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Sign Language Translator

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Abstract:- Individuals with hearing and speech disabilities use sign language as their primary mode of communication to express their thoughts, ideas, feelings, and opinions to the rest of the world. They use multiple complementary channels to convey information as visual languages. This includes manual characteristics like hand shape, movement and pose, facial expression, lip movement, and so on. For someone who has never learned the language, the sign gestures are frequently mixed up and confused. Our project focuses on bridging this gap by recognizing hand gestures and converting them into readable text and audio speech using machine learning algorithms, and it also allows written text to be converted into hand gestures. Sign language recognition and translation enable us to learn the spatial representations, underlying language model, and mapping between sign and spoken language in real time.

I. INTRODUCTION

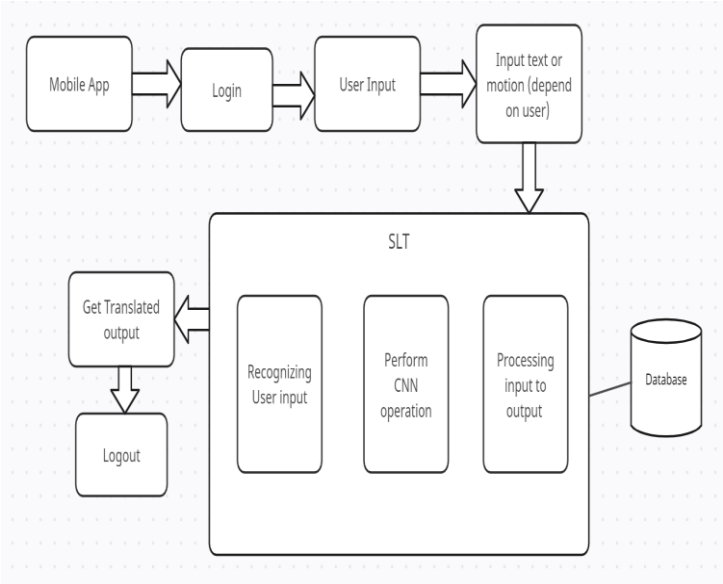
A sign language is a language that uses hand movements, body orientation, and facial expressions for communication rather than relying on acoustic waves. According to a World Health Organization report, "a total of 466 million people worldwide have a hearing impairment, and this number is expected to rise to 900 million people, by the year 2050." As a result, it is now more than necessary to develop a cost-effective and comprehensive system to assist these individuals. This system aims to not only bridge the communication gap, but also to improve individuals' learning curves and make them more confident. There are numerous data-sets and models available, but none of them have been shown to be very accurate due to inconsistencies in the data-set or the model. There have been hardware innovations in the past that focused on phrase conversion, but the scope is limited to the data-set. While in our proposed system, each alphabet in American Sign Language has been translated to text and speech and allows for bi-directional communication.

II. EXISTING SYSTEM

To interpret sign language in the existing system, the K-Nearest Neighbour (KNN) algorithm in Machine Learning is used. The accuracy and speed with which this system can generate text are insufficient. When the background is not black, it is unable to interpret the text. This system can only detect up to ten sign alphabets, which must be pre-trained before using a large number of images for a single alphabet, word, or phrase. When it comes to providing text and audio output, this system falls short in terms of accuracy and speed.

III. PROPOSED SYSTEM

For hand sign sequences, our platform employs neural networks with LSTM (long short-term memory) layers. It detects sign languages in real time using OpenCV. This platform converts recognised signs into written text and audio. Another advantage of this approach is that it can be used with any background and produces results faster. It is a complete sign language to audio and text translation model that can also be used for learning. This platform offers a user-friendly application that reduces the amount of time spent on communication. It allows you to reach a larger audience and interact with them even from a distance, without making any noise.



(Fig.1 Proposed System Architecture)

IV. EXPERIMENTAL TOOLS

- *Deep learning:*

Deep learning is a machine learning algorithm that employs multiple layers to extract higher-level features from raw input. Learning can take place under supervision, semi-supervised, or unsupervised. Deep-learning architectures such as deep neural networks, deep belief networks, deep reinforcement learning, recurrent neural networks, convolutional neural networks, and transformers have been used in computer vision. Deep learning demands a vast amount of data and computer power, but it has become more

accessible in recent years thanks to cloud computing and open-source frameworks like Tensor Flow and PyTorch. In the upcoming years, it is anticipated to have a substantial impact on a variety of industries, including healthcare, banking, and transportation. Artificial neural networks are used in deep learning, a branch of machine learning, to model and resolve complicated issues.

- *Python:*

Python is an interpreted object-oriented, high-level programming language with dynamic semantics. Its built-in high-level data structures, combined with dynamic typing and dynamic binding, make it an excellent choice for use as a scripting or glue language to connect existing components. Python's straightforward, simple syntax emphasises readability, lowering programme maintenance costs. Python supports modules and packages, which encourages programme modularity and code reuse. Python's interpreter and extensive standard library are available in source or binary form for all major platforms.

- *Flask:*

Flask is a Python-based micro web framework. Because it does not require the use of any specific tools or libraries, it is classified as a micro-framework. It lacks a database abstraction layer, form validation, and other components that are provided by third-party libraries. Flask, on the other hand, supports extensions that allow you to add application features as if they were built into Flask. It is very simple to learn and use. The tools and libraries required to create web applications, like as routing, request processing, and templates, are provided by Flask. Due to Flask's strong extensibility, developers can quickly incorporate third-party libraries and tools as required. The simplicity and minimalism of Flask are two of its main advantages. Overall, Flask is a strong and adaptable technology that is suitable for Python web application development.

- *HTML:*

HTML is an abbreviation for Hypertext Markup Language, which is the standard markup language for creating web pages and applications. HTML allows developers to structure content on a web page by defining different elements such as headings, paragraphs, links, images, and forms using tags and attributes. HTML documents are composed of a series of tags enclosed in angle brackets, such as <html>, <head>, <title>, <body>, and many others.

- *CSS:*

CSS (Cascading Style Sheets) is a style sheet language that is used to describe the appearance and layout of HTML or XML documents. CSS allows developers to separate a web page's content from its visual presentation, giving them more flexibility and control over how the page is displayed. CSS applies rules or styles to specific HTML elements or groups of HTML elements. These rules can be used to define the font, colour, size, layout, and positioning of various elements on a web page.

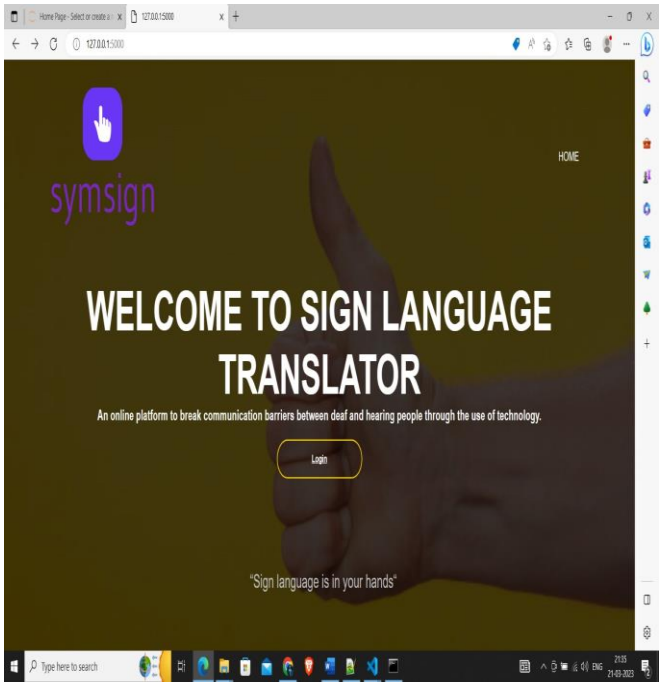
- *MySQL:*

MySQL is a well-known open-source relational database management system (RDBMS) that is used to store and manage structured data. Because of its scalability, reliability, and ease of use, it is widely used in web development and is frequently the database of choice for many web applications. MySQL employs a client-server architecture, in which data is stored on a server and accessible via a network by multiple clients. MySQL is built on SQL (Structured Query Language), a database management and querying language. MySQL supports a wide range of programming languages, including Python, Java, and PHP.

- *Visual studio code:*

Microsoft's Visual Studio Code (VS Code) is widely used by programmers and developers for writing and debugging code. Many features, such as code highlighting, autocomplete, and debugging tools, make VS Code popular among developers. It supports numerous programming languages, including Java, Python, JavaScript, C++, and others. VS Code supports a wide range of programming languages, including CSS, Go, and Docker file in addition to Java, C++, and Python. In addition, VS Code enables you to add new extensions like code linters, debuggers, and support for cloud and web development.

V. OUTPUT



(Fig.1 Home Page)

Home page displays project title and Login button, which takes you to the login page.

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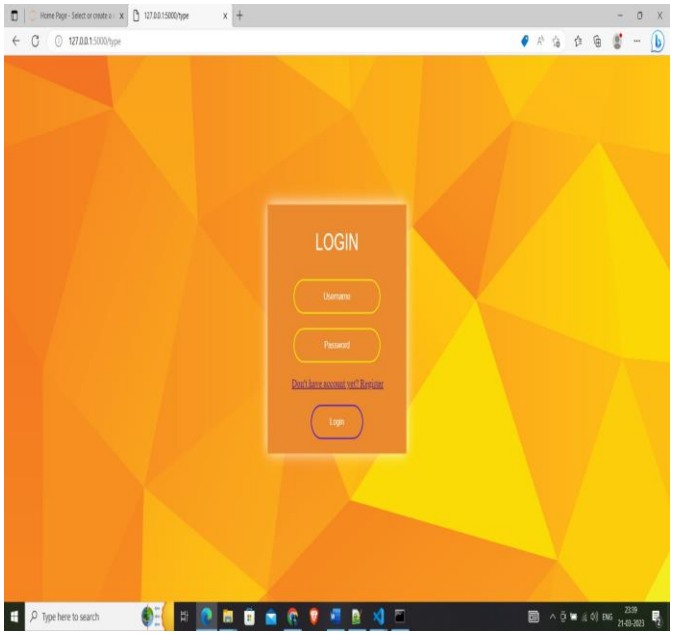
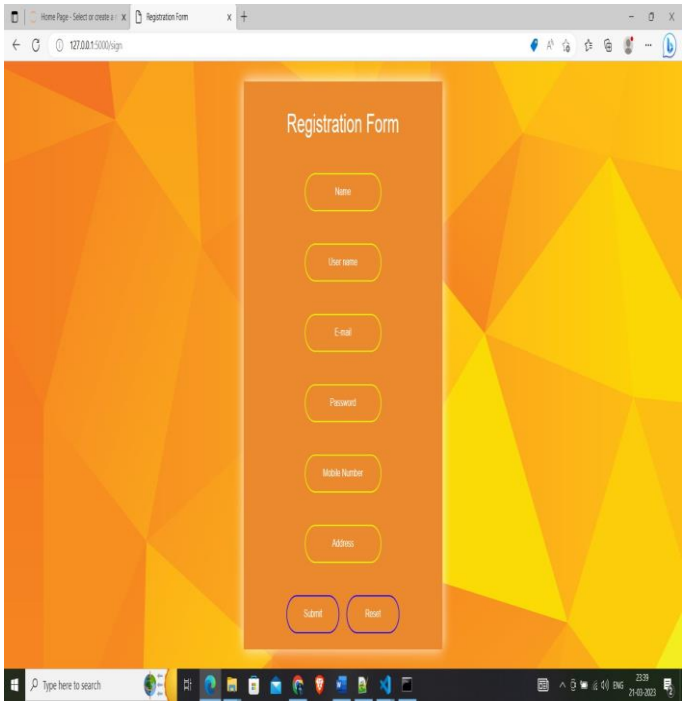


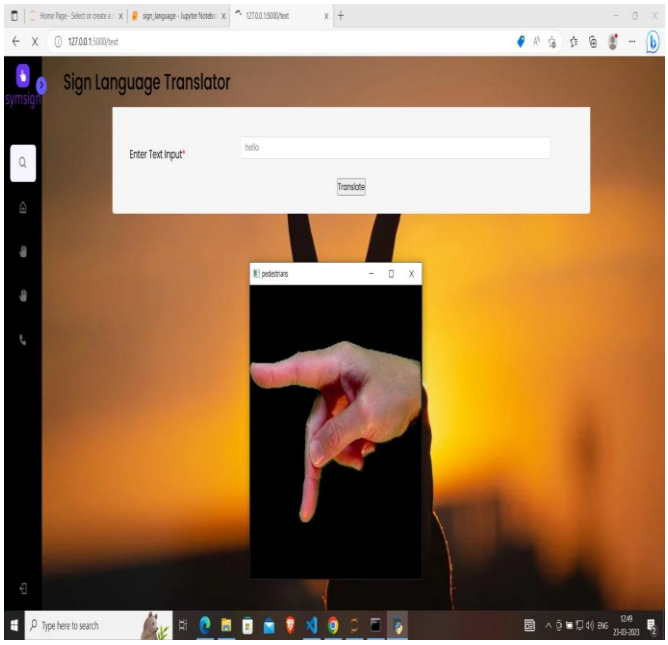
(Fig.3 Login Page)

It displays the login page, where they can register if it's their first time and also login if they already registered.



(Fig.4 Registration Form)

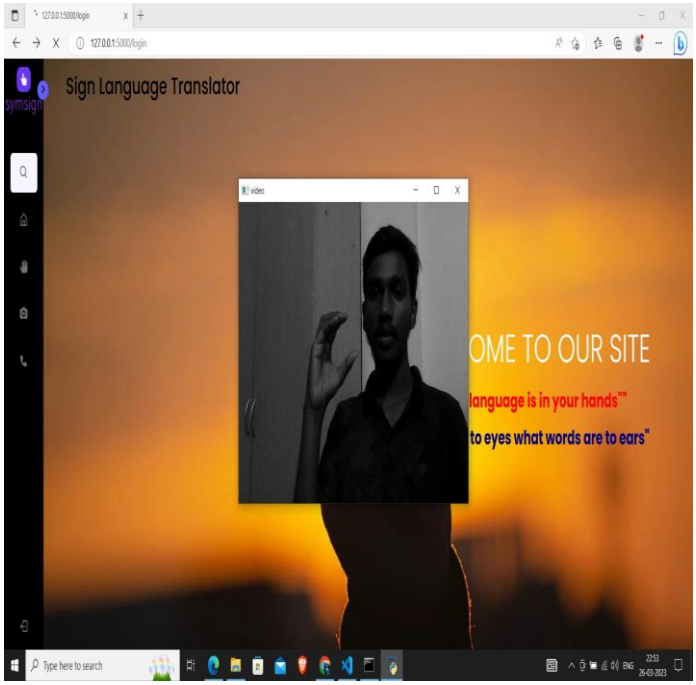
It displays the user to fill the personal details to register and can directly login next time.



(Fig.5 Text as input)

In this page text is given as input and we will have voice and sign language as the output.

The sign language is displayed in the other window.



(Fig.6 Image as input)

In this page image is taken as input and we will have the translated text of the sign image as the output.

VI. CONCLUSION

A sign language translator project is a significant technological advancement that has the potential to transform communication for the deaf and hard-of-hearing communities. The project's goal is to increase accessibility and social inclusion by facilitating communication between deaf and hard-of-hearing people and the hearing population. A sign language translator can accurately recognise and interpret sign language gestures and translate them into spoken language or written text using advanced artificial intelligence and machine learning algorithms, and vice versa. Education, public events, healthcare, customer service, online communication, and emergency services are among the many applications of the project. A sign language translator project can improve communication and access to information for all individuals, regardless of hearing ability, by developing a user-friendly interface that integrates with other technologies. Overall, the creation of a sign language translator project provides an opportunity to advance technology, promote inclusivity and accessibility, and raise awareness of the needs of the deaf or hard-of-hearing community.

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