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American Sign Language to English Bi-lingual Translator

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Abstract: The creation of a real-time sign language interpreter is a significant step forward in improving contact between the deaf community and the general public. We hereby present the creation and implementation of a convolutional neural network-based fingerspelling translator for American Sign Language (ASL). Developing tools, Information technology along with communication for education purposes to improve the learning process and facilitating between teachers and students. Unimpaired people face a lot of problems to communicate with deaf people due to the lack of Sign language development, learning measures, and interpreters. This study provides a tool which is developed by the researchers to facilitate the people who face difficulty to communicate with deaf people by obtaining video or audio of the user and therefore converting it into required form

KEYWORDS: Unimpaired, Sign language, Interpreters, Translator, Interpreters, .

I. INTRODUCTION

Many a time we come across this question that what is American Sign Language and why is it useful? American Sign Language is used by deaf people to communicate with the society with help of gestures and signs. Learning ASL increases sensitivity and understanding of the deaf and hard of hearing population. You will gain a strong respect for deaf community as a result of your ASL proficiency, and you will be able to encourage language comprehension and acceptance among others. (ASL) substantially facilitates communication in the deaf community. However, there are only ~250,000-550,000 speakers which significantly limit the number of people that they can easily communicate with. When an emergency arises, written correspondence is inconvenient, impersonal, and sometimes impractical. We present an ASL recognition system that uses Convolutional Neural Networks (CNN) to translate a video of a user's ASL signs into text in real-time, lowering the barrier to communication and enabling dynamic communication.
Three tasks must be completed in real time to solve our dilemma:

1. **Obtaining video of the user signing is step one (input)**
2. **Assigning a letter to each frame of the video**
3. **Using classification scores to reassemble and show the most possible expression (output)**

This dilemma poses a major challenge in terms of computer vision because of a variety of factors, including:
•Concerns about the environment (e.g., lighting sensitivity, background, and camera position)
•Containment (e.g., any or all fingers, or even an entire hand, may be hidden from view.)
•Detection of sign boundaries (when a sign ends and the next begins)
•Alternative articulation (when a sign is affected by the preceding or succeeding sign).

Although Neural Networks have previously been used to recognise ASL letters with accuracies of over 90%, many of them require a 3-D capture feature such as motion-tracking gloves or a Microsoft Kinect, and only one of them offers real-time classifications. The scalability and viability of these solutions was hampered by the additional criteria. A pipeline in our system accepts video of a user signing a term as feedback from a web browser. Then, using a CNN, we remove individual frames from the video and create letter probabilities for each. We group the frames based on the character index that each frame is suspected to refer to, using a number of heuristics. Eventually, we employ a language model to provide the consumer with a probable expression.

II. LITERATURE SURVEY

Sr. No	Title of Paper	Author name	Innovation/Technology Developed/Result	Drawback/Limitation
1	Sign Language Recognition Using Leap Motion Sensor	C. Chuan, E. Regina and C. Guardino	Used the Leap Motion Controller	However, the accuracy rate obtained in this study is lower compared to existing studies
2	Intelligent system based on speech recognition with capability of self-learning	Ms.Sneha K. Upadhyay, Mr. Vijay N. Chavda	This application was firstly embedded on raspberry pi and Qt Creator is the software which is being useful to interface this GUI with the hardware connected to Pi.	It uses complex algorithms.
3	Design And Development Of Hand Gesture Recognition System For Speech Impaired People	Neela Harish and S. Poonguzhali	Machine learning is employed for implementing this method	This system has ground noise or area reverberation in conjunction with the speech signal that is totally undesirable
4	American sign language-based finger-spelling recognition using k-Nearest Neighbours classifier	D. Aryanie and Y. Heryadi	feature used to K-Nearest Neighbour classification	Best accuracy obtains from distance using k=3 were only 62.42% precise.
5	A translator for sign language to text and speech	V. N. T. Truong, C. Yang and Q. Tran	To increase the accuracy of the system used a huge database for training process generates impressive results.	Detects only static hand signs of alphabets.

6	A Survey on Voice Command Recognition Technique	Navneet Om PrakashPrabhakar Kumar Sahu	English text using common computing environments used to K-Nearest Neighbour classification	Depending on the solution used, customization may be difficult.
7	American sign language translation using edge detection and cross correlation	A. Joshi, H. Sierra and E. Arzuaga	implemented an automated translation system that is capable of translating sign language to English text using common computing environments such as a computer and a generic webcam	The translation of words and phrases consists of splitting a video sequence into frames.
8	A Novel Model for Speech to Text Conversion	Deepa V. Jose, Alfateh Mustafa, Sharan R	includes the accurate spelling and meaning with end results of achieving excellence in pronunciation.	sound accuracy is poor.
9	Translation of Text to Speech Conversion for Hindi Language	KaveriKamble, Ramesh Kagalkar	A database was created from the various domain words and syllables	system read the input data in a natural form from database, hence if input is wrong it won't translate or correct the word.
10	Vision-based approach for Sign Language recognition using Edge Orientation Histogram	J. R. Pansare and M. Ingle	Low-level feature extraction from extracted region reduces calculations and works efficiently while matching feature vectors in real time	It is observed that results are more inaccurate when we use high definition cameras.

III. METHODOLOGY

Figure 1: Implementation flowchart

A) For Sign to Text:

Data is collected by taking images using a webcam and concentrating on the section of the image where the hand is placed. The data would then be pre-processed before being fed to the model for translation from sign to text. CNNs are commonly employed in pattern and image recognition problems because they have many benefits over other techniques.With the aid of the MiCT model, the gesture we made on the camera will predicted and an alphabet for the corresponding gesture will appear underneath the frame.

B) For speech to sign:

Speech will be imputed through Microphone. NLP will be used for text pre-processing for speech to sign conversion. Natural Language Processing (NLP) is an innovative Deep Learning technology that helps computers to understand and read complex voice with the e intent to behave and function as humans do. Subsequently, the speech will be compared to a database of different words, and compilation of images/image of the next word will be created
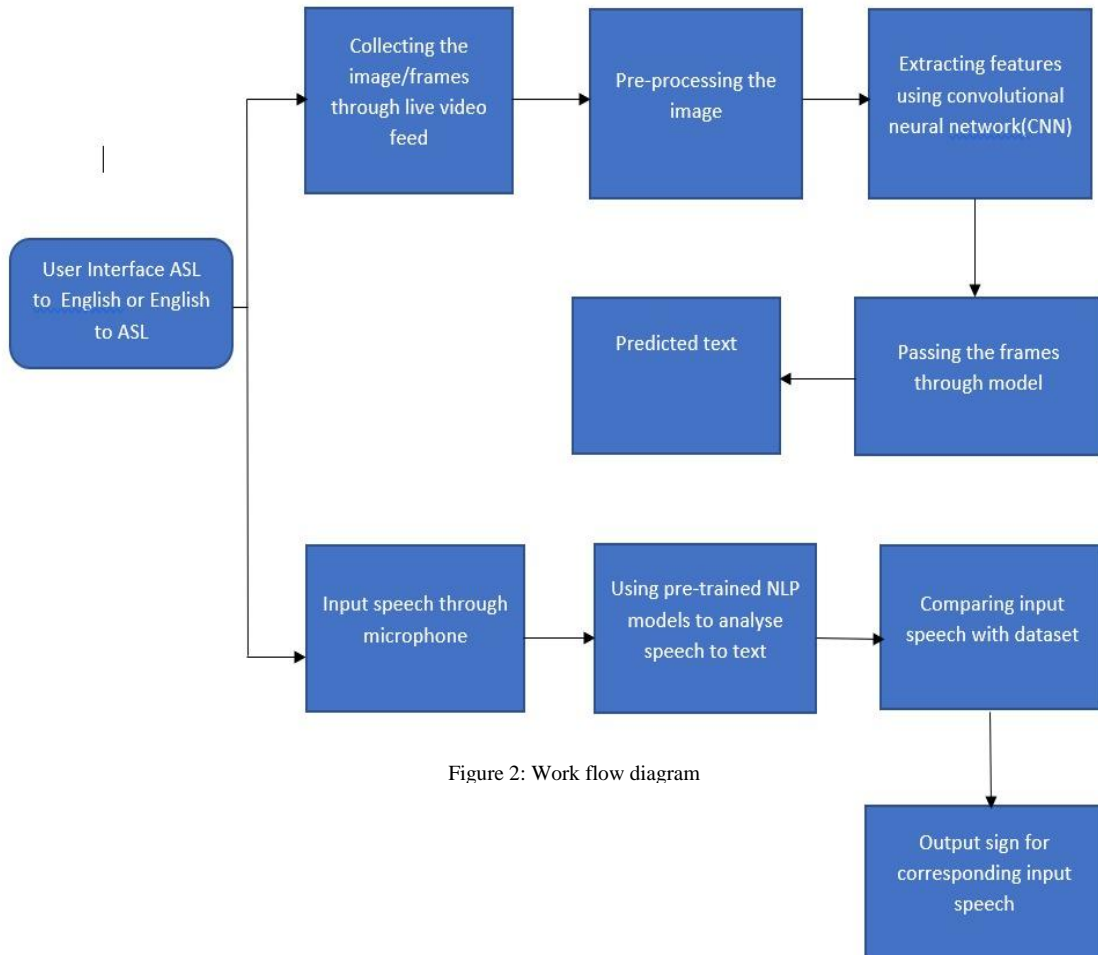
IV. IMPLEMENTATION:
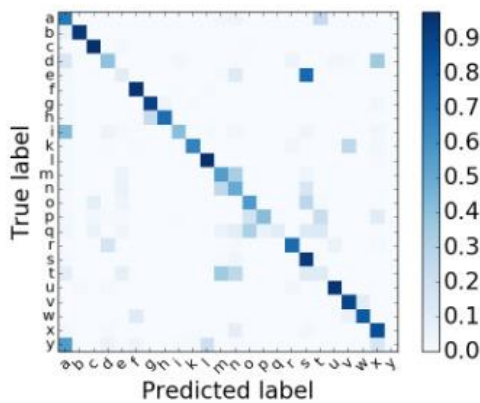

Figure 2: Work flow diagram

Figure 3: Confusion Matrix

IV. CONCLUSION AND FUTURE SCOPE

We propose that this program can be used for providing two-way communication which will facilitate the conversation between abled and hearing-impaired people. Our scope is to provide novelty in terms of approach to ease the interaction between normal and hearing-impaired people to exchange thoughts and ideas by eliminating the communication barrier. The focus is to provide an easy-to-use application to the society to establish the ease of communication between hearing-impaired and abled individuals by making use of Image Processing, convolutional neural network, and natural language processing.

V. ACKNOWLEDGEMENT

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