World Academy of Science, Engineering and Technology
International Journal of Cognitive and Language Sciences
Vol:18, No:11, 2024

American Sign Language Recognition System

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Abstract : The rapid evolution of technology in the communication sector continually seeks to bridge the gap between different communities, notably between the deaf community and the hearing world. This project develops a comprehensive American Sign Language (ASL) recognition system, leveraging the advanced capabilities of convolutional neural networks (CNNs) and vision transformers (ViTs) to interpret and translate ASL in real-time. The primary objective of this system is to provide an effective communication tool that enables seamless interaction through accurate sign language interpretation. The architecture of the proposed system integrates dual networks -VGG16 for precise spatial feature extraction and vision transformers for contextual understanding of the sign language gestures. The system processes live input, extracting critical features through these sophisticated neural network models, and combines them to enhance gesture recognition accuracy. This integration facilitates a robust understanding of ASL by capturing detailed nuances and broader gesture dynamics. The system is evaluated through a series of tests that measure its efficiency and accuracy in real-world scenarios. Results indicate a high level of precision in recognizing diverse ASL signs, substantiating the potential of this technology in practical applications. Challenges such as enhancing the system's ability to operate in varied environmental conditions and further expanding the dataset for training were identified and discussed. Future work will refine the model's adaptability and incorporate haptic feedback to enhance the interactivity and richness of the user experience. This project demonstrates the feasibility of an advanced ASL recognition system and lays the groundwork for future innovations in assistive communication technologies.

Keywords : sign language, computer vision, vision transformer, VGG16, CNN
Conference Title : ICSLSP 2024 : International Conference on Sign Language and Sign Perception
Conference Location : San Francisco, United States
Conference Dates : November 04-05, 2024