International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

AI Powered Sign Language Translator

Prof. Aradhana Pawar[1], Shital Kale[2], Riya Kamble[3], Kiran Misal[4]

[1]*Computer Department, Dr. D. Y. Patil college of Engineering and Innovation, Varale.*
[2]*Computer Department, Dr. D. Y. Patil college of Engineering and Innovation, Varale.*
[3]*Computer Department, Dr. D. Y. Patil college of Engineering and Innovation, Varale.*
[4]*Computer Department, Dr. D. Y. Patil college of Engineering and Innovation, Varale.*

Abstract - The purpose of this effort is to promote equitable environments and allow people with hearing disabilities to communicate in their native language by proposing an AI-based sign language translator. We used a transformer neural network, which can analyze over 500 data points from a person's face and gestures, to translate sign language into text. The translator can expand, produce new datasets, and build models for sign language recognition thanks to our machine learning process. As a proof of concept, we developed an interpreter for emergency calls using more than 200 sign language words. The main goal is to empower people who are deaf to participate in social, political, economic, and cultural spheres of life. We see a lot of people with illnesses, including blindness, deafness, and dumbness, every day. They have trouble interacting with other people. The suggested method can translate sign language into text and voice since this study describes two-way communication between deaf, dumb, and normal individuals.

Key Words: Sign Language, Inclusion, Social Development, Artificial Intelligence, Machine Learning.

1. INTRODUCTION

A computer-assisted visual gesture and sign language system for the deaf automates communication between hearing and deaf persons using the idea of human-computer interaction. Due to the fact that a large number of people with hearing impairments cannot hear, write, or even speak spoken language, applications for sign language are rapidly developing. The AI-powered Sign Language Translator is a creative application of computer vision, machine learning, and artificial intelligence. It is a transformative tool that facilitates communication between the hearing and the deaf while also advocating for inclusivity and equal opportunities for individuals with hearing impairments. This study intends to investigate the concept, development, and uses of this novel technology, highlighting how it has the potential to fundamentally alter our comprehension and utilization of sign language.

A major obstacle to efficient communication in a world where it is essential for hearing-impaired people to utilize sign language is the linguistic barrier between those who do and do not understand it. Creating a translator from sign language has become a vital technological approach to dealing with this problem.

With this breakthrough, the community of hearing-challenged people and non-sign language speakers will be able to communicate more easily. This technology hasthe ability to improve understanding, accessibility, and social inclusion for all people, regardless of hearing ability, by offering real-time translation from sign language to spoken language and vice versa.

2.BODY OF PAPER

Consider having a conversation with a deaf individual. It could seem like a challenging assignment already if you are unfamiliar with sign language. Millions of deaf individuals engage in conversation and interaction with hearing individuals. We proposed a method to deal with this problem for people who use sign language to interact with one another, both deaf and vocal. We believed that something had to be done to help these physically challenged individuals, which is why we came up with this idea. By lowering communication obstacles, the AI-powered Sign Language Translator project hopes to help the deaf and hard-of-hearing communities.

2.1 Problem Statement

There are about 46 million dumb people on the globe who are mute and deaf. Because deaf people communicate with hand signs, normal people have trouble understanding what they are saying. People with hearing impairments never have an easy time conversing with regular people. They find it difficult to communicate their ideas and thoughts to regular people whose knowledge of sign language is either very poor or nonexistent. This causes the community of hearing-impaired persons to become disinterested in social events, avoid interacting with regular people occasionally, and live in solitude.

There are serious communication barriers that both hearing-impaired people who use sign language and

others who do not comprehend it must overcome. The community of people with hearing impairments has feelings of exclusion and loneliness due to a lack of appropriate communication techniques, which restricts their involvement in different activities and makes it more difficult for them to share their ideas and views with others. This communication gap highlights the necessity for a reliable and accurate sign language interpreter that can help people with hearing impairments and non-sign language speakers communicate easily. A solution like this ought to improve comprehension, accessibility, and social inclusion by bridging the divide between the two communities.

2.2 Methodology:

CNNs, or convolutional neural networks, are network topologies for deep learning that obtain their knowledge directly from data. CNNs are highly useful when searching for patterns in images to identify items, classes, and categories. In the classification of signals, time series, and audio data, they can also be very helpful. Convolutional neural networks are one type of artificial deep learning neural network. Computer vision and image recognition both use it. The hidden layers are composed of completely linked layers, pooling, normalizing, and convolution. CNNs filter input volumes to higher abstraction levels using several convolution layers.

1. Data collection:
   Assemble a diverse set of sign language movements and expressions that represent regional variances, dialects, and sign languages. Videos and annotations of sign language gestures should be included in this dataset in order to train and validate the AI model.

2. Preprocessing:
   Segment and annotate the sign language motions in the acquired data to enable precise categorization and synchronization between the signed words and their related translations.

3. Model Selection for Machine Learning:
   Choose the appropriate computer vision and machine learning models, such as recurrent neural networks (RNNs) and convolutional neural networks (CNNs), to process and understand sign language gestures. Examine state-of-the-art sign language recognition models, like deep learning systems.

4. Model Training:
   Train the selected model with the preprocessed dataset, aiming for resilience and accuracy in real time.

5. Real-time Data Acquisition:
   Install a system that records hand movements in sign language in real time using cameras. With the AI model that has been trained to analyze it, combine this data.

6. Natural Language Processing (NLP):
   Utilize NLP methods to convert identified sign language motions into spoken or written words, based on the user's preferences.

7. Usability and Availability:
   Provide a user-friendly, AI-powered sign language interpreter that both hearing and deaf people may utilize. Consider a range of platforms, including mobile apps, web apps, and specialized devices.

2.3 Requirement

- RAM: 8 GB
- Hard Disk: 40GB
- Processor: Intel i5 Processor
- IDE: spyder
- Coding Language: Python Version 3.5
- Operating System: Windows 11

2.4 Data Flow Diagram:

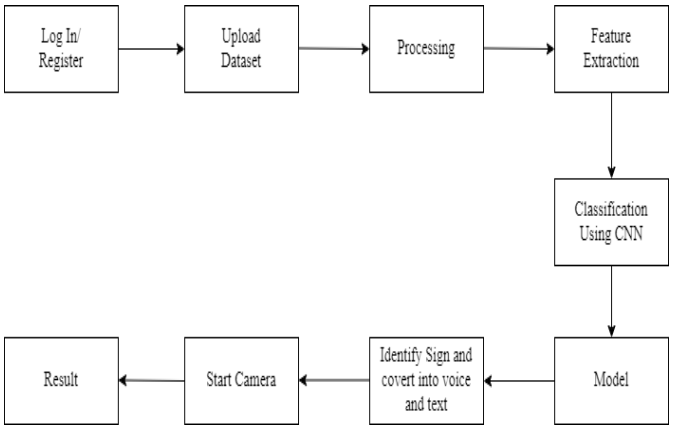


Fig 1: Data Flow Diagram

2.5 Activity Diagram:

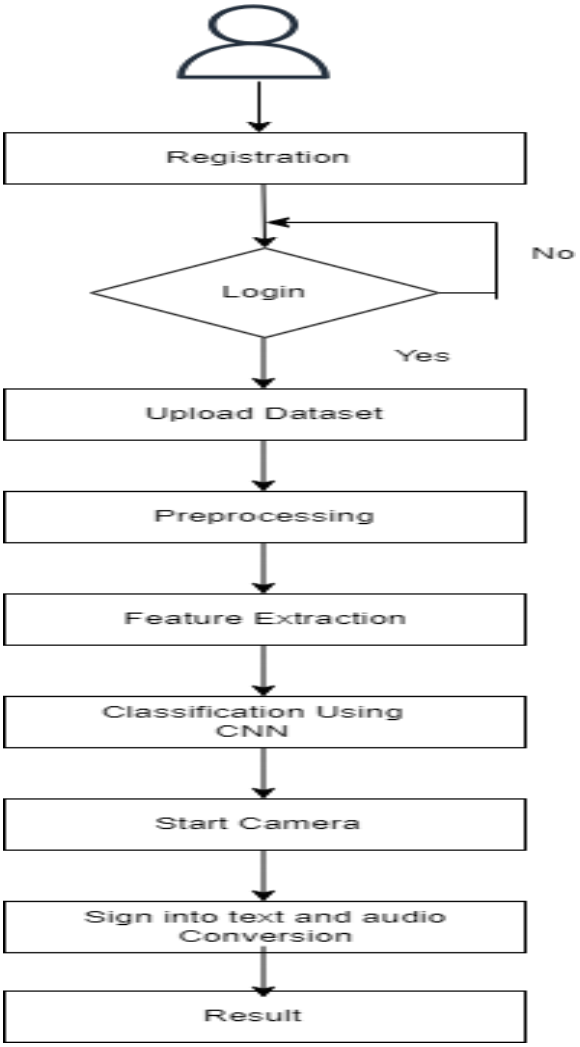


Fig 2: Activity Diagram

2.6 System Architecture:

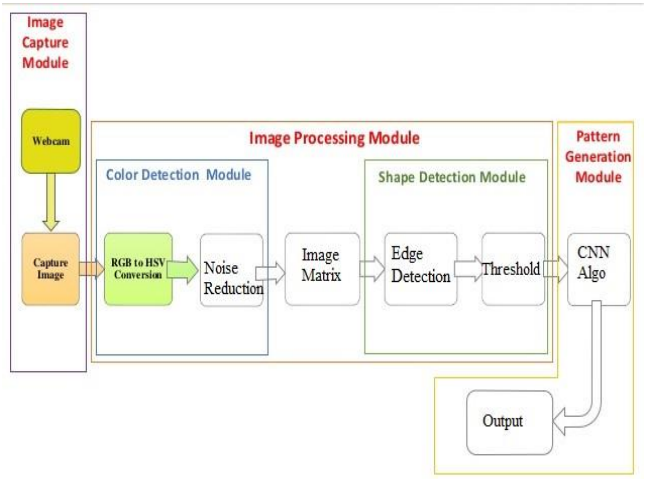


Fig 3: System Architecture

3. STEPS

1. Open "AI Powered Sign Language Translator":
   Begin by launching the "Sign Language Translator" application on your device. You can do this by locating the app icon and tapping on it.

2. Registration:
   If you're a new user, you'll need to register an account. This typically involves providing some basic information such as your name, email address, and creating a password. Registration helps personalize your experience and allows you to access additional features.

3. Login:
   After registration, log in to your account using the credentials you provided during registration. This ensures that you have access to your account and any saved preferences or data associated with it.

4. Gesture Recognition:
   Position yourself in front of the camera screen and locate the green box indicated on the interface. Perform your desired sign within this area and wait for the software to recognize and interpret it.

5. Message Display:
   Once the software recognizes your sign, it will display a corresponding message on the screen. This message typically represents the meaning or translation of the sign you performed.

6. Message Playback:
   After displaying the message, the software may also provide an option to play back the message audibly. This auditory feedback helps reinforce the meaning of the sign and aids in comprehension.

7. Repeat Steps as Needed:
   Continue performing signs in front of the camera screen and following the prompts displayed by the software until you have completed your desired communication or task.

8. Close Camera Screen:
   When you're finished using the application, close the camera screen by navigating to the appropriate option or simply closing the app.This helps conserve battery life and ensures privacy when the camera is not in use.

9. Exit the Application:
   Finally, click on the exit button or navigate to the option to exit the application completely. This closes the application and returns you to the device's home screen.

4. CONCLUSIONS

The collection of a wide range of sign language motions has created a solid base upon which to train the model. Convolutional neural networks (CNNs) are onepromising model for gesture interpretation. Cameras cannow record real-time sign language gestures thanks to a developed user interface. Future work will concentrate onenhancing the model's precision and putting natural language processing techniques into practice to guaranteeseamless translation. Additionally, the project's development will keep giving priority to the involvement of stakeholders, moral considerations, and respect for privacy protocols. The Sign LanguageTranslator project's future stages will have a solid basis thanks to this development.

In this study, a neural network-based technique for automatically deciphering Indian sign language finger typing is developed. The characteristics taken from the hand forms are used to identify the signals. The user does not need to wear gloves or any other specific gear in order to obtain the features of the hand form because the method is fully implemented through the use of digital image processing techniques.

Overall, this dual focus on refining gesture interpretation and enhancing accessibility underscores the project's commitment to addressing the unique communication needs of the deaf and hard of hearing community. With this development as a solid foundation, the SignLanguage Translator project is poised to advance further in its mission to bridge linguistic barriers and promote inclusivity.

5. ACKNOWLEDGEMENT

We also extend our heartfelt appreciation to Prof. Aradhana Pawar for her unwavering support and guidance throughout the research process. Her expertise and insights have been instrumental in shaping the direction of our work and bringing it to a successful conclusion. Additionally, we want to express ourgratitude to all the employees who generously shared their time and expertise, contributing to the depth and quality of our research. Your dedication and collaboration have been invaluable, and we are truly grateful for your contributions.

6. OUTPUT

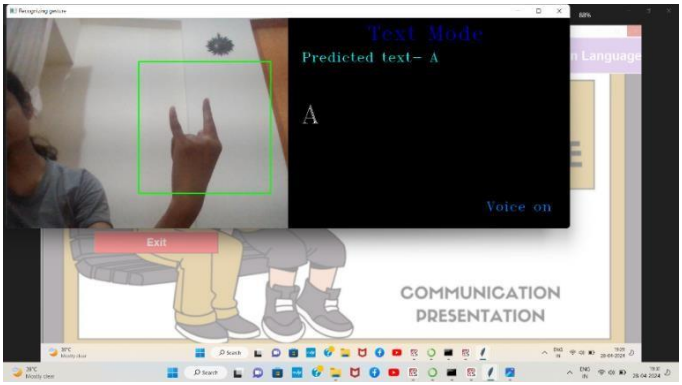
- Open Software:

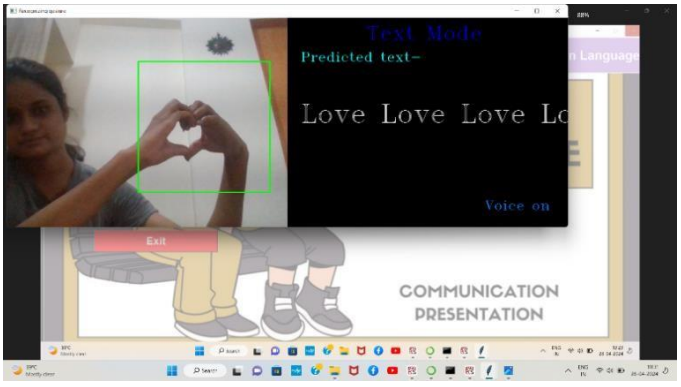
- Registration:

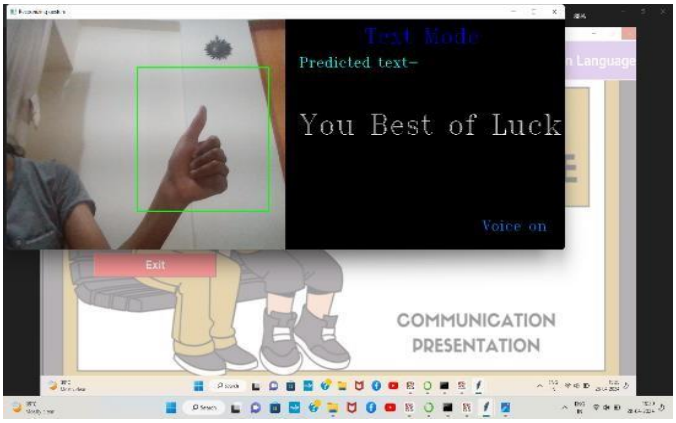
- Login:

- SAfter click on Sign Recognition:

- Recognition:







7. FUTURE SCOPE

- Android Application Development:

  The future of sign language translation lies in the development of user-friendly mobile applications. These applications will allow individuals to easily access sign language translation services on their smartphones and tablets. With the widespread use of mobile devices, an Android application will make sign language translation more accessible to a larger audience. The application will feature intuitive user interfaces, real-time translation capabilities, and customizable settings to cater to the diverse needs of users.

- Comprehensive Sign Language Guidebook Integration:

  To enhance user experience and facilitate learning, a comprehensive guidebook will be integrated into the sign language translation software. This guidebook will contain detailed information about sign language alphabets, common signs for words and phrases, numerical signs, and grammatical rules. Users can refer to this guidebook to learn sign language fundamentals, understand the meaning of different signs, and improve their communication skills. Additionally, the guidebook will feature interactive exercises and quizzes to help users practice and reinforce their learning.

- Continuous Improvement through Machine Learning:

  To ensure accurate and reliable sign language translation, the software will leverage machine learning algorithms that continuously learn and improve over time. These algorithms will analyze large datasets of sign language videos and corresponding translations to refine their understanding of sign language patterns and nuances. Through iterative learning processes, the software will become increasingly proficient at translating sign language gestures into spoken language and vice versa, enhancing the overall user experience and effectiveness of the translation system.

8. REFERENCES

1. A Design Science Research Study on Artificial Intelligence for Sign Language Translation (2023) Strobel Gero, Germany's Thorsten Schoormann Frederik Möller and Leonardo Banh.

2. Written sign language instruction using multimedia technologies (2021) Farkhadov M.P., Myasoedova Z.P., and Myasoedova M.A.
3. For the purpose of sign language recognition, data gathering of 3D spatial aspects of motions from a static Peruvian sign language alphabet (2021) Pedro Shiguihara Juarez, Cristopher Ramos-Carrion, and Robert Nurenajana.
4. Bengali Sign Language Recognition using a New Deep Convolutional Neural Network (2021) Mds. Sabbir Ejaz and Jahangir Hossein
5. Study on Dynamic Algorithms for Sign Language Utilizing Sign Language Trajectories and Key Frame Extraction (2019) Chenyu Liu, Qunzhu Tao, Zhijun Li, and Yufei Yan
6. Using LSTM for Real-Time Translation of Indian Sign Language (2019) Ashna Iqbal, Akshatha Nayak, and Ebey Abraham.

7. Galib Ibne Haidar, Hasin Ishraq Reefat, Glove-Based American Sign Language Interpretation Using Convolutional Neural Networks and Data Glass (2020).
8. Development of Image Segmentation Classifiers for Deaf and Dumb Sign Language Processing (2020) Abhishek Biswas and Pushan Kumar Dutta. Nilanjana Chaudhary and Ahona Ghosh.
9. Toward the Recognition of Multilingual Sign Language (2020) Mathew Magimai, Sandrine Tornay, and Marzieh Razavi.- Doss.
10. Using Templates to Recognize Sign Language Symbols (2020) Sarika Jain and Deepika Pahuja
11. Key Action Recognition in Chinese Sign Language Using Extenics Immune Neural Network (2020): Rui Feng, Yue Sun, Tiantian Yuan, and Junfen Chen.
12. An automated portable two-way communicator that bridges the gap between privileged and normal people in English and Hindi (2020) A. Sathya S. Kanaga Suba Raja, Dr. L. Priya.