SMART SIGN LANGUAGE BY USING IMAGE PROCESSING TECHNIQUE

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Abstract-- **Sign language is an incredible advancement that has grown over the years. They are a form of non-verbal communication in which visible bodily actions are used to communicate important messages, either in place of speech or together and in parallel with spoken words. Sign Language include movement of the hands, face, or other parts of the body. Physical non-verbal communication such as purely expressive displays, proxemics, or displays of joint attention differ from gestures, which communicate specific messages. Gestures are culturally distinctive and can communicate a wide range of meanings in various social and cultural contexts. Unfortunately, there are several disadvantages associated with this language. When conversing with a deaf or dumb individual, not everyone knows how to interpret sign language. Sign language is always required for communication. Without an interpreter, communication is difficult.**

We need a product that is both adaptable and robust to solve this. We need to transform sign language so that it can be understood by the general public and used to assist individuals communicate without obstacles.

Our project's major goal is to break down the barriers that exist between the deaf and the rest of society. We'll follow the path of human action and look for patterns in the languages. Each instant of the joint, elbows, and face must be identified. It is capable of categorising live video activity of human sign languages such as alphabets, phrases, and sentences using a Deep Learning algorithm.

***Keywords*—Sign learning, Deep learning and Gestures**

I INTRODUCTION

A digital image is a two-dimensional image that has been processed by a computer. It refers to the digital processing of any two-dimensional data in a larger sense. A digital image is a collection of real or complex numbers encoded in a finite amount of bits. An picture on a transparency, slide, photograph, or X-ray is first digitised and stored in computer memory as a matrix of binary numbers. After that, the digital image can be processed and/or seen on a high-resolution television monitor. The image is stored in a rapid-access buffer memory for display, and the monitor is refreshed at a rate of 25 frames per second to generate a visually continuous display.

Sign language is commonly used by deaf-dumb persons as a means of communication. A sign language is made up of diverse motions made up of distinct hand shapes, movements, and orientations, as well as face expressions. Hearing loss affects roughly 466 million people globally, with 34 million of them being children. People who are referred to as "deaf" have little or no hearing capabilities. They communicate through sign language. In different places of the world, people utilise different sign languages. They are insignificant in comparison to spoken languages. Indian Sign Language is the country's native sign language (ISL). There are extremely few schools for deaf pupils in poor nations.

The portrayal of letters in a writing system, as well as numeral systems, is known as finger spelling. Fingerspelling can be used to represent the English alphabets A-Z in Sign Language (ISL). It can be done one-handed or two-handed, and ISL prefers the latter. It was created to represent words that do not have a symbol equivalent or to emphasise a word. Finger spelling is less common in informal signing,

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although it is an important part of learning sign language. The goal of this experiment was to recognise alphabets in Indian Sign Language using gestures. The recognition of gestures and sign languages is a well-studied topic in American Sign Language (ASL), but few studies on Indian Sign Language have been published (ISL).

II LITERATURE SURVEY

In 2020**,** D Prakhya, M Sri Manjari, A Varaprasadh, D Krishna Vamsi worked on "A Robust Sign Language And Hand Gestures Recognition System Using Convolution Neural Networks" and explains for someone who is unable to talk or hear, sign language is their only means of communication. Physically challenged people can express their thoughts and emotions via sign language. In this paper, an unique sign language identification technique for identifying alphabets and motions in sign language is proposed. We can recognise the indications and provide the appropriate text output using computer vision and neural networks.

In 2020, A Thesis worked on "Deep Learning Application On American Sign Language Database For Video-Based Gesture Recognition" and explains about individuals who speak ASL always have a translator with them. This causes obstacles for persons who want to participate in activities by themselves. Online translators exist, however they are limited to individual characters rather than motions that meaningfully aggregate characters, and connectivity is not always available. As a result, this study addresses the shortcomings of existing technologies and proposes a model for predicting and classifying American sign language gestures/characters, which is implemented in MATLAB 2020b. The suggested method investigates current neural networks and how they might be applied to the World's Largest - American Sign Language data collection. This research examines the effectiveness of pre-trained networks against these various detection and segmentation techniques using state-of-the-art detection and segmentation algorithms.

In 2020, Teena Varma, Ricketa Baptista, Daksha Chithirai Pandi, Ryland Coutinho worked on "Sign Language Detection using Image Processing and Deep Learning" explains about Sign Language is a language in which we communicate with persons who are mostly deaf and dumb by using hand movements and gestures. This paper proposes a system to recognise hand gestures using a Deep Learning Algorithm and a Convolution Neural Network (CNN) to process the image and predict the processing techniques such as greyscale, thresholding, skin masking, and Canny Edge Detection were designed and tested with our dataset to improve recognition accuracy. The identification of 26 alphabets and 0-9 digits hand movements in American Sign Language is demonstrated in this article. Pre-processing and feature extraction, model training and testing, and sign to text conversion are all included in the proposed system.

In 2021, Ilias Papastratis, Christos Chatzikonstantinou, Dimitrios Konstantinidis, Kosmas Dimitropoulos and Petros Daras worked on "Artificial Intelligence Technologies for Sign Language" and explains about AI technologies have the potential to help deaf or hearing-impaired people communicate with other communities, hence increasing their social inclusion. Recent advancements in both sensor technology and AI algorithms have paved the way for the creation of a variety of applications aimed at meeting the needs of deaf and hearing-impaired people. To that end, the purpose of this survey is to provide a complete evaluation of current state-of-the-art approaches in sign language capturing, recognition, translation, and representation, as well as their benefits and drawbacks. The study also includes a list of applications as well as a discussion of the major obstacles in the field of sign language technologies. Future study directions are also suggested in order to aid future scholars in furthering the discipline.

III PROPOSED SYSTEM

Individuals who are deaf or hard of hearing can communicate through sign language. Individuals communicate their sentiments and desires through nonverbal contact by using sign language expressions. Non-signers, on the other hand, find it extremely difficult to understand, which is why certified sign language interpreters are required for medical and legal activities, as well as training and instructional sessions. Over the last five years, the need for translation services has skyrocketed. Video remote analysis and high-speed Broadband connectivity are

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among the new methods. They also have a simple sign language communication tool that can be used, although it has significant limitations, such as the need for internet access and a compatible computer. Check the experiment with additional metrics to examine the precision of the measurements of larger sample scales and evaluate two separate CNN outputs, as one suggestion. We also recommend using sign language with live actions to aid direct communication. It is more accountable than the standard image model. In addition, there is a sufficient number of videos, which strengthens our model. It is capable of identifying Videos of various sign languages, such as words and sentences, using a Deep Learning algorithm.

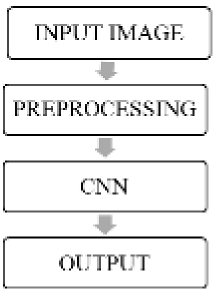

FIG 1: BLOCK DIAGRAM OF MATLAB IMAGE PROCESSING AND IMAGE DATASET

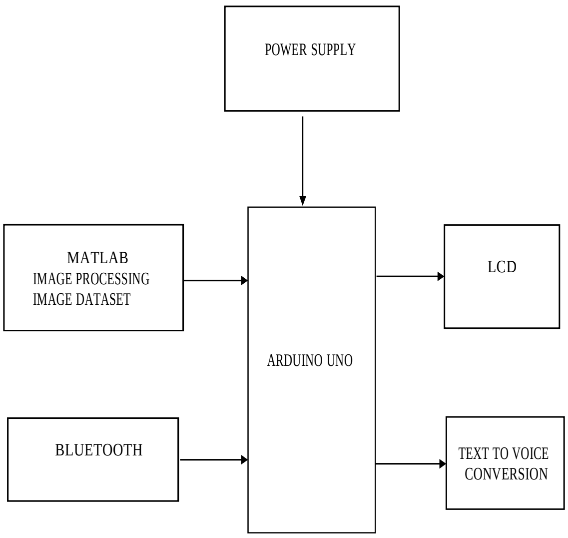

FIG 2: BLOCK DIAGRAM OF PROPOSED SYSTEM

Arduino UNO microcontroller id used to interface between MATLAB Image Processing and communication device. In MATLAB image processing technique is well trained and tested. LCD is used to display tested values. Text to Voice conversion is done by using Bluetooth module.

IV SYSTEM ARCHITECTURE

FIG 3: SYSTEM ARCHITECTURE

We will provide input via OpenCV, which will be detected by video, after which frame conversion will occur, and movies will be captured frame by frame. These captured videos will be collected, each with a different sign language. Pre-processing will begin after all of the collected data has been stored. All of the data must first be trained, and then the data must be tested in a neural network. We must now develop a NN model using all of the data we have gathered. We will now do a live video that will be captured frame by frame. Finally, output based on detected live Sign language will be generated.

V WORK FLOW

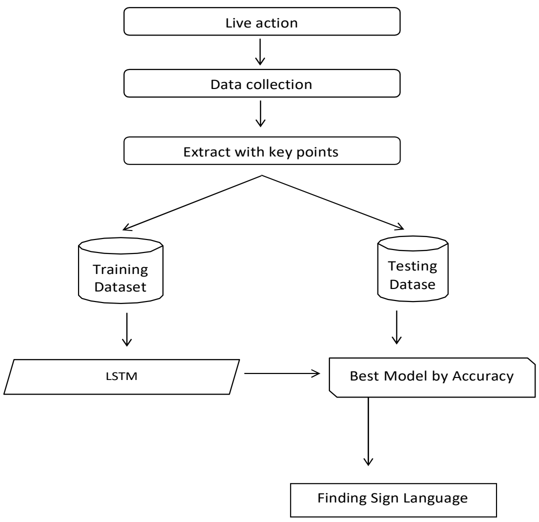

FIG 4: FLOW CHART

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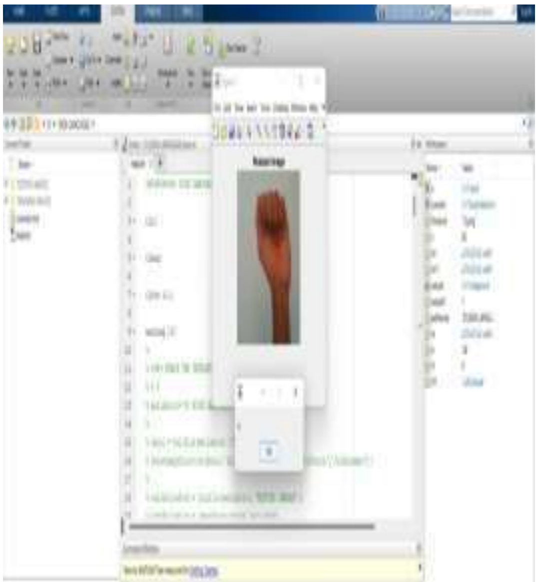
VI RESULT ANALYSIS



VII CONCLUSION

We used methods learned in computer vision and machine learning to construct an autonomous sign language gesture recognition system in real-time in this project. Despite using a sophisticated segmentation technique, the most effective skin masks were extracted using a simple skin segmentation model. We also recognised the time restrictions and challenges of building a dataset from the ground up. Looking back, having a dataset to work with would have been preferable. Some letters, such as "a" and I were more difficult to classify in our live demonstration because they only differ by a slight edge (the I has the pinky pointing up).

Extending the gesture recognition system to all ASL alphabets and additional non-alphabet motions would be possible extensions to this project. We believe that by coding in C, we can boost the speed of our real-time system, having chosen MATLAB as the implementation platform. The project's foundation can be used for a variety of additional applications, such as commanding robot navigation with hand gestures. The study also looked at how films from a specific dataset (trained dataset) in the field and previous data sets were used to predict the pattern of various live action using a neural network model. This results in some of the following live sign predictions. We analysed the accuracy and loss of several types of neural networks to produce better classification.

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