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Sign Language Recognition System

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Abstract*: *We witness many people who face disabilities like being deaf, dumb, blind etc. They face a lot of challenges and difficulties trying to interact and communicate with others. This paper presents a new technique by providing a virtual solution without making use of any sensors. Histogram Oriented Gradient (HOG) along with Artificial Neural Network (ANN) have been implemented. The user makes use of web camera, which takes input from the user and processes the image of different gestures. The algorithm recognizes the image and identifies the pending voice input. This paper explains two way means of communication between impaired and normal people which implies that the proposed ideology can convert sign language to text and voice.

Keywords*: *Histogram Oriented Gradient (HOG), Artificial Neural Network (ANN), Confusion matrix.

I. INTRODUCTION

Communication plays a significant job in our lives, as it empowers us to share our considerations. We as a rule impart through discourse, motions, non-verbal communication, composing, perusing, or outwardly, discourse being one of the normally utilized among us. Albeit sadly, for individuals who deal with talking and hearing issues, there is a tremendous problem in correspondence. Visual guides, or different gadgets, are utilized for passing on message to them. Nonetheless, these sorts of strategies are fairly lumbering or costly, and can't be utilized during crisis purposes. Communication through signing essentially utilizes manual correspondence to pass on the message. Communication through signing comprises of fingerspelling, what illuminates words character by character, and word level affiliation which includes hand signals that pass on the word meaning.

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Fingerspelling is a crucial device in gesture-based communication, as it empowers the correspondence of names, addresses and different words that don't convey a significance in word level affiliation. Despite this, fingerspelling isn't broadly utilized as it is trying to comprehend and hard to utilize. Also, there is no all-inclusive communication via gestures and not many individuals know it, which makes it a lacking option for correspondence. A framework for gesture-based communication acknowledgment that arranges finger spelling can tackle this issue. Different machine learning calculations are utilized, and their correctness are recorded and analyzed in this paper.

II. RELATED WORK

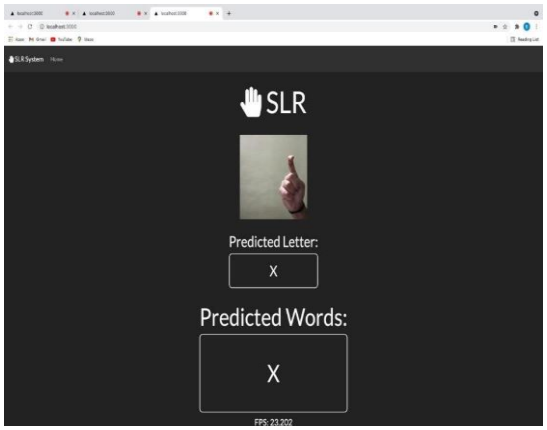
The existing SLR system involves - Hardware modules, Flex Sensors, Immobile sensory equipment and kits. The implemented canteen SLR system is a real time recognition system, end to end communication, easy to interface, flexible and has minimal software specifications and requirements. The different tech stacks used by similar Sign Language recognitions systems are Python, TensorFlow, OpenCV, Keras, NumPy and various machine learning algorithms.

III. METHODOLOGY

The implementation of the project has two main parts frontend and backend. Frontend is built using ReactJS and Bootstrap, backend is built using NodeJS and Express is used to connect both the ends while data is stored and managed in MongoDB.

A. The User Interface

The user interface includes the use of the system's webcam for detecting the sign language and predicting the accurate words and display it on the screen which can comprehended by the user and for better communication.



B. Technologies Used

Frontend: ReactJS framework is used to build reusable component-based UI. It is an open source, declarative code which is predictable and easy to debug. The react hooks help in DOM manipulation. A react application can have multiple or nested components each responsible for rendering a small reusable piece of HTML.

Algorithm: Python is an open-source scripting language which facilitates the use of certain libraries which uses machine learning to train a model. It is a high-level language with dynamic semantics. NumPy is a library for adding support for large multi-dimensional arrays and matrices along with large collection of mathematical functions. OpenCV is a computer vision and ML software library toolkit for processing real-time image and video.

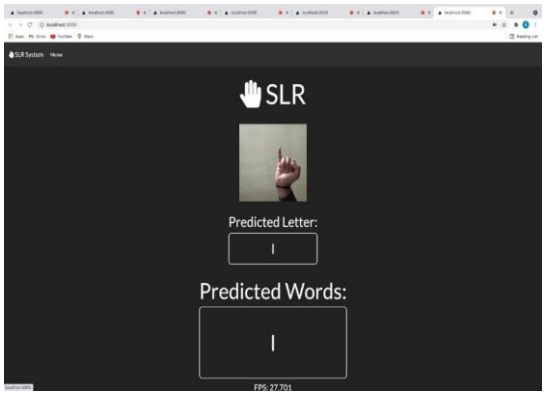


Fig. 1: Website outlook

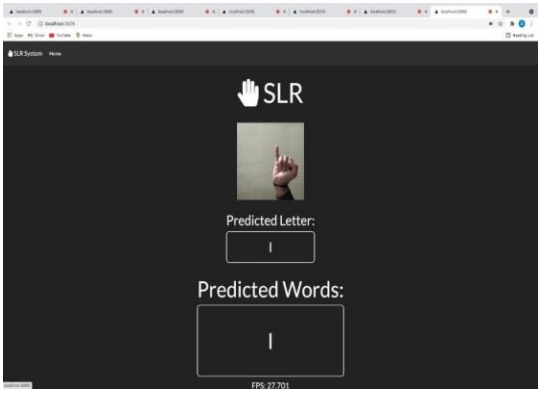


Fig. 2: Predicted result

IV. RESULTS AND DISCUSSION

The performance of the algorithm is projected in terms of the confusion matrix as shown in the fig 3 and 4.

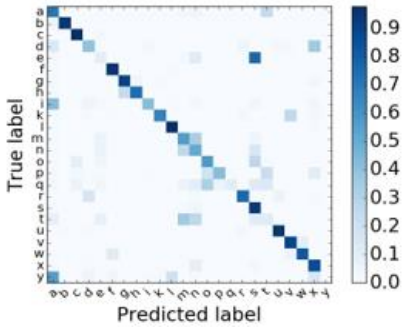


Fig. 3: Confusion matrix for the 2_init model trained on letters a-y

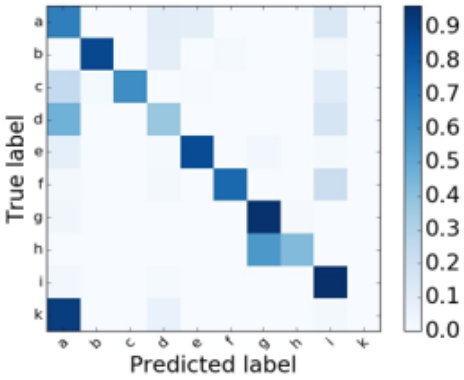


Fig. 4: Confusion matrix for the 2_init model trained on letters a-k

V. CONCLUSION

An American Sign Language translator is created on a web application subject to a CNN classifier. A strong model for letters a-e, and a modest one for letters a-k (excepting j) is the consequence of this work. Since it was impractical to discover a variety in our datasets, the validation correction percentage we checked during planning were not clearly reproducible subsequent to testing on the web application. We accept that with additional data taken under natural implications, the models would have the option to sum up with extensively higher exactness and would deliver a sturdy model for all letters.

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