International Journal of Scientific Research & Engineering Trends
Volume 9, Issue 2, Mar-Apr-2023, ISSN (Online): 2395-566X

Sign Language Translator

Asst. Prof. Ms. Pragati V. Thawani, Ms.Kaanchi Mukati, Ms.Shreya Jaiswal
Department of (IT)
K.C College,Mumbai,India
Pragati.thawani@kccollege.edu.in, Kaanchmukati@gmail.com, jaiswalshrya595@gmail.com

Abstract- Individuals who have trouble hearing can communicate by using sign language. Since it might bedifficult for regular people to communicate with deaf people, this technique is beneficial for helping them. The system suggested in this research seeks to partially address this issue.In order to create a real-time sign language dataset using a computer or laptop web camera and then use the Tensor Flowmodel and LSTM Deep Learning Model, along with many other technologies, to create a real-time sign language recognition system and aid in closing the gap between signers and non-signers, the authors proposed a method. Four modules—image capture, pre-processing, classification, andprediction—make up the proposed system.

Keywords- Real-time, OpenCV, NumPy, MediaPipe, Python, TensorFlow, Keras, LSTM Deep Learning Model.

I. INTRODUCTION

In layman's terms, communication is defined as the act of sharing information, ideas, and emotions with two or more people; however, this is not as straightforward for individuals with disabilities. They use hand gestures and signs to communicate, but not everyone is familiar with or understands sign language, which makes it challenging for both normally abled and differently abled individuals to comprehend one another. The system suggested in this research seeks to partially address this issue. The authors suggested a technique for developing a real-time sign language dataset utilizing a computer or laptop web camera and a variety of other technologies, including the TensorFlow model and the LSTM Deep Learning Model.

The way the world functions is rapidly changing and improving thanks to technology. As projects from the past two decades have progressed, there are less obstacles for deaf persons. Researchers are working to create gear and software that will influence how deaf people communicate and learn through the use of artificial intelligence. Our study focuses on finding a way to help the deaf and hard of hearing communicate with others, as well as the possible effects that these efforts may have on deaf education and communities at large.

For those who are deaf or hard of hearing, communicating with those who do not understand sign language becomes a major concern. In these circumstances, a sign language interpreter is required to ensure communication and understanding. Since it might be difficult for regular people to communicate with deaf people, hence People who have trouble hearing can communicate by using sign language this technique is beneficial for helping them. The system suggested in this research seeks to partially address this issue. In order to create a real-time sign language dataset using a computer or laptop web camera and then employ the Tensor Flow model and LSTM Deep Learning Model, along with many other technologies, to create a real-time sign language recognition system and aid in closing the gap between signers and non- signers, the authors proposed a method. Four modules— image capture, pre-processing, categorization, and prediction—make up the proposed system.

II. LITERATURE SURVEY

Mohammed Elmahgiubi, Mohamed Ennajar, Nabil Drawil, and Mohamed Samir Elbuni developed a sign language translator and gesture recognition system. Their created sign language translator uses a glove with sensors that can decipher the (ASL) alphabet to do the work. On a single chip, a 6-DOF accelerometer/gyroscope, touch sensors, and flex sensors are all used in the glove. All of these sensors are put on the hand to collect information on the placement of each finger and the hand's orientation in order to distinguish between the letters. The Arduino microcontroller receives sensory data and processes it before translating and displaying it.

III. PROPOSED MODEL

The answer to this problem statement is not difficult to come up with at all. The Rapid Application Development Model, or RAD, will be used. It places a strong emphasis on employing an element-based construction method and a brief development cycle. The authors are utilizing a key point detection model to construct a sequence of key points that can then be sent to an action detection model to decode sign language. RAD is a concept that enables products to be developed more quickly and with higher quality. The authors will be able to use TensorFlow and Keras to develop a deep neural network that uses LSTM layers to manage the sequence of critical points as part of the model-building process. Here, a supervised learning model is used, meaning the model is trained using a labelled dataset.

IV. METHODOLOGY

The model must first be trained. The model distinguishes hand features and facial characteristics to separate the signs in the second stage, which involves detecting face, hand, and posture markers of the features. The next stage is to identify the main points. Create folders for data collection so it will be simple to maintain and stay organised.

Gather important point sequences that will aid in the identification of the signs. To identify the various signals, preprocess the data and create labels. Create and train an LSTM Deep Learning Model to retain the data necessary to recognise gestures. Make predictions in sign language to be stored in the model. So that the model may use them, save the model weights. The second-to-last step is evaluation using a confusion matrix, and the final step is real-time testing. The trained model we developed has a 98.50% accuracy.

V. TECHNOLOGY ADOPTED

1. Python:
Python is a high-level, interpreted programming language that is based on OOPs (Object Oriented Programming). It is a powerful language with a strong emphasis on expedient application development (RAD). Python makes coding and code execution simple. In comparison to other OOPs languages, Python may implement the same logic with as little as one fifth of the code. Python is used in so many different ways that it can't be used for just one thing.

Increasingly common procedures, including Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Data Science, and others, have been made possible by its expanding popularity. The libraries used for Sign Language Translator are OpenCV and NumPy.

2. NumPy:
The library known as NumPy, or "Numerical Python," contains multidimensional array objects and a selection of procedures for handling those arrays. Arrays can be subjected to logical and mathematical operations using NumPy. Both Python 2.x and 3.x versions are compatible with it. When compared to Python-based alternatives for similar data structures, its key benefit is that it uses less memory and offers faster runtime (for lists and tuples).

3. OpenCV:
OpenCV (Open Computer Vision Library) is a cross-platform library that allows authors to create real-time computer vision applications. It now plays a significant part in real-time operation, which is crucial in modern systems. Using it, one may analyse pictures and movies to find faces, objects, and even human handwriting. To comprehend the content of the images is the goal of computer vision. It takes the description of the images—which may be of an object, a text description, a three-dimensional model, etc.—and extracts it from the images. Computer vision, for instance, can help cars by enabling them to recognise various roadside items, such as traffic lights, people, traffic signs, and so forth, and then respond appropriately.

4. TensorFlow:
Google created the open-source library TensorFlow specifically for deep learning applications. Traditional machine learning is also supported. Tensors, multi-dimensional arrays with higher dimensions, are the data formats that it accepts. When handling a lot of data, multi-dimensional arrays come in quite handy.

5. Keras:
Deep models can be produced using Keras and then deployed on mobile devices. Deep learning models with distributed training also use Keras. On top of the machine learning framework TensorFlow, Keras is a Python-based deep learning API. It was created with the goal of facilitating quick experimentation.

6. Scikit-learn:
The most practical Python library for machine learning is definitely scikit-learn. Numerous effective methods for machine learning and statistical modelling, such as classification, regression, clustering, and dimensionality reduction, are available through a Python consistency interface in the sklearn package.

7. Matplotlib:
Python's Matplotlib toolkit provides a complete tool for building static, animated, and interactive visualizations. Python's Matplotlib package allows users to create 2D graphs of array data. A multi- platform data visualisation package called Matplotlib was created to deal with the larger SciPy stack and is based on NumPy arrays. One of visualization's biggest advantages is that it gives us visual access to vast volumes of data in forms that are simple to understand. There are numerous plot types in Matplotlib, including line, bar, scatter, and histogram.

8. LSTM:
A recurrent neural network is what is known as Long Short Term Memory (LSTM). Hochreiter and Schmidhuber created LSTM. It addressed the issue of long-term RNN dependency, in which the RNN can predict words from current data but cannot predict words held in long-term memory. RNN's performance becomes less effective as the gap length increases. By default, LSTM can save the data for a very long time. It is utilized for time-series data processing, forecasting, and classification.

VI. FLOW DIAGRAM

The working of the model is simple. The user gestures in front of the camera that is communicating via sign language. The camera takes the video feed of the actions and separates the hand gestures from the background, aligns the orientation of the video so that the hand is easily recognizable and then processes it. The filtered video is then recognized as filtered images capturing the hand gestures. It then maps the gesture accordingly and passes the hand gesture shown by the user through the ones in the trained network and displays the correct output to the user in the form of text.

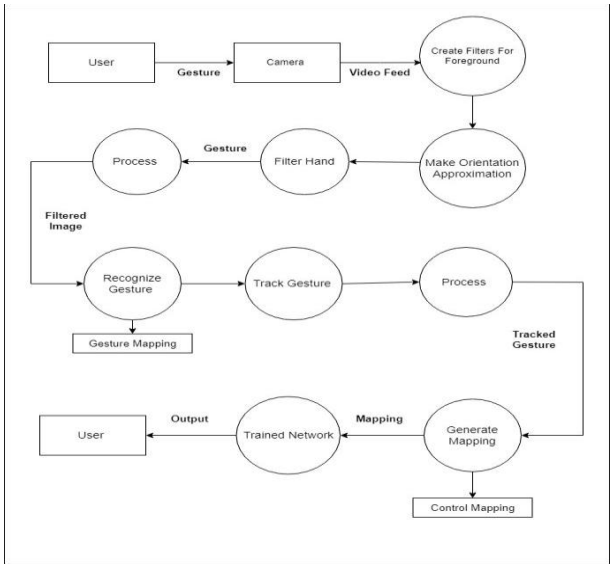

Fig 1. Flow Diagram.

VII. TRAINING THE MODEL

Five signs can be recognized here, which are hello, I love you, no, thanks, and yes. For each sign, 30 times the specific sign was given as an input. Each sign was captured in 30 frames to achieve higher accuracy.

Fig 2. Training the Model.

VIII. FUTURE SCOPE

Our approach will make it easier for signers to connect with non-signers in the modern world, where communication is the focal point of interaction between two people. Future versions of our technology should be able to translate between Standard English speech and sign language, as well as the other way around.

The range of several sign languages can be expanded. The letter can be detected with greater accuracy by adding more training data. This study can be expanded in order to translate signs into speech, which entails first turning a series of motions into text (words and phrases), and then into speech that non-signers can hear.

IX. ACKNOWLEDEMENT

We are very much thankful to our research guide Ms. Pragati Thawani for her constant support and guidance and thankful to college for giving us the opportunity to do research and publish paper in a good impact factor journal.

X. CONCLUSION

The fundamental goal of the sign language translation system is to give deaf and hard of hearing persons a practical means of hand gesture-based communication. Utilizing a webcam or other built-in camera that recognizes signs and processes them for detection, the suggested system can be accessed. Based on machine learning, this system takes into account both the advantages and disadvantages of the current system in order to function more effectively.

REFERENCES

[1] Design And Implementation of Sign Language Translator Using Micro touch Sensor - Nithyakalyani. K, S. Ramkumar, K. Manikandan.
[2] Sign Language Recognition – Anna Daza and Danial Hasan.
[3] Sign Language Translator and Gesture Recognition – Global Summit on Computer & Information Technology (GSCIT) 2015.
[4] Sign Language Problem and Solutions for Deaf and Dumb People - Gupta, P., Agrawal, A.K. and Fatima S.
[5] Kiron Tello O'Shea, An Introduction to Convolutional Neural Networks, (2015 November) Research GATE.
[6] Nicholas Renotte YouTube videos
[7] https://www.exastax.com/deep-learning/top-five-use-cases-of-tensorflow/
[8] https://en.m.wikipedia.org/wiki/OpenCV

[9] Sign Language Recognition and Translation: A Multidisciplined Approach from the Field of Artificial Intelligence – Becky Sue Parton.
[10] Sign Language Interpretation – Prof. D. S. Shingate, Rutika Bajaj, Anshu Singh, Gayatri Walzade, Yogita Bhavar.
[11] Real Time Sign Language Interpreter – Geethu G. Nath and C. S. Arun.
[12] Realtime Hand Gesture Recognition using LSTM model and Conversion into Speech – Sakshi Mankar, Kanishka Mohapatra, Ashwin Avate, Mansi Talavadekar, Prof. Surendra Sutar.