signal will also produce. **effective communication between the deaf/dumb & traditional individuals.**
•	Business Model (Revenue Model)	
•	Scalability of the Solution	Smart Gloves is proposed to bridge the barrier of communication between disabled person and normal person. Sign language is the only medium for deaf and dumb persons to share their feeling or thoughts with other but their communication is restricted to other disabled person as normal cannot understand what they wants to say. Hand gesture recognition is a challenging problem in designing real life applications for deaf mute community. In this paper, we have presented an efficient method to recognize hand gestures captured with Kinect VI. .

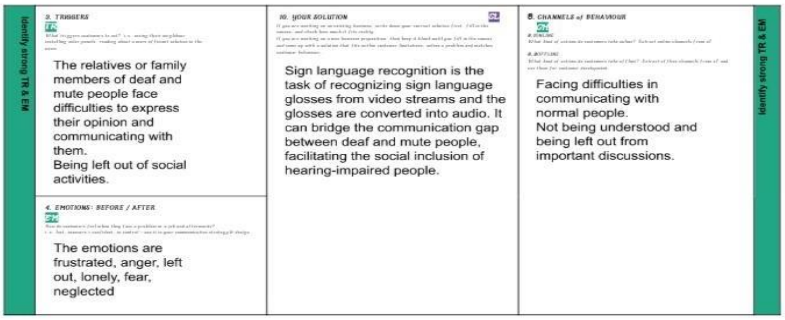
P

Problem Solution fit





P


Identify strong TR & EM
3. TRIGGERS
The relatives or family members of deaf and mute people face difficulties to express their opinion and communicating with them.
Being left out of social activities.
4. EMOTIONS: BEFORE / AFTER
The emotions are frustrated, anger, left out, lonely, fear, neglected
10. YOUR SOLUTION
Sign language recognition is the task of recognizing sign language glosses from video streams and the glosses are converted into audio. It can bridge the communication gap between deaf and mute people, facilitating the social inclusion of hearing-impaired people.
9. CHANNELS of BEHAVIOUR
Facing difficulties in communicating with normal people.
Not being understood and being left out from important discussions.
Identify strong TR & EM

P

REQUIREMENTANALYSIS

4.1 Functional requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Linked IN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Verification	The user should receive a verification e-mail which they have to confirm to complete the registration.
FR-4	Compliance to rules or laws	Terms and conditions, Privacy policy, End user licensing agreement.
FR-5	Authorization levels	There are two levels of authorization namely standard access level and advanced access level.
FR-6	Legal Requirements	Medical Certificate is produced

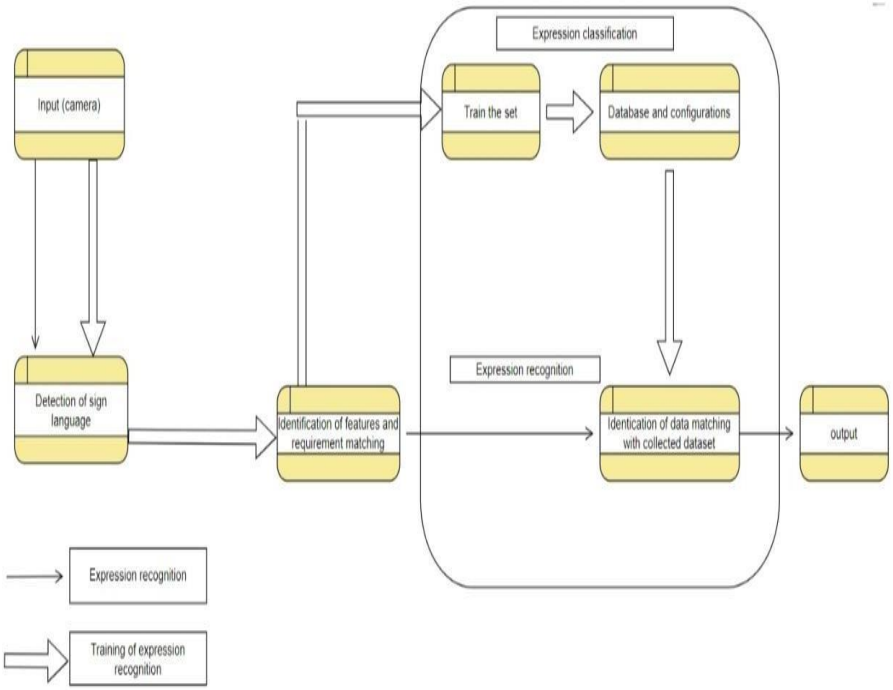
Non Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The designed system is easy to use for specially abled persons as it is portable and platform independent.
NFR-2	Security	Converted information using signs into speech is accessed only by the user.
NFR-3	Reliability	System is tested with large number of data and Provides insight into issues.
NFR-4	Performance	Quick Launch time of application and faster in converting signs into speech
NFR-5	Availability	Provides automatic recovery and User access.
NFR-6	Scalability	Standard network condition the device should convert information within second.

P

PROJECT DESIGN

Data Flow Diagrams

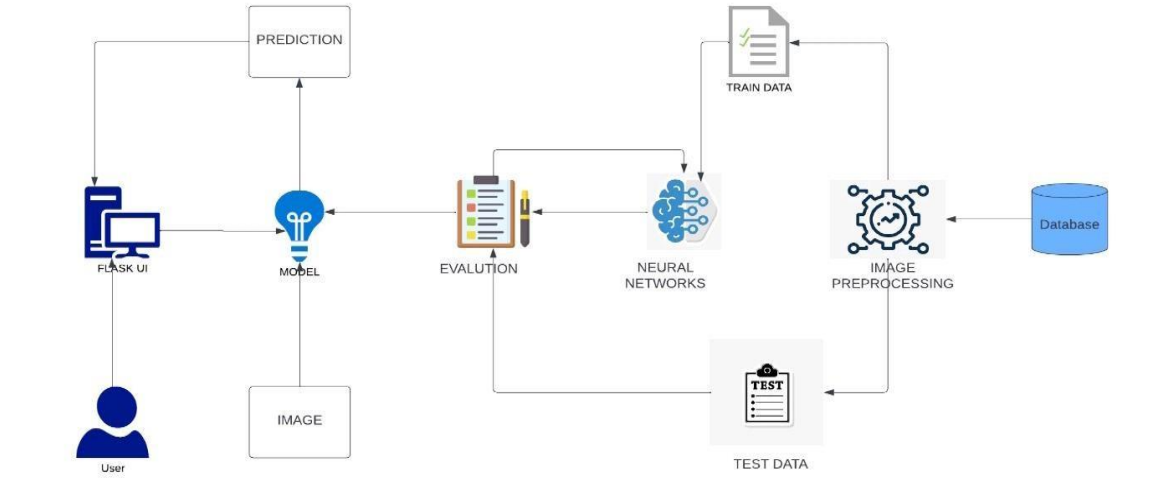


P

Solution Architecture:

The Deliverable shall include the architectural diagram.

Example-Solution Architecture Diagram:



P

User Stories

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	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
		USN-2	As a user, I can register for the application through Gmail	I can access my account / dashboard	High	Sprint-1
	Confirmation	USN-3	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can enter into the login by id and password	High	Sprint-1
	Data input	USN-5	User will be giving the input, the camera as speech or signs	I can give the input to the system	High	Sprint-1
		USN-6	The system will take the input for the testing will the given data base	The will accept the input for the testing	High	Sprint-2
	Data verification	USN-7	It will verify with the data base that will match with the input	Configuration of the input	High	Sprint-2
		USN-8	Identification of the input and convert into the text if the input is signs or as signs	Identification of the input and creating output	High	Sprint-3
	Output Display	USN-9	Display the output on the screen for the user	Display of the output	High	Sprint-4

P

PROJECT PLANNING AND SCHEDULING

Sprint Planning And Estimation

P

TITLE	DESCRIPTION	DATE	ACHIEVEMENT
Literature Survey &Information Gathering	Literature survey on theselected project & gatheringinformation byreferring the technical papers, research publications etc.	01 NOVEMBER 2022	Referring to **the previous findings made to understandthe drawbacks that are present in the app.** Able to **understand the technologies and methodsused** in building of the system. **Helped us to know what would be the output if atechnology is used.**
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the userPains & Gains, Prepare list of problemstatements	01NOVEMBER 2022	Empathy map enabled us **togather all the ideas at one single place.** Successfully segregated **thepros, cons, public opinion and time required for building of the app** and other factors clearly. **Very helpful when we were at the scratch.**

Ideation	List the by organizing the brainstorming session andprioritize the top 3 ideas based on the feasibility & importance.	01NOVEMBER 2022	Brainstorming session enabled us to **join together and collectively give variousideas** to solve existing problem. Based on the priority, **best ideas to implement and booming technologies suggested were plotted inthe graph** for clear cut understanding.

P

TITLE	DESCRIPTION	DATE	ACHIEVEMENT
Proposed Solution	Prepare the proposed solutiondocument, which includes thenovelty, feasibility of idea, business model, social impact, scalability of solution, etc.	01NOVEMBER 2022	Once the ideation was finished, we as team now decided our own solution inorder to solve the existing problem. Document made on the Problem statement, customer satisfaction and uniqueness made to understand the core of theexisting problem, much better.
Problem Solution Fit	Prepare problem - solution fitdocument.	01NOVEMBER 2022	Similar to ideation, where we were actually thinking on theside of user and noted the pros, cons, issues faced in using the app. Pointed out the triggers and problem root cause and alsothe available solutions that reduce the effects of their inability. See that, the proposed solution can be a bonanzabesides the available solution to the disabled.
Solution Architecture	Prepare solution architecturedocument.	01NOVEMBER 2022	In this phase , we as a team made an architecture diagram which would describe the role performedby admin, end user and the the operations being performed. The operations involved in the proposed solution are briefed in this diagram.

P

TITLE	DESCRIPTION	DATE	ACHIEVEMENT
Customer Journey	Prepare the customer journeymaps to understandthe user interactions & experiences with the application (entry to exit).	01NOVEMBER 2022	Listed different factors like **Research, Comparison withothers, working condition of the app, questioning and sign out.** It made to **understand thecustomer's point of view precisely** before , at present and after using the app.
Functional Requirement	Prepare the functional requiremen tdocument.	01NOVEMBER 2022	**Stated the software andhardware requirements** required from user's side inorder to use the app. Also **mentioned the specifications and the functionalities** required to use the app.
Data Flow Diagrams	Draw the data flow diagrams and submitforreview.	01NOVEMBER 2022	DFD is constructed in orderto **understand the start and end process of app usage.** Also, **mentioned the user stories along with their sprints** to determine the amount of time required in implementing the particular sprint.
Technology Architecture	Prepare the technol ogy architecturediagram.	01 NOVEMBER 2022	**Given a detailed mind-blowing architecture where all the technologiesare used and also the sequential process** from start to end. **Sample outputs provided enriched the quality and importance** of using theapp.

Prepare Milestone &ActivityList	Prepare the milestones&activity list of the project.	08NOVEMBER 2022	Made us to **list the achievements obtained** ineach and every phase. Made us to **feel good and confident to move forwardtowards development phase.**
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testingit.	IN PROGRESS...	Entire development phase is **divided into four sprints.** **Design and build** each andevery module .

P

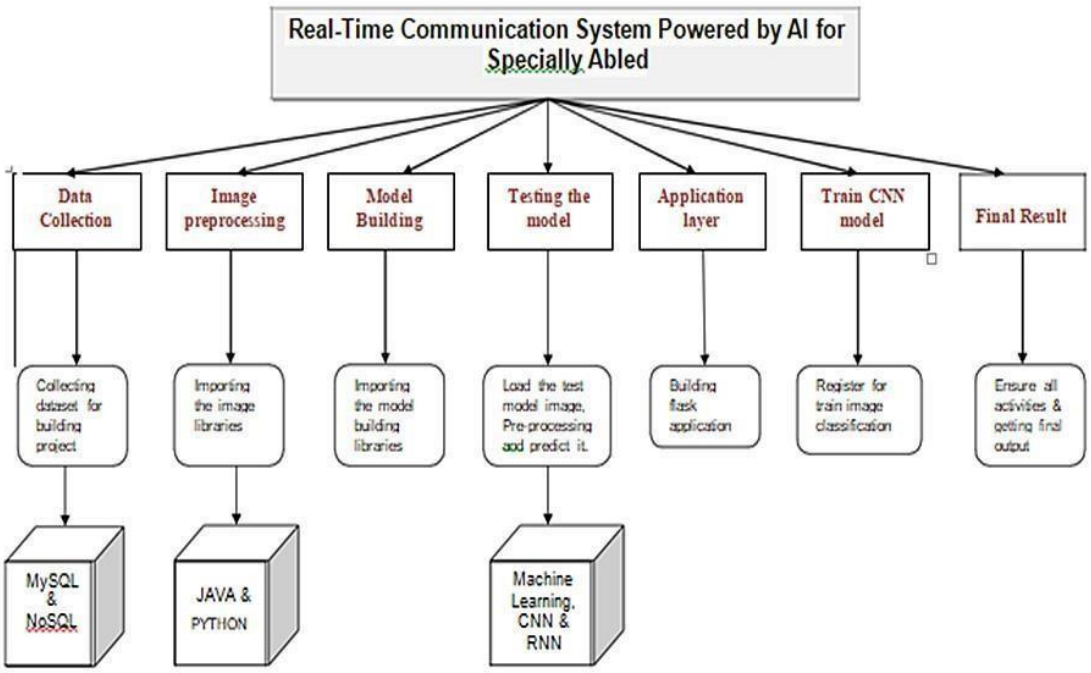
ACTIVITY LIST

Activity Number	Activity Name	Detailed Activity Description
1.	Main page	As a User, I can enter the web page onceclicked, which provides be the Guidelines to use the app
2.	Guidelines	As a User , I can give a read through the guidelines to understand the functioningof the app.
3.	Camera(Hand movement detection)	As a User, I can show my hand sign towards the camera which convertsthem into text manner.
4.	Voice mode	Once the text is obtained, As a User I canclick on the voice mode which provides the text in the form of speech.
5.	Provide the necessary functionalitiesrequired to use the app.	As an Executive, I can provide the Specifications of Camera required, andother factors that are required for smooth functioning of the app.

Activity Number	Activity Name	Detailed Activity Description
6.	Check the performance of the app	As an Executive, I can check the usageand queries obtained from the end users.
7.	Receive queries based on the usage	As an Admin, I can take the queries fromthe customer care and perform the testing phase again , loading the other signs in the dataset, in order to make thecustomers to use the app effectively.

P

MILESTONE ACTIVITY PLAN



P

SPRINT PLANING

Sprint	Functional Requirement(Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Collect Data set.	9	High	UMA
Sprint-1	Image processing	USN-2	Image p reprocessing	8	Medium	RAKESH GOWTHAM
Sprint-2	Model Building	USN-3	Import the required libraries, add the necessary layers and compile the model	10	High	UMA RAKESH
						GOWTHAM SNEKA
Sprint-2	CNNMODEL	USN-4	Training the image classification model using CNN	7	Medium	UMA RAKESH GOWTHAM
Sprint-3	Training and Testing	USN-5	Training the model and testing the model's performance	9	High	UMA SNEKA
Sprint-4	Implementation of the application	USN-6	Converting the input sign language image sin to English alphabets	8	Medium	UMA RAKESH SNEKA

P

Sprint Delivery Schedule

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1 USN-4	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	k.uma&D.sneka
Sprint-2			As a user, I will receive confirmation email oncel have registered for the application	1		
Sprint-1	Login	USN-2 USN-3	As a user, I can log into the application by entering email & password	1	Medium	M.Gowthaman&p.Rakesh
Sprint-2	Dashboard		As a user, I can log into my account in a given Dashboard	1		
Sprint-1	User interface	USN-4	Professional responsible for user requirements & needs	1	High	K.Uma
Sprint-3	Objective	USN-3	The goal is to describe all the inputs and outputs	1	High	D.Sneka
Sprint-4	Privacy	USN-1	The developed application should be secure for the users	1	High	M.Gowthaman

4

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	26 Oct 2022	29 Oct 2022	20	30 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

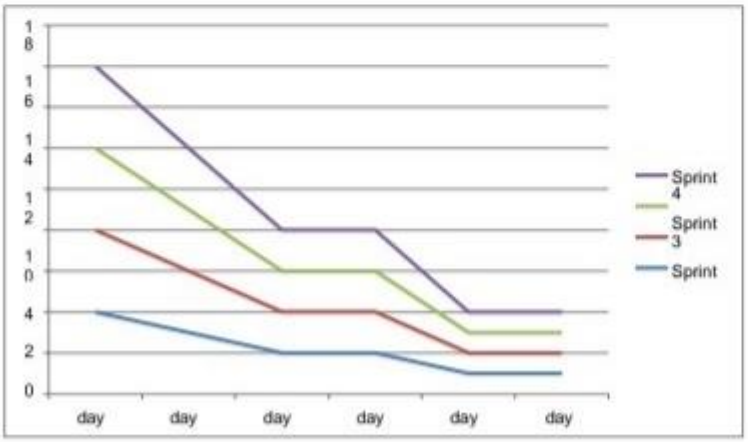
P

Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

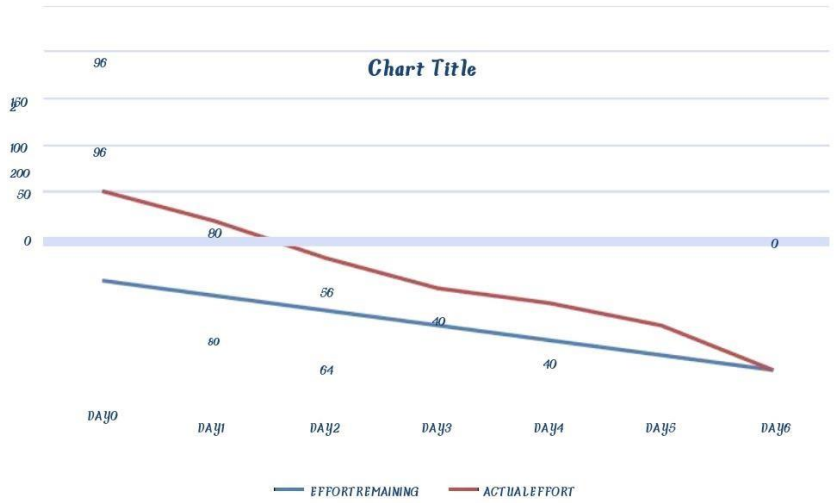
Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



P

Report From Jira



BURNDOWNCHART

P

CODING AND EXECUTION

Feature1

The proposed system consists of two features front end and backend. The frontendisdesignedusingHTMLandCSS.Thefirstfeatureisawebpagewheneverauserwantstotranslate the sign language to English, they can go to the webpage it has start button. On pressing the start button, it will turn on the camera for live translation. Once the camera is turne don,we can start translating.

Coding:

```
<!DOCTYPEhtml>
<html>
<head>
<title>RealTimeCommunication</title>
<style>body
{
background-image:linear-
gradient(tobottomright,blue,black);background-repeat: no-
repeat;
background-attachment:fixed;
}
h1,h2,a,p{co
lor:white;
}
</style>
</head>
```

P

<body>

<divclass="title">

<h1>

REAL-

TIMECOMMUNICATIONSYSTEMPOWEREDBYAIFORSPE

CIALLYABLED </h1>

<imgsrc="../static/img/img.png"width="300"height="300">

<h2>ShowtheseGesturestoget the Alphabet</h2>

<ahref="{{url_for('predict')}}">CLICKHERETO
SHOWYOURGESTURES

In our society, we have people with disabilities. The technology isdeveloping dayby daybutnosignificantdevelopmentsare undertakenforthebettermentof these people. Communications between deaf-mute and a normal person has alwaysbeen a challenging task. It is very difficult for mute people to convey their message tonormal people. Since normal people are not trained on hand sign language. In emergencytimesconveyingtheirmessageisverydifficult.

The project aims to develop a system that converts the sign language into a alphabet inthe desired language to convey a message to normal people. We are making use of aconvolution neural network to create a model that is trained on different hand gestures.Anappis builtwhichusesthismodel.Thisappenablesdeafanddumbpeopleto conveytheir information using signs which get converted to human-understandable language isgivenasoutput.

P

</body>

</html>

Feature 2

The second feature of the proposed system is backend. The backend is designed using python with the packages of python like flask, tensorflow, opencv-python, keras, numpy, pandas, virtualenv, pillow and Machine learning technology and trained with datasets. Once the camera is turned on the system detects and identify the sign language and translate it to English by matching the live action with the trained dataset.

Coding:from flask import Flask ,render_template,request import cv2

From keras.model sim port load_

model import numpy as np from gtts

import TTSimportos

From keras. Preprocessing import

image from sk image.transform import

resize from play sound import play

sound app

=

Flask(_name_)model=load_model("

aslpng1.h5")vals=['A','B','C','D','E','F

','G','H','I']

@app. route('/',methods=['GET'])def

index():

return render_

template('index.html')@app. route('/index',

P

methods=['GET']) def home():

P

```
            return
render_template('index.html')@app.route('/predict',
methods=['GET','POST'])defpredict():
                    print("[INFO]starting video
                   stream...")vs=cv2.VideoCapture(0)
                   (W,H)=(None,
                    None)while True:
            (grabbed, frame)=vs .read()
                        If not grabbed:
                                break
                        if W is  None or His None:
                                (H, W) = frame.
                         shape[:2]output=frame. copy()
                         # r = cv2.selectROI("Slect",
                       output)#print(r)
                         cv2.rectangle(output,(81,79),(276,274),(0,255,0),2)fra
                         me=frame[81:276,79:274]
                         frame= cv2.cvtColor(frame,cv2.COLOR_RGB2GRAY)
                         _, frame = cv2.threshold(frame, 95,
255,cv2.THRESH_BINARY_INV)
                         frame=cv2.cvtColor(frame,cv2.COLOR_GRAY2RGB)i
                        mg=resize(frame,(64,64,3))
                        img=np.expand_dims(img,axis=0)i
                         f(np.max(img)>1):
```

P

```
                                    img=img/255.0
                                result=np.argmax(model.predict(img))i
                                ndex=['A','B','C','D','E','F','G','H','I']
                                 result=str(index[result])
                            cv2.putText(output,"The
PredictedLetter:{}".format(result),(10,50),cv2.FONT_HERSHEY_PLAIN,
                                                              2,(150,0,150),2)
                                 cv2.putText(output,"Pressqtoexit",(10,450),cv
2.FONT_HERSHEY_PLAIN,2,(0,0,255),2)
                             speech = gTTS(text = result, lang = 'en', slow =
                                 False)cv2.imshow("Output",output)
                                 key = cv2.waitKey(1) &
                                 0xFFifkey==ord("q"):
                                        breakprint(
                        "[INFO] cleaning
                        up...")vs.release()cv2.destroy
                        AllWindows()
                        return render _template("index.html")if
_name_ == '_main_ ':app
.run(debug=True)
```

USER ACCEPTANCE TEST

P

1) PurposeofDocument

Thisdocument'spurposeistoprovideabriefexplanationofourproject'stestcoverageandunresolvedissuesattheti meoftheproject'sreleaseforUserAcceptanceTesting(UAT).

2) DefectAnalysis

Thisreportliststhenumberofbugsthathavebeenfixedorclosedateachseveritylevel,alongwithhowtheywerefixed.

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	11	7	4	2	24
Duplicate	1	0	2	0	3
External	2	3	2	1	8
Fixed	10	5	3	14	32
NotReproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	1	0	0	1	1
Totals	25	15	13	26	70

3) TestCaseAnalysis

Thenumberoftestcasesthat havesucceeded,failed,andnotbeentestedisdisplayedinthisreport.

Section	TotalCases	NotTested	Fail	Pass
PrintEngine	7	0	0	7
ClientApplication	15	0	0	15
Security	2	0	0	2
OutsourceShipping	2	0	0	2
ExceptionReporting	9	0	0	9
FinalReportOutput	4	0	0	4
VersionControl	2	0	0	2

P

PERFORMANCE TESTING

P

ModelPerformanceTesting:

Project teamshallfillthefollowinginformationin modelperformancetestingtemplate.

S.No.	Parameter	Values	Screenshot
1.	ModelSummary	Model:Sequential ➢ Totalparans:203,434 ➢ Trainableparans:203,434 ➢ Non-trainableparans:0	Model: "sequential" Layer (type) Output Shape Param # conv2d (Conv2D) (None, 26, 26, 64) 640 conv2d_1 (Conv2D) (None, 24, 24, 32) 18464 flatten (Flatten) (None, 18432) 0 dense (Dense) (None, 10) 184330 Total params: 203,434 Trainable params: 203,434 Non-trainable params: 0
2.	Accuracy	TrainingAccuracy– ➢ Loss:0.0303 ➢ Accuracy:0.9899 ValidationAccuracy: ➢ Val_loss:0.1260 ➢ Val_accuracy:0.9737	[illegible]
		➢ Testloss:0.1259 ➢ Testaccuracy:0.9736	Metrics (Test loss &Test Accuracy): [0.12595367431640625, 0.9736999869346619]

P

TESTING

```
# Importing Libarries
fromtensorflow.keras.modelsimportload_modelfr
omtensorflow.keras.preprocessing import image
import numpy as np import cv2 # loading model
model = load_ model('aslpng1.h5') from sk
image. transform import resize def detect(frame):
    img=resize(frame, (64,64,3))
    img= np. expand_ dims(img,
    axis=0)if np .max(img)>1:
        img=img/255.0
    prediction=model.predict(img)p
    rint(prediction)
    return prediction frame = cv2.imread(r"D:\Real-time Communication
System for specially abled\Dataset\test_set\A\16.png") data
=detect(frame)
index=['A','B','C','D','E','F','G','H','I']
index[np.argmax(data)]#ImportingLi
brariesimportcv2

import numpy as np
```

P

```
fromtensorflow.keras.modelsimportload_modelfromte
nsorflow.keras.preprocessingimportimage
#Loading Model
model=load_model("aslpng1.h5")video
=cv2.VideoCapture(0)
index=['A','B','C','D','E','F','G','H','I']while
True:
    success, frame =
    video.read()cv2.imwrite('frame
    .jpg',frame)
    img=image.load_img('frame.jpg',target_size=(64,64))x=i
    mage.img_to_array(img)
    x=cv2.cvtColor(x,cv2.COLOR_BGR2HSV)a
    = x.array_to_img(x)
    cv2.imshow("")
x=np.expand_dims(x,axis=0)
    pred=np.argmax(model.predict(x),axis=1)
y=pred[0]
    copy=frame.copy()
    cv2.rectangle(copy,(320,100),(620,400),(255,0,0), 5)
    cv2.putText(frame, "The Predicted Alphabet : " + str(index[y]), (100,
100),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,0),4)
    cv2.imshow('frame',frame)
    ifcv2.waitKey(1)&0xFF==ord('q'):break
```

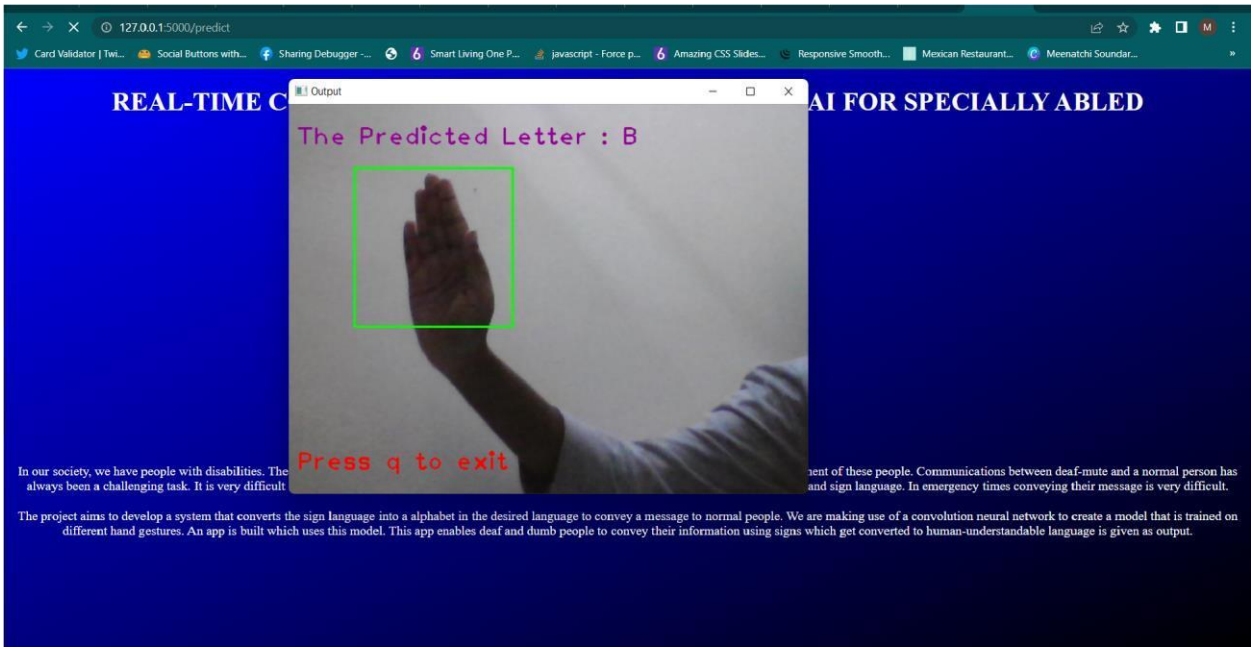
P

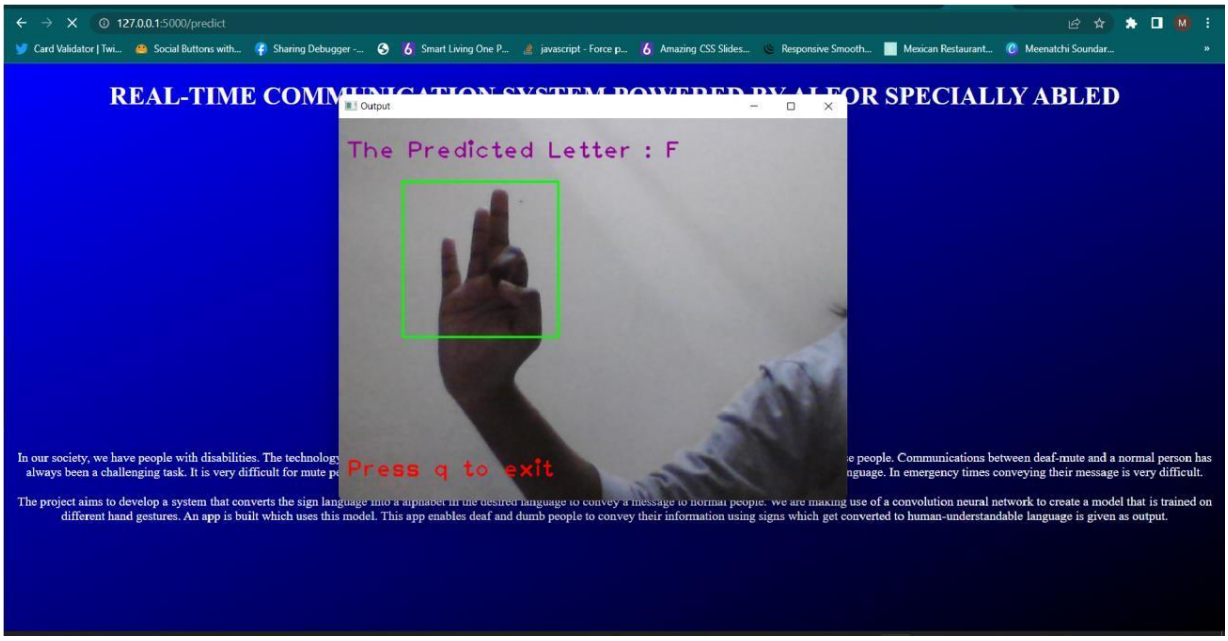
video. release()cv2.destroyAllWindows()

RESULT

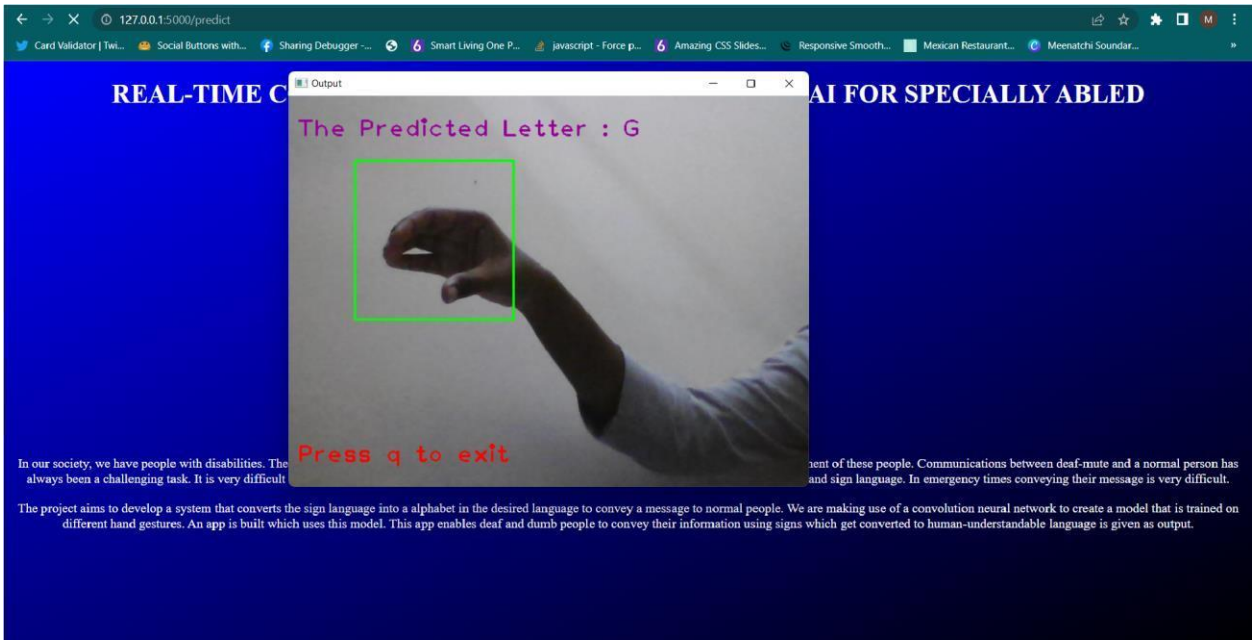
Performance Metrics

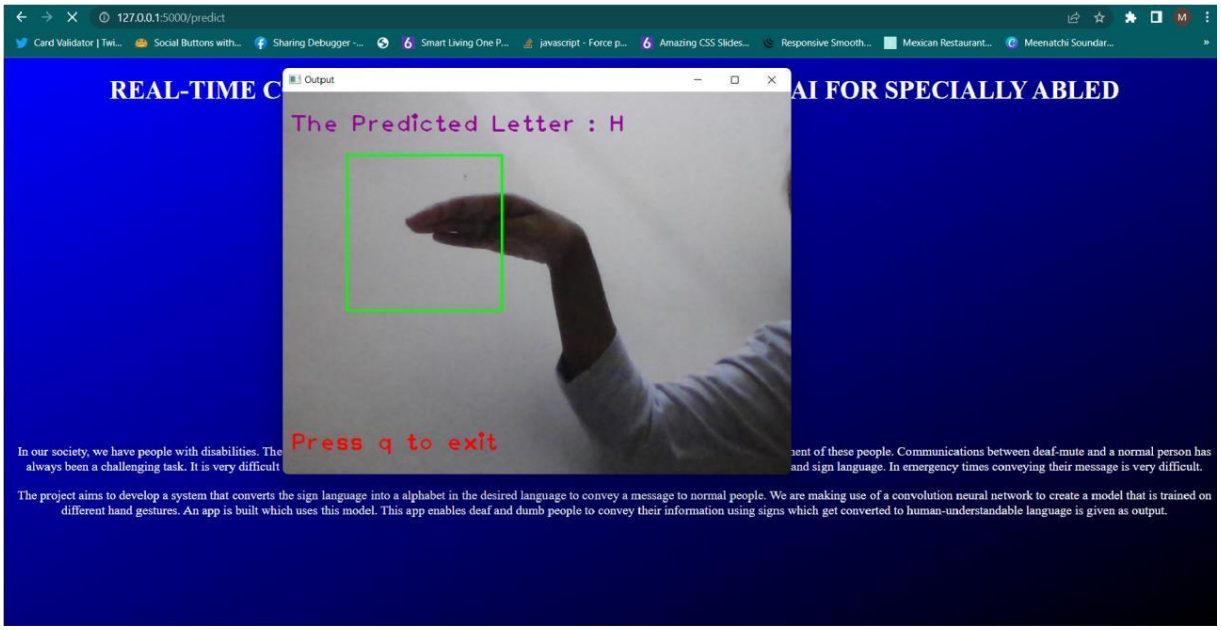
P


127.0.0.1:5000/predict
REAL-TIME C
AI FOR SPECIALLY ABLED
Output
The Predicted Letter : B
Press q to exit
In our society, we have people with disabilities. The
ent of these people. Communications between deaf-mute and a normal person has
always been a challenging task. It is very difficult
and sign language. In emergency times conveying their message is very difficult.
The project aims to develop a system that converts the sign language into a alphabet in the desired language to convey a message to normal people. 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 is given as output.


127.0.0.1:5000/predict
REAL-TIME COMM
OR SPECIALLY ABLED
Output
The Predicted Letter : F
Press q to exit
In our society, we have people with disabilities. The technolog
e people. Communications between deaf-mute and a normal person has
always been a challenging task. It is very difficult for mute p
nguage. In emergency times conveying their message is very difficult.
The project aims to develop a system that converts the sign language into a alphabet in the desired language to convey a message to normal people. 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 is given as output.

P


127.0.0.1:5000/predict
REAL-TIME C
AI FOR SPECIALLY ABLED
Output
The Predicted Letter : G
Press q to exit
In our society, we have people with disabilities. The
ent of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult
and sign language. In emergency times conveying their message is very difficult.
The project aims to develop a system that converts the sign language into a alphabet in the desired language to convey a message to normal people. 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 is given as output.


127.0.0.1:5000/predict
REAL-TIME C
AI FOR SPECIALLY ABLED
Output
The Predicted Letter : H
Press q to exit
In our society, we have people with disabilities. The
ent of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult
and sign language. In emergency times conveying their message is very difficult.
The project aims to develop a system that converts the sign language into a alphabet in the desired language to convey a message to normal people. 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 is given as output.

P

ADVANTAGES AND

DISADVANTAGES

ADVANTAGE:

- Communication is the key in this societypeoplewithdisabilitytendssufferbuttheproposedsystemprovidesasolutiontoth em.
- Makes the translation of sign language to English easy.
- It can identify and translate the live and moving images.
- The proposed system ensures the easy translation of sign language to English.
- Eventhepeoplewithlackofsignlanguagecanusetheproposedsystemeasily.
- This does not require high-end device to use it.
- Can be used on almost all operating systems and browses.
- Does not require prior programming knowledge tuse the system
- The proposed system is user friendly.
- Makes the life of the person with disability easy.

DISADVANTAGE:

- The proposed system is nota two-way translation system.
- There is chance for wrong translation.
- Sinceitisawebpage-basedsystem,itdoesrequireinternetconnectivitywhich can be in convenient times.

- It would have been convenient if it is application based.

CONCLUSION

Sign language is a useful tool for facilitating communication between deaf and hearing people. Because it allows for two-way communication, the system aims to bridge the communication gap between deaf people and theres to society. The proposedmethodologytranslateslanguageintoEnglishalphabetsthatareunderstandabletohumans.This system sends hand gestures to the model, who recognizes them and displays the equivalent Alphabet on the screen. Deaf-mute people can use their hands to perform sign language, which will then be converted into alphabets, thanks to this project.

FUTURE

SCOPE

In the future to take the project to the next level two way communication system such as sign language to english and english to sign language is beign under the planning phase. The application version of the web page for both ios and android is also in planningprocessforthefuturedevelopment.Researchtoimprovetheaccuracyofthesystemisunderprogress.

P

APPENDIX

SOURCECODE:

HTML:

```
<!DOCTYPEhtml>
<html>
<head>
<title>RealTimeCommunication</title>
<style>body
{
background-image:linear-
gradient(tobottomright,blue,black);background-repeat: no-
repeat;
background-attachment:fixed;
}
h1,h2,a,p{co
lor:white;
}
</style>
</head>
<body>
<divclass="title">
<h1><center>
REAL-TIMECOMMUNICATIONSYSTEMPOWEREDBYAI
```

P

FORSPECIALLYABLED </h1>

<imgsrc="../static/img/img.png"width="300"height="300">

<h2>ShowtheseGesturestoget the Alphabet</h2>

<ahref="{{url_for('predict')}}">CLICKHERETO
SHOWYOURGESTURES

In our society, we have people with disabilities. The technology is developing day by day but no significant development sareunder taken for the better men to f 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 project aims to develop a system that converts the sign language into a alphabet in the desired language to convey a message to normal people. 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 is given as output.

</body>

</html>

P

PYTHON:

```
fromflaskimportFlask,render_template,requestimportcv
2

from keras. Model sim port load_
model import numpy as np from gtts
import gTT Simportos
fromkeras.preprocessingimportimagefr
om skimage.transform import
resizefromplaysoundimport
playsoundapp
=
Flask(_name_)model=load_model("
aslpng1.h5")vals=['A','B','C','D','E','F
','G','H','I']
@app.route('/',methods=['GET'])defi
ndex():
        return
render_template('index.html')@app.route('/in
dex', methods=['GET']) defhome():
        return
render_template('index.html')@app.route('/predict',
methods=['GET','POST'])defpredict():
                print("[INFO]startingvideostream...")v
                s=cv2.VideoCapture(0)
                (W,H)=(None,None)w
```

P

hileTrue:

```
P

            (grabbed,frame)=vs.read()
                        ifnotgrabbed:
                                    break
                        ifWis Noneor HisNone:
                                    (H, W) =
                         frame.shape[:2]output=frame.copy
                         ()
                         # r = cv2.selectROI("Slect",
                       output)#print(r)
                         cv2.rectangle(output,(81,79),(276,274),(0,255,0),2)fra
                         me=frame[81:276,79:274]
                         frame= cv2.cvtColor(frame,cv2.COLOR_RGB2GRAY)
                         _, frame = cv2.threshold(frame, 95,
    255,cv2.THRESH_BINARY_INV)
                         frame=cv2.cvtColor(frame,cv2.COLOR_GRAY2RGB)i
                        mg=resize(frame,(64,64,3))
                        img=np.expand_dims(img,axis=0)i
                         f(np.max(img)>1):
                                    img=img/255.0
                       result=np.argmax(model.predict(img))i
                       ndex=['A','B','C','D','E','F','G','H','I']
                         result=str(index[result])
                    cv2.putText(output,"The
    PredictedLetter:{}".format(result),(10,50),cv2.FONT_HERSHEY_PLAIN,
                                                2,(150,0,150),2)
```

P

```
                    cv2.putText(output,"Pressqtoexit",(10,450),cv
2.FONT_HERSHEY_PLAIN,2,(0,0,255),2)

                speech = gTTS(text = result, lang = 'en', slow =

                    False)cv2.imshow("Output",output)

                    key = cv2.waitKey(1) &

                    0xFFifkey==ord("q"):

                        breakprint(

            "[INFO] cleaning

            up...")vs.release()cv2.destroy

            AllWindows()

            returnrender_template("index.html")if

_name_=='_main_':

        app.run(debug=True)TRAI

NNINGCODE:

#ImportingLibraries

fromtensorflow.keras.preprocessing.imageimportImageDataGenerator

#ImageAugmentation

train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_ra

nge=

0.2,horizontal_flip=True)test_datagen=Im

ageDataGenerator(rescale=1./255)

#Loadingtrainandtestset

X_train = train_datagen.flow_from_directory(r"D:\Real-time Communication System
forspeciallyabled\Dataset\training_set",target_size=(64,64),batch_size=32,class_mode
='categorical')
```

P

```
X_test = test_datagen.flow_from_directory(r"D:\Real-time Communication System
forspeciallyabled\Dataset\training_set",target_size=(64,64),batch_size=32,class_mode
='categorical')

# checking

indicesX_train.class_i

ndices#

ImportingLibraries

fromtensorflow.keras.modelsimportSequentialfromte

nsorflow.keras.layers importDense

fromtensorflow.keras.layersimportConvolution2D,MaxPooling2D,Flatten#I

nitializingtheModel

model=Sequential()#

AddingConvolutionLayer

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

ingPoolingLayer

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

AddingFlattenLayer

model.add(Flatten())#

AddingHiddenLayer

model.add(Dense(units=512,kernel_initializer='random_uniform',activation='relu'))

# Adding Output Layer model.add(Dense(units = 9, kernel_initializer

='random_uniform', activation = 'softmax')) # Compile the

modelmodel.compile(loss = 'categorical_crossentropy', optimizer = 'adam',

metrics =['accuracy'])#Fiitingthemodel

model.fit_generator(X_train,steps_per_epoch=24, epochs = 10, validation_data

= X_test, validation_steps = 40) # Saving themodelmodel.save('aslpng1.h5')
```

P

TESTINGCODE:

```
#ImportingLibarries
fromtensorflow.keras.modelsimportload_modelfromte
nsorflow.keras.preprocessing import image
importnumpy as np import cv2 # loading model model
=load_model('aslpng1.h5') from
skimage.transformimportresizedefdetect(frame):
    img=resize(frame, (64,64,3))
    img=np.expand_dims(img,axis=0)ifn
    p.max(img)>1:
        img=img/255.0
    prediction=model.predict(img)p
    rint(prediction)
    return prediction frame = cv2.imread(r"D:\Real-time Communication
System for specially abled\Dataset\test_set\A\16.png") data
=detect(frame)
index=['A','B','C','D','E','F','G','H','I']
index[np.argmax(data)]#ImportingLi
braries import cv2 import
numpyasnp
fromtensorflow.keras.modelsimportload_modelfromte
nsorflow.keras.preprocessingimportimage
# Loading Model model
=load_model("aslpng1.h5")video=cv
2.VideoCapture(0)
```

P

```
index=['A','B','C','D','E','F','G','H','I']while
True:
    success, frame =
    video.read()cv2.imwrite('frame
    .jpg',frame)
    img=image.load_img('frame.jpg',target_size=(64,64))x=i
    mage.img_to_array(img)
    x=cv2.cvtColor(x,cv2.COLOR_BGR2HSV)a
    = x.array_to_img(x)
    cv2.imshow("")
x=np.expand_dims(x,axis=0)
    pred=np.argmax(model.predict(x),axis=1)
y=pred[0]
    copy=frame.copy()
    cv2.rectangle(copy,(320,100), (620,400), (255,0,0), 5)
    cv2.putText(frame, "The Predicted Alphabet : " + str(index[y]), (100,
100),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,0),4)
    cv2.imshow('frame',frame)
    ifcv2.waitKey(1)&0xFF==ord('q'):break

video.release()cv2.destroyAllWindows()
```

P

GITHUBLINK:

https://github.com/IBM-EPBL/IBM-Project-5964-1658821323