International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 6 ǁ 2022 ǁ PP. 140-147

Language Translation for Impaired People using NLP Semantics

Prateek M J[1], Sai Charan[2], Sanjan S Shetty[3], Vinayak H[4], A B Rajendra
[1]*Vidyavardhaka College Of Engineering, Mysuru, India*

Abstract *Gesture based communication is a visual language used by both discourse disabled and hearing-impeded individuals as their first language. Individuals experiencing hearing and communicating in handicaps utilize communication through gestures as a direct method of correspondence among one another and furthermore with others yet tragically few out of every odd one of the ordinary individuals can grasp communication through gestures consequently it brings about an absence of correspondence and isolation. To the extent both discourse disabled and hearing-weakened individuals are concerned, approaching gesture based communication is extremely fundamental for their social, passionate, etymological and social development of people. Our venture expects to overcome any barrier between these both discourse disabled and hearing-weakened individuals and ordinary individuals with the coming of new innovations or technologies. We are building an application which will change the voice of the client over to communication through signing with the assistance of normal language preparing semantics.*
Keywords: *Impaired people, sign language, vocal communication, semantics*

Date of Submission: 20-05-2022 Date of acceptance: 03-06-2022

I. Introduction

Communication via gestures is a sort of language that utilizes hand developments, outward appearances and non-verbal communication to convey. It is utilized overwhelmingly by the hard of hearing and individuals who can hear yet can't talk. However, it is additionally utilized by some conference individuals, regularly families and family members of the hard of hearing, and translators who empower the hard of hearing and more extensive networks to speak with one another [1].

Correspondence through signaling is a sort of correspondence used by people with upset hearing and talk. People use motion-based correspondence movements as a technique for non-verbal correspondence to convey their insights and sentiments [2].

However, non-endorsers find it difficult to see, in this manner arranged correspondence through signals interpreters are needed during clinical and authentic game plans, informational and instructional gatherings. Over the span of ongoing years, there has been a growing interest in translating organizations [3]. Various techniques, for instance, video inaccessible human unravelling using quick Internet affiliations, have been introduced. They will in this manner give an easy-to-use motion-based correspondence translating organization, which can be used, yet has huge requirements [4].

Sign language is divided into two i.e. Visual Sign Language & Tactile Sign Language. a) Visual sign language: It is used by hearing & speech impaired people b) Tactile sign language: It is used by hearing & sight impaired people. We are basically working on the visual sign language used by deaf & dumb. Sign Language varies country to country it depends on its culture as Sign language in India is ISL (Indian Sign Language), America uses ASL (American Sign Language), China uses CSL (Chinese Sign Language). Sign Language is a method of communication for deaf & dumb which is composed of various gestures formed by hand shapes, body orientation & facial expression. Each gesture has a meaning assigned to it.Alphabets in sign language are composed of different hand shapes & words are composed of hand shapes with orientation. Complete visual sign language also includes facial expressions.Visual sign language is an effective means of communication for deaf & dumb. Though it is true,the hearing-impaired have to challenge communication obstacles in a mostly hearing capable

society. This research work will concentrate on Visual Sign language interaction. Natural language is a skill used for understanding human language. It is a part of linguistics and Artificial Intelligence. NLP (Natural language processing) is a step for developing a system that can convert the text (words) in human language. POS tagging is the method of NLP and first introduced in 1960. It is an important method for language processing. For many NLP applications it is the simplest and most stable step. Part of tagging is the initial step for machine translation, retrieval of information and etc. Second important method in NLP is parsing. Parsing is

the method which is followed by the compiler. When we thought of sign recognition, we should consider the major challenges or motivation in sign recognition which are mentioned below. The main purpose of this project is to build an application which accepts Audio/Voice as input and converts them to corresponding Sign Language for both speech-impaired and hearing-impaired people. The interface works in two phases, first converting Audio to Text using speech to text API (python modules or Google API) and secondly, applying the semantics of Natural Language Processing (NLTK specifically) and then produce the output.

Existing system: - A good deal of study has been done on the topic of Indian Sign Language, to help create systems that can help in the betterment of lives of people with speech and hearing impairment. There are multiple projects and systems that have been developed and are being developed to recognize the Indian Sign Language, they make use of different kinds of technologies that will help in achieving it.[5].They have made use of different machine learning techniques, for example they classify single and double handed ISL using algorithms of machine learning, and they have used k-nearest neighbour classification, ANN based and Convolution Neural Networks based ISL recognition techniques have been used. There are a very few systems that have been developed that convert audio to Indian Sign Language, for example a system that converts audio to ISL gloss using WordNet. There are other language texts that are converted to ISL. But not many systems are created that converts voice/speech/audio to Indian Sign Language [7].

Proposed system: - The application relies upon changing over the sound signs and has the opportunity to message using talk to message API (python modules or google API) and thereafter using the semantics of Natural Language Processing to break down the substance into more unassuming sensible pieces. Informational collections of predefined gesture based communication are utilized which the application can utilize to show the changed over sound into the communication via gestures.

It is word reference based Machine Translation.The motivation of this project is to decrease the barrier of communication between the impaired people. Deaf people will be able to communicate just like normal people through the help of this project. They can understand others' messages once the audio input is changed to video format. The output format is very easy to understand and there would be no need for complex devices to solve an easy problem.

Designing a software which will be used to convert audio spoken by normal people into sign languages used by vocally and hearing impaired people. The sign language generated will be in the form of video which will be displayed in the software.

Objective

The main purpose is to translate audio to sign language. Sign language is the natural way of communication for challenged people with speaking-hearing disabilities. People use sign language gestures as a means of non-verbal communication to express their thoughts and emotions. But non-signers find it extremely difficult to understand hence trained sign language interpreters are needed during medical and legal appointments, educational and training sessions.

Our project aims to bridge the gap between these both Speech impaired and hearing-impaired people and normal people with the advent of new technologies. We have developed an application which will convert voice of the user to sign language with the help of natural language processing semantics.

It also helps to convert live audio to sign language where the communication can be easy between these people. In this project, we translate a complete speech audio file to its corresponding sign language. The main and most important outcome is to eliminate the dependency on the human interpreter, where everything can be done by system itself. Therefore, we can provide an easier alternative for the speech-hearing impaired community to communicate with the rest of the world. When deployed, there won't be any need of educating the users about how to use the application. It creates a user-friendly environment for the user by providing text output for audio input. Takes comparatively less time for translation of audio to Indian Sign language.

The proposed Language translator for impaired people using google Application programming interface, python and natural language processing. This application relies upon changing over the sound signs had the opportunity to message using talk to message API and using logic of natural language processing to convert into more sensible pieces.

II. Literature survey

Paper 1- Motionlets matching with adaptive kernels for 3D Indian Sign Language Recognition. In this paper, an application for identifying indication of Indian sign language 3D motion captured data is created. Here they build a two- phase algorithm which handles multiple attributes of 3D sign language motion data for machine translation.

Paper 2- A Wearable system for recognizing American Sign Language in real time using IMU and Surface EMG Sensors. In this paper they have proposed a wearable real-time ASL recognition system. The author says

that the signs performed by the both speechimpaired and hearing-impaired people into speech are detected by hand gestures using two important modalities i.e.., Inertial measurement unit and surface electromyography. The author concentrates on recognizing American sign language. The author states that this was the first study of ASL recognition system consolidating IMU sensor and sEMG signals that are compatible to each other. Feature selection is performed to select the best subset of features from a large number of well-established features and four popular classification algorithms are investigated for our system design. In this the author uses sign language recognition (SLR) tool to bridge the communication gap between both speech-impaired and hearing-impaired people. The system was estimated with 80 commonly used ASL signs in daily conversation and an average accuracy of 96.16% was achieved with 40 selected features.

Paper 3- Avatar-based Sign Language Interpretation for weather forecast and other TV programs. The author proposed a system that translated the closed captions of weather forecast programs into KSL and presented it with 3D avatar animation. This paper generated 3D sign language animation by translating the closed captions in DTV, for both speech-impaired and hearing-impaired people to see the weather forecast with sign language interpreter. To identify the frequency of each word, they analyzed the last three years' weather forecast scripts from several sources that are available. They also built sign language synonym dictionary using KorLex to improve the translation performance. KorLex was also used for the disambiguation process of word sense. They focused on capturing the motions of a professional sign language interpreter and build the motion database. The motions were applied with motion blending to a 3D avatar.

Paper 4- Glove-based Continuous Arabic Sign Language Recognition in User-Dependent Mode. In this paper, the authors have proposed an application for uninterrupted Arabic Sign Language Recognition (ArSL) based on data acquired from the two DG5-VHand data gloves. In this the sensor readings cannot be examined visually for manual labelling, the solution for manual labelling of glove-based sensor readings is to place a camera to record the signing. Once the signing is completed, the video recordings can be synchronized with the sensor readings to detect the boundaries of the words. Raw feature vectors are pretreated in terms of resampling and the sensor readings are normalized. Window-based statistical features were used to expand the raw data. This is a key step in the whole process because it captures the context of the feature vector where the statistical measures are calculated from former and upcoming raw feature vectors.

Paper 5- Intelligence mobile assistant for hearing impairs to interact with the society language is a way of words or signs that people use to share feelings and ideas with each other. In view of the society there is an issue in communication among hearing impaired people and hearing people. Most of the hearing people have no idea about the sign languages and they are not having any desire to learn sign language. Thus, typically hearing impairers are used to be isolated. When considering about all the solutions there is an absence of a Sinhala application with Sinhala sign language.

Paper 6- In the current fast-moving world, human computer- interactions (HCI) is one of the main contributors towards the progress of the country. Since the conventional input devices limit the naturalness and speed of human computer- interactions, Sign Language recognition system has gained a lot of importance. Different sign languages can be used to express intentions and intonations or for controlling devices such as home robots. The main focus of this work is to create a vision based system, a Convolutional Neural Network (CNN) model, to identify six different sign languages from the images captured. The two CNN models developed have different type of optimizers, the Stochastic Gradient Descent (SGD) and Adam.

This chapter records the survey of many journals and articles presented in the Table 1

Table 1 Literature Survey

	Paper name	Author name	Algorithm used	Application	limitation
1	Motionlets matching with adaptive kernels for 3D Indian Sign Language recognition.	Kishore, D.A,Sastry,A.C. S, & E. K, P.V. Kumar,	They create a two-phase algorithm for device translations that maintain many regions of three- dimensional sign language motion information.	An application that recognizes Indian sign language indications. It is generated 3D motion captured data, which is then used to recognize sign language.	The model translates sign languages does not convert text to sign languages.
2	A wearable system for recognizing American Sign Language using IMU and surface EMG sensors.	Wu, Jian,Lu, Sun and Roozbeh Jafari	The best subset of highlights from countless different highlights is selected, and 4 common different algorithms are researched for device designs.	Hand gestures are used to detect signals performed by both speech-impaired and hearing impaired people into speech	Using hand-held sensors and talking would not have the same level of

					precision.
3	Avatar- based sign language interpretation for weather forecast and other TV programs	oh J, Kim B, Kim M, Kang S, Kwon H, Kim I, Song Y	They studied the previous 3 years' worth of weather forecasting documents from the variety of Sources to determine the frequency of each word.	For both speech- impaired and hearing- impaired people to see the weather forecast with a sign language	This system works only with a weather forecasting system.
4	Glove-based continuous Arabic Sign Language recognition in user-dependent mode	Tubaiz N, Shanableh T, Assaleh K	Modified K- Nearest Neighbours classifier.	Continuous Arabic sign language recognition (ArSL)	Sensor readings cannot be visually checked for manual labelling,
5	Intelligent mobile assistant for hearing impairers to interact with the society in Sinhala language",	Yasintha Perera, Nelunika Jayalath, Shenali Tissera, oshani Bandara, Samantha Thelijjagoda	Instant Messaging, Mobile Application, Voice recognition, Natural Language processing, Graphic Interchange Format Introduction	The significance is that it allows hearing- impaired individuals to communicate when they are long distance apart. This app will close the divide between hearing impaired people	The file Format is not compatible
6	Sign Language Recognition System Using Deep Neural Network", Advanced Computing & Communication Systems (ICACCS)	Surejya Suresh, Haridas T.P. Mithun, M.H. Supriya.	CNN structure and a summary of the planned construction. The planned construction was studied using 2 plans, the 1st of which use the Stochastic Gradient optimizer and the second of which used the Adam	The convolutional neural network was used to create a basic version of the sign recognition plan, which was successfully tested.	It is not user friendly

III. Modeling and Implementation

This chapter deals with the System Architecture as shown in Figure 1, data flow diagram in Figure 2, Sequence diagram Figure 3 and Use case diagram Figure 4 respectively. Refer the sketches.

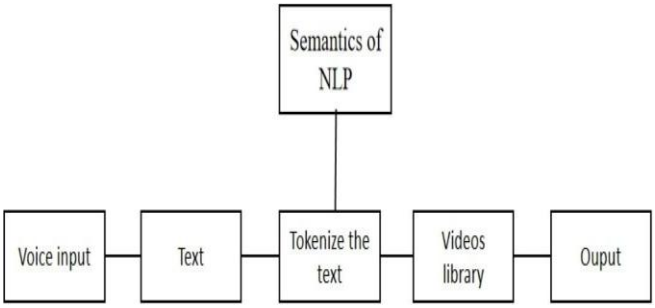

Figure 1 System Architecture

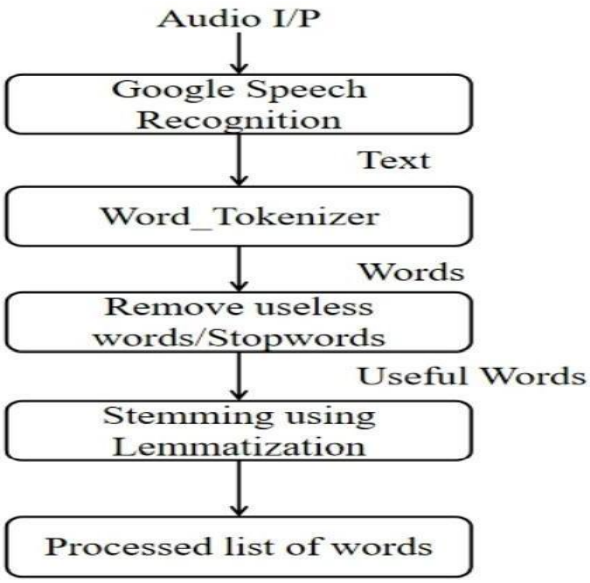

Figure 2 Audio to processed text Dataflow

IV. Testing, Results and Discussion

Testing is the principal part of any venture improvement cycle. A task is inadequate without effective testing and execution. Various Test cases for our application is shown in the following tables Table 2, Table 3 and Table 4 respectively.

Table 2 Live Voice

Test case #	**1**
Test Case Name	Live voice
Description	Users can use a microphone to give the voice input. This input gets converted to text and then the sign language video will be displayed on the screen otherwise it says couldn't hear properly
Expected Output	Sign language video is displayed.
Actual Output	Sign language video is displayed.
Remarks	pass

Table 3 Recorded voice

Test case #	**2**
Test Case Name	Recorded Voice
Description	A pre-recorded video file can be selected by the user and it gets converted to text and then the sign language video will be displayed on the screen otherwise it says couldn't hear properly

Table 4 Recorded Voice

Expected Output	Sign language video is displayed.
Actual Output	Sign language video is displayed.
Remarks	pass

V. Results

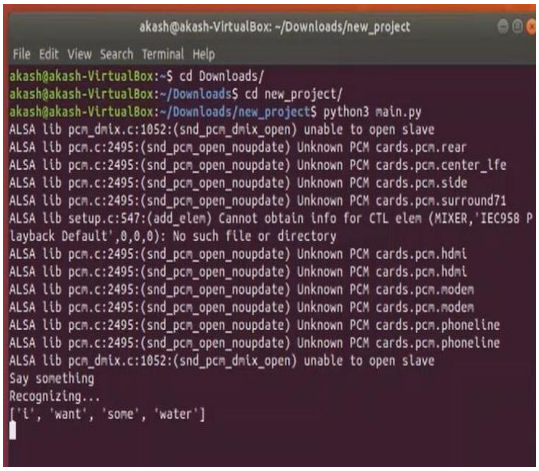

Figure 1 Figure 6 Output Video 2

Figure 5 Output Video 1

Figure 4 Taking Input

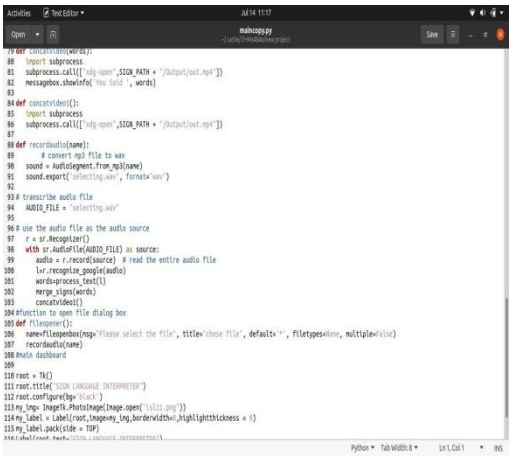

Figure 7 Listing Useless words to remove them

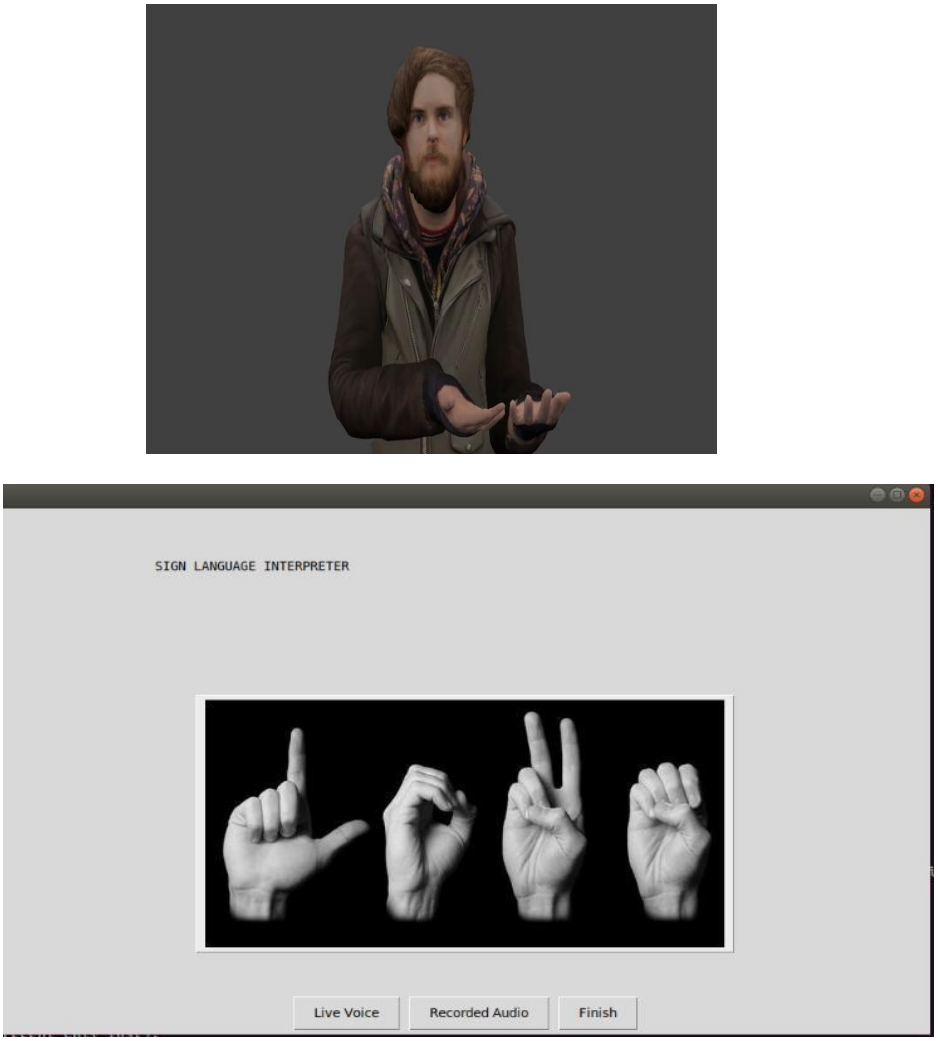

Figure 9 Figure our Application Interface

VI. Conclusion and Future Scope

We have been successful in implementing the Sign Language Interpreter. After successful user testing it has been found that the new system has overcome most of the limitations of the existing systems especially for ISL. As the ISL is new and very little advancement has been done in this subject, numerous new recordings for various words can be added to the word reference to augment its degree and assist with imparting better utilization of this language.

The current system operates on a basic set of words and in order to extend the system, many new words can be included in the dictionary in future and specialized terms from different fields can be incorporated too. This project can be made as a mobile application, so that user can install the application into their mobile phones or laptops and can access it easily.

References

[1]. P.V.V. Kishore, D.Anil Kumar, ‘’Motionlets Matching with Adaptive Kernels for 3D Indian Sign Language Recognition’’, 2018, IEEE Sensors Journal 2 DOI 10.1109/JSEN.2018.2810449.

[2]. Ankita Harkude, Sarika Namade, Shefali Patil, Anita Morey “Audio to Sign Language Translation for Deaf People” ISSN: 2277-3754, International Journal of Engineering and Innovative Technology (IJEIT) Volume 9, Issue 10, April 2020.

[3]. Seonggyu Jeon, Byungsun Kim, Minho Kim, ‘’Avatar-based Sign Language Interpretation for weather forecast and other TV programs’’, SMPTE Motion Imaging Journal (Volume: 126, Issue: 1, Jan.-Feb. 2017).

[4]. Noor Tubaiz, Tamer Shanableh, Khaled Assaleh, ‘’Glove-based Continuous Arabic Sign Language Recognition in User-Dependent Mode’’ IEEE Transactions on Human-Machine Systems (Volume: 45, Issue: 4, Aug. 2015)

[5]. Amitkumar Shinde, Ramesh M. Kagalkar, ‘’Sign language to text and vice versa recognition using computer vision in Marathi’’, May 2015 International Journal of Computer Applications 118(13):1-7.

[6]. Neha Poddar, Vrushali Somavanshi, ‘’Study of Sign Language Translation using Gesture Recognition’’, February 2015 IJARCCE, DOI:10.17148/IJARCCE.2015.4258.

[7]. V.Padmanabhan, M.SornalathaHand, ‘’Gesture Recognition And Voice Conversion System Using Sign Language Transcription

System'', International Journal of Scientific & Engineering Research, Volume 5, Issue 5, May-2014 427 ISSN 2229-5518.
[8]. Farahanaaz Shaikh, Shreya Darunde,Nikita Wahie, Swapnil Mali "Sign Language Translation System for Railway Station Announcements", Institute of Electrical and Electronics Engineers (IEEE), IEEE Bombay Section Signature Conference (IBSSC), 2019.
[9]. V Aiswarya, N Naren Raju, Singh S Johanan Joy, T Nagarajan, P Vijayalakshmi, "Hidden Markov ModelBased Sign Language to Speech Conversion System in TAMIL", Biosignals Images and Instrumentation (ICBSII) 2018 Fourth International Conference on, pp. 206-212, 2018.
[10]. Surejya Suresh, Haridas T.P. Mithun, M.H. Supriya, "Sign Language Recognition System Using Deep Neural Network", Advanced Computing & Communication Systems (ICACCS) 2019 5th International Conference on, pp. 614-618, 2019.
[11]. RabeetFatmi, Sherif Rashad, Ryan Integlia, "Comparing ANN SVM and HMM based Machine Learning Methods for American Sign Language Recognition using Wearable Motion Sensors", Computing and Communication Workshop and Conference (CCWC) 2019 IEEE 9th Annual, pp. 0290-0297, 2019.
[12]. Ilya Makarov, Nikolay Veldyaykin, Maxim Chertkov, AlekseiPokoev, "Russian Sign Language Dactyl Recognition", Telecommunications and Signal Processing (TSP) 2019 42nd International Conference on, 2019.
[13]. K. Bantupalli and Y. Xie, "American Sign Language Recognition using Deep Learning and Computer Vision," 2018 IEEE International Conference on Big Data (Big Data), Seattle, WA, USA, 2018.
[14]. Mittal, A.; Kumar, P.; Roy, P.P.; Balasubramanian, R.; Chaudhuri, B.B. A modified LSTM model for continuous sign language recognition using leap motion. *IEEE Sens* 2019.
[15]. Krishnaraj, N.; Kavitha, M.; Jayasankar, T.; Kumar, K.V. A Glove based approach to recognize Indian Sign Languages. *Int. J. Recent Technol. Eng. IJRTE* 2019. *7*, 1419–1425.
[16]. Patel, B.D.; Patel, H.B.; Khanvilkar, M.A.; Patel, N.R.; Akilan, T. ES2ISL: An advancement in speech to sign language translation using 3D avatar animator. In Proceedings of the 2020 IEEE Canadian Conference on Electrical and Computer Engineering (CCECE), London, ON, Canada, 30 August–2 September 2020; pp. 1–5.
[17]. Stoll, S.; Camgöz, N.C.; Hadfield, S.; Bowden, R. Text2Sign: Towards Sign Language Production Using Neural Machine Translation and Generative Adversarial Networks. *Int. J. Comput. Vis.* **2020**, *128*, 891–908.
[18]. Zhang, Y.; Vogel, S.; Waibel, A. Interpreting bleu/nist scores: How much improvement do we need to have a better system? In Proceedings of the Fourth International Conference on Language Resources and Evaluation, Lisbon, Portugal, 26–28 May 2019; pp. 1650–1654.
[19]. Mehta, N.; Pai, S.; Singh, S. Automated 3D sign language caption generation for video. *Univers. Access Inf. Soc.* **2020**, *19*, 725–738.
[20]. Deep learning methods for indian sign language recognition Pratik Likhar, Neel Kamal Bhagat, GN Rathna 2020 IEEE 10th International Conference on Consumer Electronics (ICCE-Berlin), 1-6, 2020.
[21]. Indian sign language gesture recognition using image processing and deep learning Neel Kamal Bhagat, Y Vishnusai, GN Rathna 2019 Digital Image Computing: Techniques and Applications (DICTA), 1-8, 2019.
[22]. Signet: A deep learning based indian sign language recognition system CJ Sruthi, A Lijiya 2019 International conference on communication and signal processing (ICCSP), 0596-0600, 2019.