IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 4, April 2023

DOI: 10.17148/IJARCCE.2023.124213

SIGN LANGUAGE RECOGNITION SYSTEM

Pratheek Gowda D J[1], Shamanth T N[2], KS Shamantaka[3], Dr. Shilpa R[4], Sandeep B[5]

Department of Electronics and Communication Engineering Vidyavardhaka College of Engineering, Mysuru, India[1-5]

Abstract: Conversing to a person with hearing disability is always a major challenge. Sign language has indelibly become the ultimate panacea and is a very powerful tool for individuals with hearing and speech disability to communicate their feelings and opinions to the world. It makes the integration process between them and others smooth and less complex. In this study, the user must be able to capture images of the hand gesture using web camera and the system shall predict and display the name of the captured image.

Keywords: Sign Language, ASL, Hearing disability, Convolutional Neural Network (CNN), Computer Vision, Machine Learning, Gesture recognition, Sign language recognition, Hue Saturation Value algorithm.

I. INTRODUCTION

As Nelson Mandela stipulated, "Talk to a man in a language he understands, that goes to his head. Talk to him in his own language, that goes to his heart", language is undoubtedly essential to human interaction and has existed since human civilisation began. It is a medium humans use to communicate to express themselves and understand notions of the real world. Without it, no books, no cell phones and definitely not any word we write would have any meaning. It is so deeply embedded in our everyday routine that we often take it for granted and don't realise its importance. Sadly, in the fast-changing society we live in, people with hearing impairment are usually forgotten and left out.

They have to struggle to bring up their ideas, voice out their opinions and express themselves to people who are different to them. Sign language, although being a medium of communication to deaf people, still have no meaning when conveyed to a non-sign language user. Hence, broadening the communication gap.

To prevent this from happening, we are putting forward a sign language recognition system. It will be an ultimate tool for people with hearing disability to communicate their thoughts as well as a very good interpretation for non-sign language user to understand what the latter is saying. Many countries have their own standard and interpretation of sign gestures. For instance, an alphabet in Korean sign language will not mean the same thing as in Indian sign language. While this highlights diversity, it also pinpoints the complexity of sign languages. Deep learning must be well versed with the gestures so that we can get a decent accuracy. In our proposed system, American Sign Language is intended to be used to create our datasets.

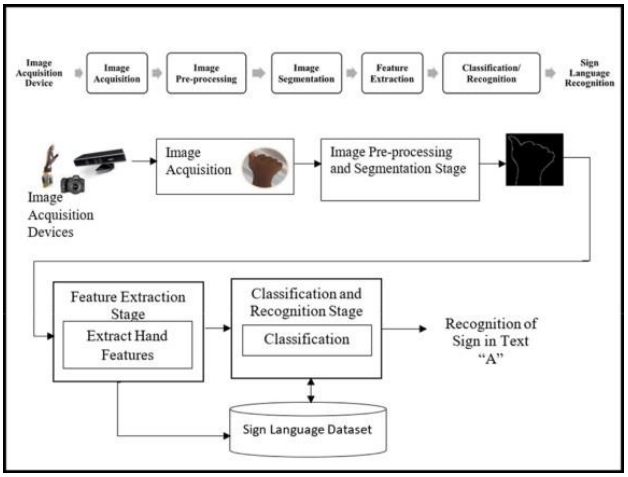

Fig.1. The architecture of vision-based sign language recognition

II. LITERATURE REVIEW

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 4, April 2023
DOI: 10.17148/IJARCCE.2023.124213

Mrs. Priyanka C Pankajakshan and Thilagavathi B [1], has proposed it is a glove- based system or a vision-based system. It does not involve any complex devices like a glove and nor wear any type of cumbersome components for the recognition purpose.

The work carried out by Ms. Greeshma Pala, et al. provides a comparison between KNN, SVM, and CNN algorithms and it determines which algorithm would provide the best accuracy among all. Approximately 29,000 images were split into test and train data and preprocessed to fit into the KNN, SVM, and CNN models to obtain a working model.
Ms. Amrutha K and Mr. Prabu P [3], has proposed to review different steps in an automated sign language recognition (SLR) system. The model is based on vision-based isolated hand gesture detection and recognition. The model made use of a convex hull for feature extraction and KNN for classification.

Mr. Mohammed Safeel, et.al., [4], they proposed to aim, the review for various techniques that have been employed in the recent past for SLR that are employed at various stages of recognition. The approaches that are being reviewed are flexible to implement.

The work carried out by Mr. Ashish S. Nikam and Mrs. Aarti G. Ambekar [5], is considered in the mind that similarities of human hand shape with four fingers and one thumb, the software aims to present a real time system for recognition of hand gesture on basis of detection of some shape based features like orientation, Centre of mass centroid, fingers status, thumb in positions of raised or folded fingers of hand.

Mr. Suharjitoa, et.al.,[6], proposed that we can consider the Sign Language Recognition form application point of view. This approach talks about data acquisition, such as data from early researches or self-made data, the recognition method that are recently used by researchers, and the output of previous researches.

The work carried by Mr. Ilias Papastratis, et.al.,[7], it talks about, the accurate sign language recognition significantly affects the performance of sign language translation and representation methods. The breakthroughs in sensorial devices and AI have paved the way for the development of sign language applications that can immensely facilitate hearing-impaired people in their everyday life.

Parama Sridevi, et.al., [8], they have proposed to develop a sign language recognition system using vision-based system. It uses a webcam for real time dynamic input. Here the user conveys his/her message by a sign of ASL in front of the webcam and the output is given by comparing the features with the trained classifier.

Tülay KarayÕlan, Özkan KÕlÕç [9], has proposed the sign language is converted to text by an automated sign language recognition system based on machine learning system. The proposed system uses the images captured from webcam camera as input. The Processed input image it gives, the two classifiers which use Artificial Neural Network and Back propagation Algorithm. One of them uses raw features and the other one uses histogram features.

Finally, the predicted result is produced as text.The work carried out by Satwik Ram Kodandaram, N Pavan Kumar, Sunil G L [10], that it uses the most popular neural network algorithm which is a widely used algorithm for Image/Video tasks called Deep Learning Convolution Neural Networks (CNN). For Convolution Neural Networks (CNN) they have advanced architectures like LeNET-5 [2], and MobileNetV2 [3].

Kusumika Krori Dutta, Sunny Arokia Swamy Bellary [11], have proposed to deal with classification of Indian sign language using machine learning. The system is trained with double handed sign language by using a Principal Component Analysis (PCA) and Artificial neural network (ANN) algorithm in MATLAB. Indian Sign Language is used by the people of India and common all over the nation. Indian Sign Language is communicated using hand gestures made by Single hand and Double hands.

Citra Suardi, et.al.,[12] have discussed the need for a communication bridge between the community and deaf people, as most people do not understand sign language. Technology can be a solution, particularly image processing technology as a translator tool. The hand key point library is used to detect the location of the hand in each image, but it requires an algorithm as a classification tool.

The Convolutional Neural Network (CNN) algorithm in the Deep Learning method is a suitable classification tool as it

DOI: 10.17148/IJARCCE.2023.124213

can learn multiple things. Dimitrios Konstantinidis, Kosmos Dimitropoulos and Petros Daras [13] have discussed the importance of sign language recognition (SLR) for facilitating communication among deaf and hearing- impaired people. The authors propose a deep learning-based methodology for accurate and robust SLR from video sequences.

Their method utilizes hand and body skeletal features extracted from RGB videos, which makes it highly discriminative for gesture recognition without the need for additional equipment like data gloves. The authors conducted experiments on a large sign language dataset and found that their methodology outperforms other state-of-the-art approaches that rely solely on RGB features. Overall, the article presents a promising approach for SLR that could improve communication for the deaf and hearing- impaired community.

Anup Kumar, Karun Thankachan and Mevin
M. Dominic [14] presents a new system designed to aid in communication with individuals who have vocal and hearing disabilities. The system uses an improved method for sign language recognition and conversion of speech to signs. The algorithm is capable of extracting signs from video sequences using skin color segmentation, even in minimally cluttered and dynamic backgrounds. It can distinguish between static and dynamic gestures and extracts appropriate feature vectors, which are classified using Support Vector Machines. Speech recognition is built upon the standard Sphinx module. Experimental results show satisfactory sign segmentation under diverse backgrounds and relatively high accuracy in gesture and speech recognition. Overall, the article presents a promising new system for aiding in communication with individuals with vocal and hearing disabilities.

Suharjito, et.al., [15] proposed a review of progress in feature extraction for sign language recognition in the past decade, with a focus on studying feature extraction methods. The review is based on published international papers discussing sign language recognition. The main objectives of the review are to identify the most effective and compatible feature extraction method for use in a sign language recognition system and to further research progress in the future.

The review concludes that while the current works have successfully improved hand gesture recognition by inventing technology that helps track hand regions precisely using an active sensor, there is still room for improvement based on a markerless passive sensor, such as vision-based approaches. Overall, the article highlights the need for continued research and development in feature extraction methods for sign language recognition.

REFERENCES

[1] Priyanka C Pankajakshan, PG Scholar, Department of EIE Karunya University, Coimbatore, India. Thilagavathi B, Assistant professor, Department of EIE Karunya University, Coimbatore, India.
[2] Ms. Greeshma Pala Department of Computer Engineering and Information Technology College of Engineering Pune, India. Ms. Jagruti Bhagwan Jethwani Department of Computer Engineering and Information Technology College of Engineering Pune, India. Mr. Satish Shivaji Kumbhar Department of Computer Engineering and Information Technology College of Engineering Pune, India. Ms. Shruti Dilip Patil Department of Computer Engineering and Information Technology College of Engineering Pune, India.
[3] Amrutha K Dept. of Computer Science CHRIST (Deemed to be University) Bangalore, India. Prabu P Dep. Of Computer Science CHRIST (Deemed to be University) Bangalore, India.
[4] Mohammed Safeel, Tejas Sukumar, Shashank K S, Arman M D, Shashidhar R, Puneeth S B Department of Electronics and Communication, JSS Science and Technology University Mysuru, Mysuru, India. Assistant Professor, Department of Electronics and Communication, JSS Science and Technology University Mysuru, India. Assistant Professor, Department of Electronics and Communication, Presidency University, Bengaluru, Bengaluru, India.
[5] Ashish S. Nikam P.G. Student, Dept. of Elect. & Telecom Dwarkadas J. Sanghvi College of engg. Mumbai, India. Aarti G. Ambekar Asst. professor, Dept. of Elect. & Telecom Dwarkadas J. Sanghvi College of engg. Mumbai, India.
[6] Suharjitoa, Ricky Anderson, Fanny Wiryana, Meita Chandra Ariestab, Gede Putra
[7] Kusuma. 2nd International Conference on Computer Science and Computational Intelligence 2017, ICCSCI 2017, 13-14 October 2017, Bali, Indonesia. Master of computer Science, School of Computer Science, Bina Nusantara University, Jakarta, Indonesia.
[8] Mr. Ilias Papastratis, Mr. Christos Chatzikonstantinou, Mr. Dimitrios Konstantinidis, Mr. Kosmas Dimitropoulos and Mr. Petros Daras. Visual Computing Lab, Information Technologies Institute (ITI), Centre for Research and Technology Hellas (CERTH), 57001 Thessaloniki, Greece.
[9] Parama Sridevi, Tahmida Islam, Urmi Debnath, Noor A Nazia1, Rajat Chakraborty*, Celia Shahnaz* Department of Electrical and
Electronic Engineering Bangladesh University of Engineering and Technology, Dhaka-1205.

 This work is licensed under a Creative Commons Attribution 4.0 International License

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 4, April 2023
DOI: 10.17148/IJARCCE.2023.124213

[10] Tülay KarayÕlan Department of Computer Engineering YÕldÕrÕm BeyazÕt University Ankara, Turkey. Özkan KÕlÕç Department of Computer Engineering YÕldÕrÕm BeyazÕt University Ankara, Turkey.
[11] Satwik Ram Kodandaram, 8th Sem UG Student, Visvesvaraya Technological University, Karnataka, India. N Pavan Kumar, 8th Sem UG Student, Visvesvaraya Technological University, Karnataka, India. Sunil G L, Assistant Professor, Visvesvaraya Technological University, Karnataka, India.
[12] Kusumika Krori Dutta, Department of Electrical and Electronics Engineering M.S. Ramaiah Institute of Technology Bengaluru, INDIA-560054. Sunny Arokia Swamy Bellary, Department of Electrical and Computer Engineering University of North Carolina at Charlotte Charlotte, USA – 28223.
[12] C.Suardi, A.N. Handayani, R. A. Asmara, A.P.Wibawa, L.N.Hayati and H.Azis, "Design of Sign Language Recognition Using E-CNN," 2021 3rd East Indonesia Conference on Computer and Information Technology (EIConCIT), Surabaya, Indonesia, 2021, doi:10.1109/EIConCIT50028.2021.9431877.
[13] D. Konstantinidis, K. Dimitropoulos and P. Daras, "Sign Language Recognition Based On Hand And Body Skeletal Data," 2018 - 3DTV-Conference: The True Vision - Capture, Transmission and Display of 3D Video (3DTV-CON), Helsinki, Finland, 2018-doi:10.1109/3DTV.2018.8478467.
[14] A. Kumar, K. Thankachan and M. M. Dominic, "Sign language recognition," 2016 3rd International Conference on Recent Advances in Information Technology (RAIT), Dhanbad, India, 2016, doi: 10.1109/RAIT.2016.7507939.
[15] Suharjito, F. Wiryana, G. P. Kusuma and A. Zahra, "Feature Extraction Methods in Sign Language Recognition System: A Literature Review," 2018 Indonesian Association for Pattern Recognition International Conference (INAPR),Jakarta,Indonesia,2018. doi:10.1109/INAPR.2018.8626857.