



## Recognition of Sign Language Gestures Using Neural Networks

<sup>1</sup>Sakshi Nikam, <sup>2</sup>Sanket Salunkhe, <sup>3</sup>Vedika Patil, <sup>4</sup>Avishkar Dabare <sup>5</sup>Mrs.R.R.Gaur

<sup>1,2,3,4</sup> B. Tech Student, <sup>5</sup>Assistant Professor

<sup>1,2,3,4,5</sup> Department of Computer Science and Engineering

<sup>1,2,3,4,5</sup> Nanasahab Mahadik College of Engineering, Peth, India

**Abstract - In Daily life, they face many issues to communicate as they use sign language to convey their message. But Common human cannot understand sign language as it is hard to learn sign language to everyone. To bridge the gap between the communication of deaf and mute people with any common person for this problem, we have proposed model to identify Indian Sign Language into text .Hence there is a need of a system which recognizes the different signs, gestures, and conveys the information to the normal people. It bridges the gap between physically challenged people and normal people.**

**IndexTerms - Opencv, Keras , Streamlit , Neural Network .**

### I. INTRODUCTION

Indian sign language is a predominant sign language Since the only disability Deaf and Mute people have been communication related and they cannot use spoken languages hence the only way for them to communicate is through sign language. Communication is the process of exchange of thoughts and messages in various ways such as speech, signals, behavior, and visuals. Deaf and dumb (Deaf and Mute) people make use of their hands to express different gestures to express their ideas with other people. Gestures are the non-verbally exchanged messages and these gestures are understood with vision. This nonverbal communication of deaf and dumb people is called sign language. The way deaf and dumb people communicate is called as sign language. Sign language is a visual language and consists of 3 major components. Finger Spelling, Word Level Vocabulary and Non-Manual Features . we basically focus on producing a model which can recognize Finger spelling-based hand gestures in order to form a complete word by combining each gesture. The gestures we aim to train are as given in the image below.

### II. LITERATURE REVIEW

[1]" Indian Sign Language Recognition" , Ashwitha ,Anjali Maben, Prajna Shetty, Mamatha Salian , 2021 .The paper focuses on designing and developing a user interface to help the dumb community in making a better use of their gestures. It mainly deals with making services of the hand gestures to be easily accessible and understandable to by the people using

sign languages. This system makes use of data collected from standards of Indian Sign Languages (ISL). The system is built using machine learning tools, TensorFlow library. The result of this project is to translate the gestures into the texts and return it to the web interface. The sole reason of this project is to help the individual with speech and hearing impairment.

[2]" Detection and Recognition of Hand Gestures for Indian Sign Language Recognition System", Mitashi Bansal , Sumita Gupta , 2021 . People with disabilities (hearing and listening impaired) have a vast social circle all over the world. For deaf and mute people, the sign language paves a way for the better communication which is the method that everyone understands and leads to effective communication among our diverse population. This study provides a comparative analysis for this complex task problems which are out of reach for a simple machine. As a result, there is an urgent need for the solution for such a problem, so the solution is integrating this problem with Machine Learning algorithms like Support Vector Machine, Convolutional Neural Network, K- Nearest neighbors. The results produced from Convolutional Neural Network are more accurate than those which is achieved by other several classifiers.

[3]"Sign Language Recognition Systems " , Biswara-jan Samal , Mruntyunjaya Panda , 2021 .Human-computer interaction is capable of solving the complex problems and challenges faced by human beings, among many of the complex jobs Sign Language Recognition is one of them. Therefore, automatically detecting the sign language is a broad area of research many works have been done in this area, and still, the work is going on. A variety of sign languages can be found throughout the globe sometimes the sign languages can be diversified by the country or region, the sign language(SL) which is available in India is known as the Indian Sign Language(ISL). Indian sign language requires the involvement of both hands, face, and upper body part movement which makes it difficult from the other single-handed sign languages. If we compare the Static gesture identification with the dynamic gesture identification, it is obvious that the former is easier. In real-life scenarios, a system should have the ability to identify the continuous and dynamic gestures, so that it can become an inter-face between the hearing impaired people and the normal people. Therefore, an Integrative review has been presented here which strongly summarizes the works on Indian Sign Language Recognition(ISLR) systems capable of identifying

the dynamic and continuous Vision-based gestures without using any gloves or sensor-enabled wearables.

[4] "Indian Sign Language Recognition Using Random Forest Classifier", Ajay S , Ajith Potluri , Sarah Mohan George , Gaurav R , Anusri S , 2021 .Communication is the foundation of all human relationships, both personal and professional. It is one of the basic requirements for survival in a society. Verbal communication is impossible without a well-defined language that is understood by both parties. Around 26 percent of the disabled population in India use sign language for communication. As a result, there is a pressing need to bridge the communication gap between the general public and the speech impaired.

[5]" Indian Sign Language Recognition on PYNQ Board ", Sukhendra Singh , Vivek Singhal , G N Rathna, 2022 . Sign language is the only way to communicate for speech-impaired people. But this sign language is not known to normal people so this is a barrier in communication. This is the problem faced by people with speech impairments or disorder. In this paper, we have presented a system which captures hand gestures with a Kinect camera and classifies the hand gesture into its correct symbol. We used the Kinect camera, not the ordinary web camera, because the ordinary camera does not capture its 3d orientation or depth of an image; however, Kinect camera can capture 3d image and this will make the classification more accurate.

[6]"Indian Sign Language Recognition using SVM Classifier", Deepali Mali , Nithin Limkar, Satish Mali , 2019. Sign language is the medium of communication for the hearing impaired people. It uses gestures instead of sound to convey meaning. It combines hand-shapes, orientation and movement of the hands, arms or body, facial expressions and lip-patterns for conveying messages. Different types of project are done against deaf, mute, hard hearing people. A system with computer human interface is proposed for sign language recognition. But there is country wide variation available in that project. The main idea of this project is design a system which is useful for communication of that people with outside world in any public places, so that no need to interpreter in public places. In that project we need the isolated images in the form of database with Indian sign language of numeric sign. A regular camera is useful for acquiring this numeric sign.

### III . METHODOLOGY

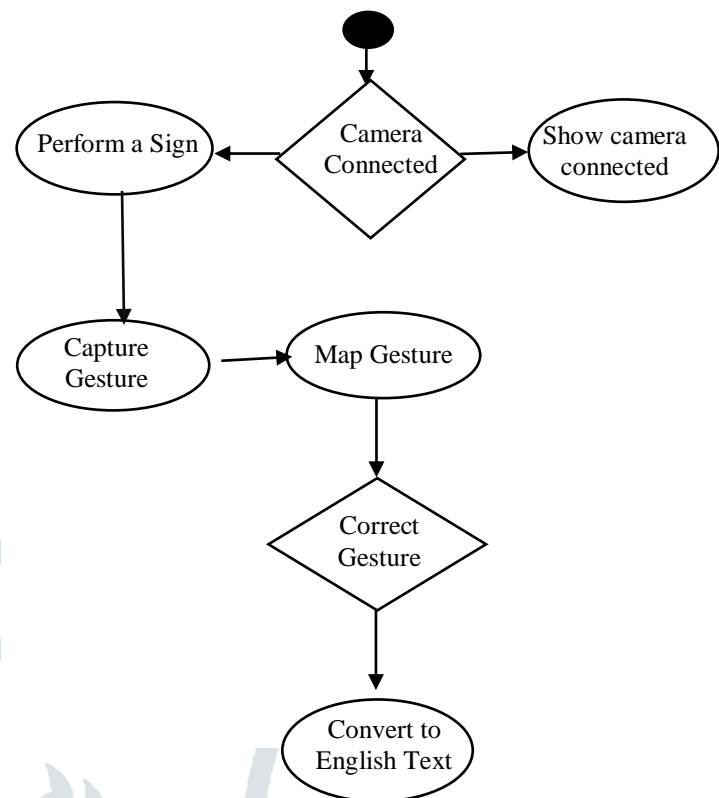


Figure 1 : System Architecture

#### 1. DATA AQUISION:

In vision-based methods computer camera is the input device for observing the information of hands or fingers. The Vision Based methods require only a camera, thus realizing a natural interaction between humans and computers without the use of any extra devices. These systems tend to complement biological vision by describing artificial vision systems that are implemented in software and/or hardware. The main challenge of vision-based hand detection is to cope with the large variability of human hand's appearance due to a huge number of hand movements, to different skin-colour possibilities as well as to the variations in viewpoints, scales, and speed of the camera capturing the scene. We have gathered images in form of .npy form which are very much compatible with Machine learning model to work with and analyze image .

#### 2. MODEL LOADING AND COLOR INITIALIZATION:

Make sure you have required libraries installed . For python can use pip or conda to install the OpenAI Python library. In Python script, import the libraries needed for model loading and color initialization. These typically include the OpenAI library and any additional libraries for color manipulation. If you want to initialize color-related information, you can use the ImageColor.getrgb() method from the PIL (Python Imaging Library) module. Pass a color name or hexadecimal value as a parameter to get the corresponding RGB tuple .

#### 3. DATABASE MANAGEMENT:

The code defines functions for password hashing and checking hashes using the hashlib module. It establishes a

connection to an SQLite database and creates a cursor for executing SQL queries. We have used SQLITE and Python to create database to add user. User every time enter its information it is going to store in database . User need to have account on website so if its first user it needs to sign up first and after creating the account successfully, User will login which will allow user to access gesture recognition.

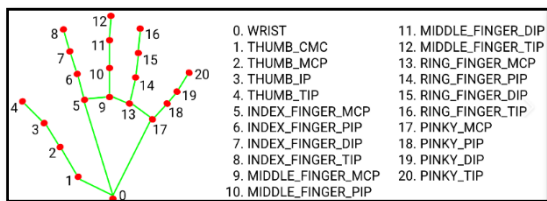


Figure 2: Initialization of hand Landmark

#### 4. USER INTERFACE SETUP:

The code uses Streamlit to create a user interface with different menu options, such as Home, Login, Signup, Text to Speech, and Gesture Recognition. Streamlit is python framework that create web interface as user require, **Streamlit**, an open-source app framework that allows us to deploy ML models easily. you write app as same you write your python script. Streamlit have unique data flow that it if we update anything on page it will rerun the whole program from top to bottom. Streamlit allows us to create apps for our machine-learning project with simple Python scripts. Hot reloading is also supported, so our app can be updated live while we edit and save our file. Streamlit API allows us to create an app in a few lines of code (as we'll see below). Declaring a variable is the same thing as adding a widget. We don't need to create a backend, handle HTTP requests or define different routes. It's easy to set up and maintain. Login checkbox, the code checks the entered credentials against the users table in the database. If the login is successful, the code proceeds to the Gesture Recognition section.

#### 5. GESTURE RECOGNITION:

This section talks about how gesture is recognized with model code sets up the webcam feed using OpenCV's Video Capture. It uses the Media Pipe library for hand detection and landmarks. The main function of the hand detect class is called, which performs the following steps: Reads frames from the webcam and flips them horizontally. Processes the frames using the Media Pipe Hands module to detect hand landmarks. Draws the detected landmarks on the frames. Counts the number of fingers raised by analyzing the landmarks. Displays the gesture recognition result on the frames. Stops the webcam feed when the ESC key is pressed.

#### 6. OPENCV:

OpenCV(Open-Source Computer Vision) is an open source library of programming functions used for real-time computer-vision.

It is mainly used for image processing, video capture and analysis for features like face and object recognition. It is written in

C++ which is its primary interface, however bindings are available for Python, Java, MATLAB/OCTAVE.

#### 7. MediaPipe:

MediaPipe is a flexible framework that allows developers to easily construct complex pipelines for real-time multimedia processing. It provides a wide range of pre-built models and algorithms, enabling tasks like hand tracking, pose estimation, and object detection. MediaPipe supports various platforms, making it suitable for applications on mobile devices, desktops, and edge devices. MediaPipe offers a diverse set of features, including robust and efficient AI models, powerful data processing capabilities. The framework supports a variety of input sources such as video, image sequences, and camera feeds. It includes a wide range of pre-trained models for tasks like hand tracking, pose estimation, face detection, and more. MediaPipe allows developers to customize and extend the provided models to suit their specific requirements.

### IV. RESULTS

#### 1 MAIN HOME PAGE :

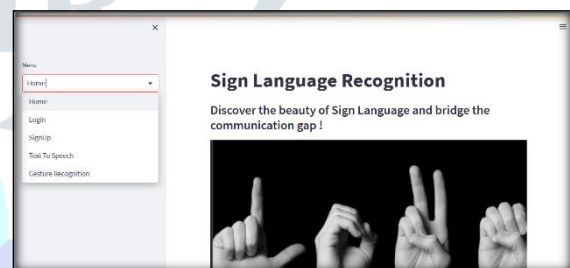


Figure 3 : Home page

#### 2 . GESTURE RECOGNITION :



Figure 4 : Gesture Recognition

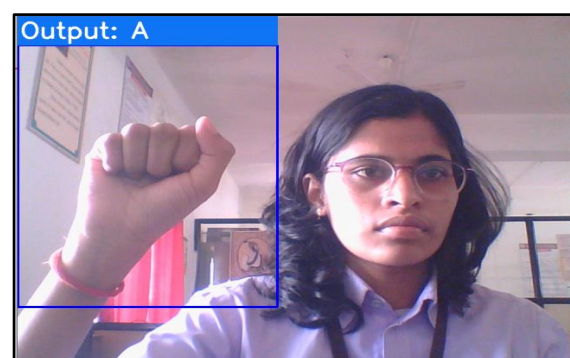


Figure 5 : Gesture Recognition

## V . CONCLUSION

A functional real time vision based Indian sign language recognition for Deaf and Mute people have been developed for ISL alphabets We are able to improve our prediction after implementing two layers of algorithms in which we verify and predict symbols which are more similar to each other. This way we are able to detect almost all the symbols provided that they are shown properly, there is no noise in the background and lighting is adequate . We are planning to achieve higher accuracy even in case of complex backgrounds by trying out various background subtraction algorithms. We are also thinking of improving the preprocessing to predict gestures in low light conditions with a higher accuracy.

## VI . REFERENCE

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