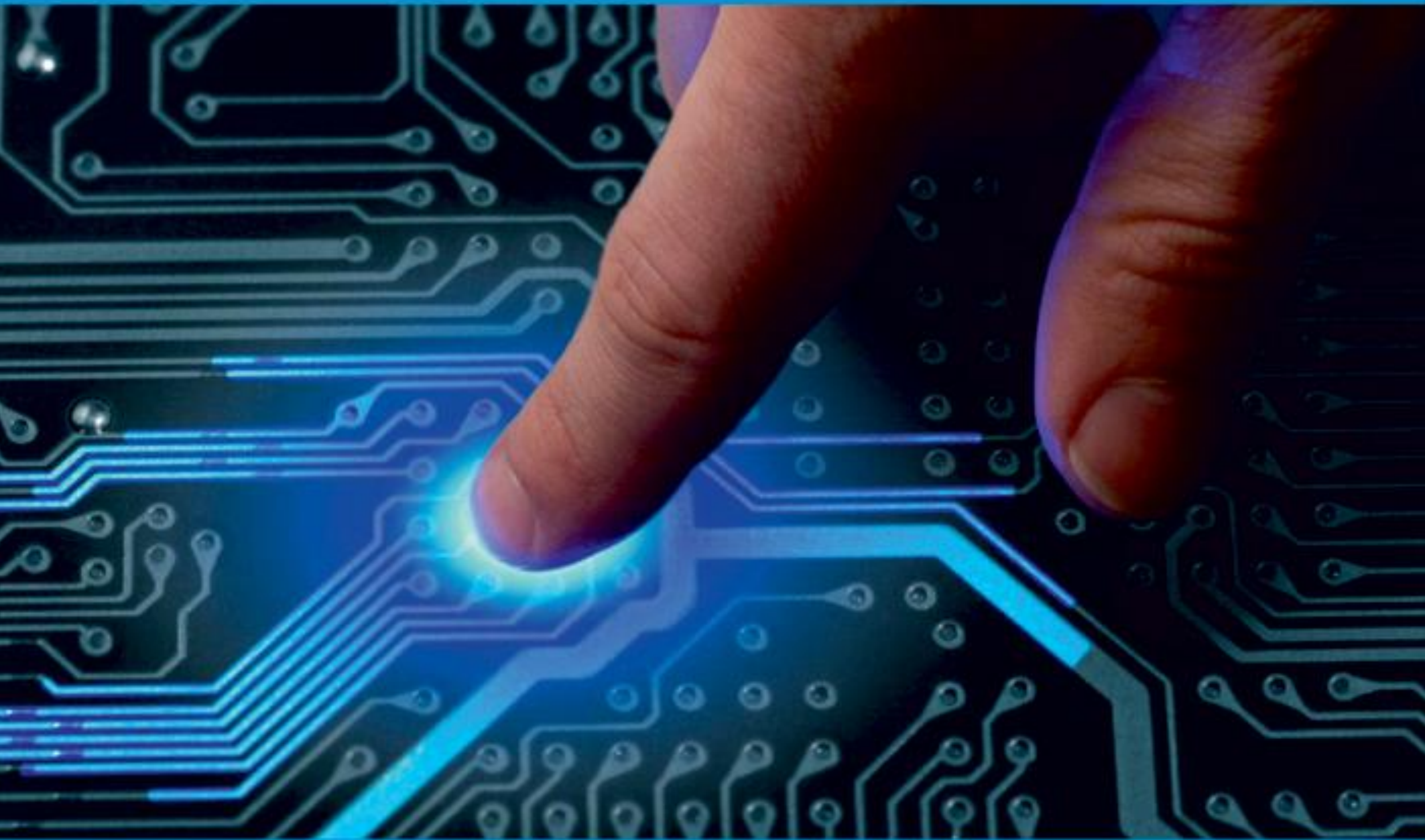
e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204099 |

Sign Language Recognition for Enhanced Communication

M. Kalpana[1], P. Hanumanth Rao [2], Tunguturi Vaishnavi [3] , Uttanooru Keerthi [4] , Yatala Chitra [5]

Associate Professor, Department of Computer Science and Technology, Vignana Bharathi Institute of Technology (Autonomus), Hyderabad, Telangana, India[1 2]

Student, Department of Computer Science and Technology, Vignana Bharathi Institute of Technology (Autonomus), Hyderabad, Telangana, India[3 4 5]

ABSTRACT: For those who are hard of hearing to interact with the outside world, sign language is an essential means of communication. Because it involves memorization of hand motions and positions, understanding sign language can be difficult. It appears that there is a need for an automatic system for recognising sign language so that anyone can communicate in it. This project aims to develop a real-time sign language identification system using computer vision, image categorization, and machine learning in order to bridge the communication gap between the hearing and the deaf communities. The system translates the sign language gestures recorded by a camera in real-time using deep learning techniques, specifically convolutional neural networks (CNNs). To improve the accuracy and robustness of the feature extraction process, the acquired image is pre-processed using OpenCV libraries.

Through the integration of supervised learning, massive data gathering, and additional training, the suggested system is able to recognize a wide range of sign language movements with accuracy in real world. Consequently, this approach has the capacity to eradicate communication gaps and enable a comprehensive setting that encourages smooth communication.

KEYWORDS: Computer Vision, Image Classification, Convolution neural networks (CNN), Deep Learning Techniques, OpenCV, Supervised Learning.

I. INTRODUCTION

In the rapidly changing world of technology, it is crucial to promote inclusive communication. For the Deaf and Hard of Hearing (DHH) community, sign language is an essential communication tool. But there is a big communication gap between people who use sign language and people who don't know what it means. Real-time sign language recognition systems have been made possible by cutting-edge technologies like Computer Vision and Deep Learning, which aim to close this gap. Convolutional Neural Networks (CNNs) are one of these that have become extremely effective tools, transforming the interpretation of sign language and facilitating smooth communication between various linguistic communities.

In today's ever evolving technological landscape, it is imperative to foster inclusive communication. Sign language is an essential communication tool for the Deaf and Hard of Hearing (DHH) community. However, there is a significant communication gap between individuals who are non-verbal and those who utilize sign language. Cutting-edge technologies that strive to reduce this gap, such Computer Vision and Deep Learning, have made real-time sign language detection systems conceivable. Among these are Convolutional Neural Networks (CNNs), which have grown to be incredibly powerful instruments that have revolutionized the way sign language is interpreted and enabled seamless communication amongst diverse linguistic populations.

II. OBJECTIVE

Bridging the communication gap between the dumb and the general public is aim of the CNN initiative on real-time sign language for enhanced communication. The project's goal is to create a reliable, real-time system that can precisely recognize and understand motions used in sign language. By giving the deaf and hard of hearing population a means of seamless contact in a variety of contexts, including public places and educational institutions, this technology aims to empower the deaf and hard of hearing community. Enhancing inclusivity and facilitating simple communication are the ultimate goals, as they will promote a more open and compassionate society for all.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204099 |

III. LITERATURE SURVEY

Through their research, J. Ekbote and M. Joshi hope to develop an automatic identification system for Indian Sign Language numerals, which range from zero to nine. They made the implementation database themselves, which has 1000 images total, 100 images for each number sign. With the astounding accuracy rate of up to 99%, the indications are categorized using ANN and SVM classifiers.

In order to get around issues with sign language recognition on particular embedded platforms, M. Jaiswal, V. Sharma, A. Sharma, S. Saini, and R. Tomar have presented a novel architecture for recognizing Indian Sign Language gestures made with two hands. This architecture uses binary values for weights and activations via bitwise operations. With an accuracy rate of 98.8%, this binarized neural network outperforms previous techniques; but, because of its limited recognition capacity, it is unable to accurately detect signs that represent M, N, and E due to their similar shapes.

Using a novel technique, Raghuveera, T., Deepthi, R., Mangalashri, R., and their team were able to recognize overlapping signals, double hand signs, and distinct ISL (Indian Sign Language) signs. Up to 71.85% improvement in average recognition accuracy has been demonstrated by this effort. It is crucial to remember that even while the system was able to translate some signs with perfect 100% accuracy, it was still unable to correctly understand the context of gestures, which resulted in incorrect translations on some occasions. Notwithstanding this drawback, the study's conclusions mark a substantial advancement in the field of sign language recognition technology and may have far-reaching effects on the deaf and hard-of-head people.

Raghuveera, T., Deepthi, R., Mangalashri, R., and their team were able to identify different ISL (Indian Sign Language) signs, overlapping signals, and double hand signs using a novel technique. This effort has shown an average recognition accuracy improvement of up to 71.85%. It is important to keep in mind that, despite the system's ability to translate certain signals with 100% accuracy, it was occasionally unable to accurately interpret gestures due to its inability to comprehend gesture context. The system's gesture separation algorithm enables it to distinguish between static and dynamic gestures.

IV. PROPOSED SYSTEM

By utilizing cutting-edge technology, the proposed solution seeks to transform communication for people with hearing impairments. It focuses on employing Convolutional Neural Networks, a deep learning method created especially for image analysis, for real-time sign language detection. Through the use of CNNs, the system is able to reliably decipher and convert sign language motions into text or voice, facilitating smooth communication between the hearing community and those who are deaf or hard of hearing.

The device uses a camera or sensor to record sign language movements in real-time circumstances. The CNN model processes these signals after undergoing rigorous training on a variety of sign language motions to guarantee accuracy and robustness. Precise interpretation is made possible by the CNN's fine recognition of subtle hand gestures, facial emotions, and body language. The technology has a significant impact on the hearing-impaired community by improving inclusivity and accessibility. It makes it easier to communicate instantly in a variety of contexts, including social interactions, healthcare, and education. This creative approach creates a more inclusive society by reducing communication barriers and advancing understanding and equitable opportunities for those with hearing impairments. Through the integration of cutting-edge technology and deep learning, the proposed system empowers individuals with hearing impairments, enabling them to participate actively and meaningfully in the world around them.

V. METHODOLOGY

Prior to Processing
There are two steps in the pre-processing:
Segmentation: Breaking apart the footage into individual frames. Segmentation is the process of breaking up a digital image into numerous smaller fragments. Making an image representation easier to comprehend and evaluate is the aim of segmentation.

Binarization: Every grayscale image is binarized using algorithms, which should work well for pictures with complex backgrounds.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204099 |

Feature Deletion

Finding the qualities that each unique sign characteristic is represented by is a crucial step in the identification of sign language. It could have to do with the way the hands, face, fingers, or complete body move dynamically. The actual hand gestures include a very wide range of shapes, motions, and textures.

To handle the multiplicity of these differences, the feature needs to be dependable and efficient.

Pattern Recognition and Matching

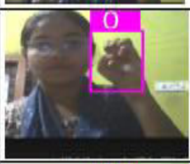
At this stage, pattern matching and recognition are done by using the database to examine subsequent motions and identify user requests or behaviors.

Since 1.5.2b, the default Python implementation has come with an integrated development environment (abbreviated IDLE, for Integrated Development and Learning Environment). In many Linux systems, it comes included as an optional element of the Python package. Everything about it is written in Python, including the wrapper functions for Tcl/Tk using the Tkinter GUI toolkit.

It is cross-platform and free of feature clutter as a result. Microsoft developed Visual Studio, a well-liked integrated development environment (IDE) for software development. It offers an extensive and adaptable tool set for developing a variety of applications, including those for the web, mobile, desktop, cloud, and game development. Developers all across the world use Visual Studio because of its rich, user-friendly interface and support for numerous programming languages.

The highly configurable code editor in Visual Studio is one of its best features; it offers debugging, syntax highlighting, and code completion, among other things. Additionally, it provides a huge selection of extensions via the Visual Studio Marketplace, enabling programmers to customize their development environment with different tools and plugins.

VI. RESULT

Test Case ID	Input	Expected Output	Actual Output	Rate
1	GESTURE 1 IS GIVEN			SUCCESS
2	GESTURE O IS GIVEN			SUCCESS
3	GESTURE U IS GIVEN			SUCCESS
4	INTERRUPTION			failure

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204099 |

VII. CONCLUSION

In conclusion, sign language identification with Convolutional Neural Networks (CNN) is a noteworthy technological development that could significantly enhance the quality of life for those who are hard of hearing. Deep learning is used by CNN-based sign language recognition systems to reliably understand and transform complicated hand movements into intelligible text or spoken language. Through the analysis of visual cues in real-time video feeds related to sign language motions, these systems serve as a conduit for efficient communication between the hearing and deaf communities. Furthermore, real-time recognition is made possible by the speed and effectiveness of CNNs, enabling quick and natural engagement in a variety of circumstances, from regular discussions to instructional settings. Real-time sign language recognition systems utilizing CNNs have potential for fostering inclusion, removing obstacles to communication, and improving the quality of life for those with hearing impairments as the fields of computer vision and deep learning continue to advance.

REFERENCES

1. Using a deep cascaded mode, Rastgoo, Kiani, and Escalera (2020) conducted a video-based isolated hand sign language identification study. Multimed Tools Appl 79, 22965–22987. This link points to 10.1007/s11042-020-09048-5.
2. "An Efficient Binarized Neural Network for Recognizing Two Hands Indian Sign Language Gestures in Real-time Environment," M. Jaiswal, V. Sharma, A. Sharma, S. Saini, and R. Tomar, 2020 IEEE 17th India Council International Conference (INDICON), New Delhi, India, 2020, pp. 1-6, doi: 10.1109/INDICON49873.2020.9342454.
3. Taghuveera, T., Mangalashri, R., Deepthi, R., et al. A depth-based Microsoft Kinect identification system for Indian Sign Language. Sādhanā 45, 34 (2020). 10.1007/s12046-019-1250-6 is the link;
4. Rastgoo, R., Escalera, S., and Kiani, K. Multimed Tools Appl 79, 22965–22987 (2020): Video-based isolated hand sign language recognition utilizing a deep cascaded mode l. In this case, 10.1007/s11042-020-09048-5
5. In 2019, Jiang, L., Huang, H., Dang, J., and Mo, Z. Real-time recognition of sign language with an effective CNN-LSTM model. In the IEEE International Conference on Computer Vision (ICCV) Workshop Proceedings, pages 3039–3047.
6. Zeng, K., Guo, Y., Akbari, H., & Ye, H. (2018). Convolutional neural networks are used for real-time recognition of American Sign Language. In Systems, Man, and Cybernetics (SMC): IEEE International Conference Proceedings (pp. 2623-2628).
7. Grosu, V., and Ostenko, O. (2017). Convolutional neural networks for recognition of sign language in real time. Pages 1586–1591 in the Workshop Proceedings of the International Conference on Computer Vision (ICCV).
8. In 2014, Plugeault, N., Bodenhagen, L., and Krüger, N. Using CNN for image classification and pre-processing on depth data, sign language recognition is achieved. Book 556–562 of the Workshop Proceedings of the International Conference on Computer Vision (ICCV).