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Sign Language Detection

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ABSTRACT: Sign language serves as a vital mode of communication for individuals facing challenges in speaking or hearing. Despite various methods available for interpreting and recognizing sign language and converting it into text, the scarcity of comprehensive sign language corpora has limited the development of text-to-sign language conversion systems. This research aims to pioneer a translation system integrating a parser module that transforms input English sentences into a phrase structure grammar representation, subsequently applied to the grammar rules of Indian sign language. The process involves eliminating stop words from the reorganized sentence and employing stemming to convert words into their base forms, considering that Indian sign language lacks word inflections.

KEYWORDS: Gesture Recognition, Air Canvas, Hand Tracking, Real-Time Interaction, Artificial Intelligence, Computer Vision, OpenCV, Media pipe, Virtual Whiteboard, Digital Drawing, Human-Computer Interaction.

I. INTRODUCTION

Sign language represents a natural form of communication for individuals with speech or hearing impairments. Despite advancements in interpreting and recognizing sign language, the creation of robust text-to-sign language conversion systems remains constrained due to the limited availability of comprehensive sign language corpora. This study endeavors to address this gap by proposing a novel translation system that seamlessly converts English sentences into Indian sign language grammar, allowing for meaningful communication in real-life scenarios. We are designing the alumni web portal which provides the best interaction platform through online chatting profile viewing and personal chatting with the stakeholders of the institute via college, students, alumni. Common architectures used in these systems include Direct Translation, Statistical Machine Translation, and Transfer-based Architecture. However, these architectures primarily focus on other sign languages and lack comprehensive models tailored specifically to ISL. Our proposed system aims to collect relevant ISL videos for each word. In cases where a word is absent from the dictionary, we plan to substitute it with synonymous words, considering their parts of speech and word duplications. Translation between spoken languages and sign languages is inherently complex and presents unique challenges. Developing efficient text-to-ISL translation systems is a significant challenge due to the limited focus on ISL within existing computational models. Our research underscores the need for specialized models specifically designed for ISL, considering the intricate differences between spoken languages and sign languages. Bridging this gap is essential to improve communication accessibility for individuals reliant on ISL, fostering inclusivity and interaction within diverse communities. Sign language serves as a profound means of communication, bridging the gap between individuals who are deaf or have speech impairments and the rest of the world. Its expressive nature, using hand gestures, facial expressions, and body movements, encapsulates a rich and diverse linguistic system, allowing for the conveyance of complex ideas and emotions. The quest to translate sign language into text stems from a fundamental motivation to empower those who use this visual-spatial language as their primary mode of communication. By harnessing technology, we aim to eliminate barriers and enable direct communication for the speech-impaired, thus obviating the need for an intermediary translator. This transformative framework is designed to create an intuitive and accessible environment, where sign gestures seamlessly translate into easily understandable textual outputs.

II. LITERATURE SURVEY

The proposed translation system, implemented by Aditya, C. R., C. Shraddha, and Ramakrishna Hegde in the paper [1], utilizes various NLP technologies such as StanfordParser, NLTK, and other Python packages. To evaluate its accuracy, the system was tested with a total of 100 English sentences, including 50 simple and 50 complex sentences.

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The authors of [2], AMonga, Hemang, Jatin Bhutani, Muskan Ahuja, Nikita Maid, and Himangi Pande, have attempted to create a model that will allow people with disabilities to express themselves distinctly, which will help them blend with the rest of the world without any difficulty.

In another study mentioned in [3] (Huenerfauth, Matt), merging multiple MT approaches in one system alleviates the traditional trade-off between divergence-handling power and domain specificity, thus making resource-intensive approaches (e.g. interlingual) practical for applications that require broad linguistic coverage,

The authors of [4], Kulkarni, Alisha, Archith Vinod Kariyal, V. Dhanush, and Paras Nath Singh, proposed a system that provides an efficient method to aid communication between an individual with hearing and speech impairment. It is a field that has had little development over the years, particularly in successful implementation in the Python programming language. The system would improve access to information for the hearing-impaired population of the country, like India. Kamal Preet Kour et. al.) Presented a novel design for sign language detection system with set of identified features and extraction methods of hand movements by using an algorithm named Speeded Up Robust Features (SURF) using image processing. [5] (Zhi-hua Chen et. al.) Presented a framework in which acquiring the hand region from the background by using segmentation. Finally, a rule classifier is applied to predict the results.

III. METHODOLOGY

Exemplar based Inpainting technique is used for inpainting of text regions, which takes structure synthesis and texture synthesis together. The inpainting is done in such a manner, that it fills the damaged region or holes in an image, with surrounding colour and texture. The algorithm is based on patch based filling procedure. First find target region using mask image and then find boundary of target region. For all the boundary points it defined patch and find the priority of these patches. It starts filling the target region from the highest priority patch by finding the best match patch. This procedure is repeated until entire target region is inpainted.

The algorithm automatically generates mask image without user interaction that contains only text regions to be inpainted.

IV. EXPERIMENTAL RESULTS

Figures shows the results of text detection from an image and inpainting by using exemplar based Inpainting algorithm. Figs. 2, 3, 4 (a) shows the original image. (b) is the image obtained by applying first set of criteria. All objects whose area greater than 10000 and filled area greater than 8000 are eliminated and major axis lengths are in between 20 to 3000 are considered to be text. Still, some small non-text objects are detected.

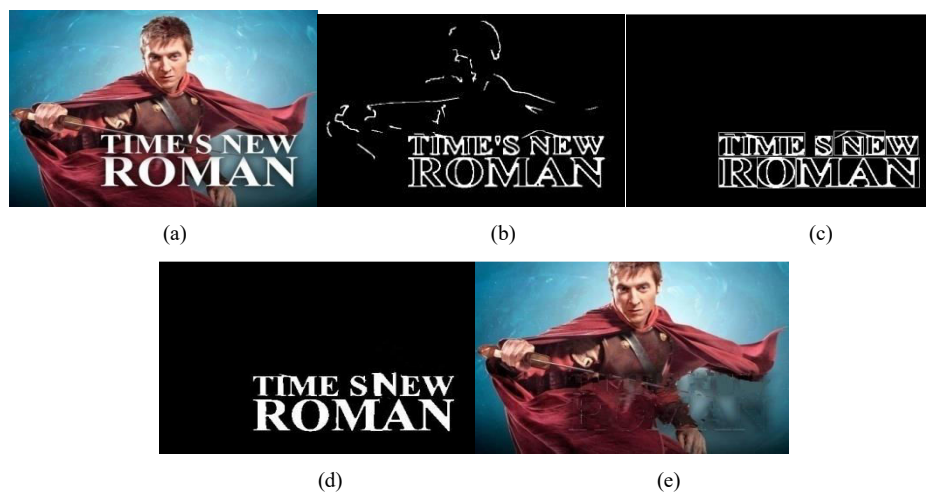


Fig. 1. Text Detection and Inpainting (a) Original image (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 4 x 4 and search window size 81 x 81

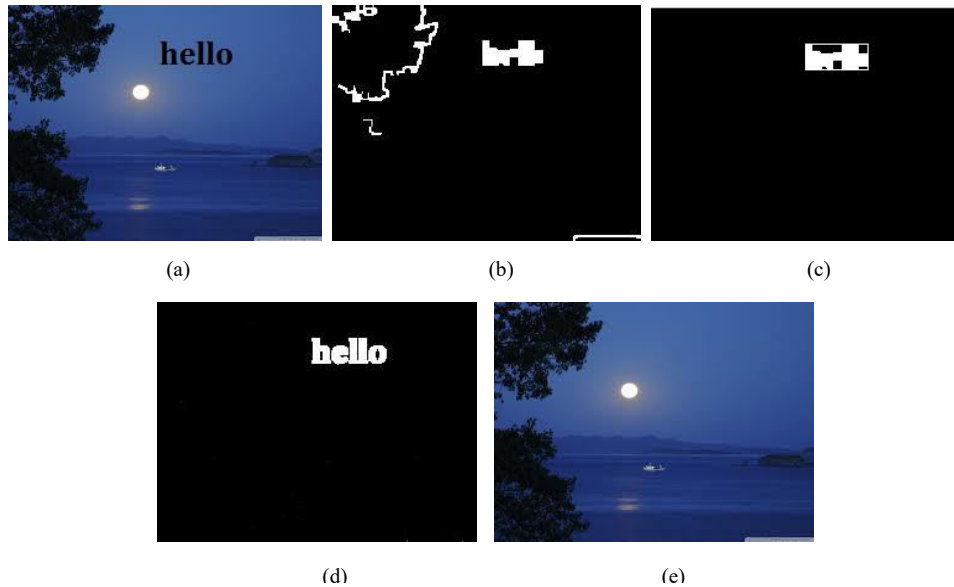


Fig. 2 Text Detection and Inpainting (a) Original image (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 5 x 5 and search window size 81 x 81



Fig. 3 Text Detection and Inpainting (a) Original image (b) Image after applying first set of criteria (c) Image after applying second set of criteria (d) Image mask (e) Inpainted image using patch size 5 x 5 and search window size 81 x 81

To eliminate small objects, connected component labelling is applied to the resultant image.(c) represents text detection by applying second set of criteria which eliminates all the objects whose area is less than 300 and filled area is less than 500.

V. CONCLUSION

We have implemented an automatic text detection technique from an image for Inpainting. Our algorithm successfully detects the text region from the image which consists of mixed text-picture-graphic regions. We have applied our algorithm on many images and found that it successfully detect the text region.

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