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SIGN-TALK

A Bridging Communication Gap

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Abstract:This People usually communicate with words, either by speaking or writing. But for deaf individuals, sign language becomes their main way of sharing information. Without someone to interpret, they face challenges in connecting with others. Sign language uses visual patterns to convey meaning, and it's not only essential for the deaf but also helpful for those with Autism Spectrum Disorder (ASD).However, there's a gap in communication between deaf individuals and the rest of society because many people don't understand sign language. To address this issue, a solution is proposed – a system that uses a camera to capture hand gestures. This system, powered by a neural network, interprets these gestures and turns them into spoken words. It's like teaching technology to understand and speak the language of sign.Sign language is crucial for those who have difficulty hearing or speaking, but it's often challenging for others to interpret. This proposed system aims to eliminate the need for an interpreter by using advanced technology. The process involves capturing hand gestures, enhancing accuracy through image processing techniques, and finally, converting the signs into spoken words using a speech synthesizer. In simpler terms, it's like creating a smart system that helps bridge the communication gap between deaf individuals and the rest of the world.

I. INTRODUCTION

In India, a significant number of people, around 50 lakh, face hearing disabilities, and approximately 20 lakh experience speech impairments. Recognizing the challenges these minorities encounter in communication, there's a push for artificial intelligence technology to lend a helping hand.While various technologies aim to translate sign language, everyday solutions are still in the making. Current translators are quite basic and struggle to adapt to the daily lives of those with speech and hearing disabilities. The call is for tools that seamlessly integrate into the routines of individuals, enabling easy interaction between those who can hear and speak and those who cannot.Communication is a vital aspect of connecting with the world, and for those deprived of it, sign language becomes crucial. However, the challenge lies in bridging the gap between those familiar with sign language and those who are not. A solution is sought to detect sign language, making communication easier for individuals with hearing and speaking disabilities. The focus is on recognizing specific hand and head movements, facial expressions, and body poses in real- time.Despite the richness of sign languages, they face a popularity gap outside the speech and hearing disabled communities. These languages are difficult for the general public to grasp since they have unique lexicons and grammar. The goal is to develop methods that facilitate communication and lower barriers between the speaking community and individuals who use sign language.

II. PROBLEM STATEMENT

Sign language is the standard form of communication among the speech and hearing impaired. The region-wise division of the sign language helps the users to have a facile method to convey information. As the larger population of society does not understand sign language, the speech, and hearing impaired usually rely on the human translator. The availability and affordability of using a human interpreter might not be possible all the time. The best substitute would be an automated translator system that can read and interpret sign language and convert it into an understandable form. This translator would reduce the communication gap that exists among people in society. The proposed system uses the images in the local system or the frame captured from webcam camera as input. Processed input image is given to theclassifiers which use Artificial Neural Network. Finally the predicted result is produced as text. Text data will be converted to audio data to improve the communication.

III. OBJECTIVES

To create an application which performs the following functionalities:

- **The Gesture Recognition and Interpretation:** Develop a robust machine learning model to accurately recognize and interpret hand gestures and sign language used by individuals with hearing and speech impairments.
- **Real-time Conversion to Text and Voice:** Implement a system that can translate recognized gestures into real-time text messages and clear voice prompts, ensuring seamless communication for deaf and mute individuals.
- **Inclusivity in Communication:** Facilitate effective communication between individuals with hearing impairments and the broader community by converting sign language into formats (text and voice) readily understood by those without proficiency in sign language.
- **Bidirectional Communication:** Enable individuals without hearing impairments to communicate with deaf and mute individuals by developing a mechanism that converts text and voice messages from non-impaired users into sign language.
- **Integration of Mapping Technologies:** Utilize mapping technologies to visualize the spatial aspect of communication, creating a digital interface that enhances the user experience for both deaf and mute individuals and those without hearing impairments.
- **Text Display for Deaf and Mute Users:** Implement a user-friendly interface that displays converted text messages for deaf and mute users, ensuring they can understand and respond to messages effectively.
- **Simultaneous Translation:** Achieve simultaneous translation of text and voice messages in both directions, providing a seamless and inclusive communication experience for all users involved.

IV. EXPECTED OUTCOMES

Expected outcome of proposed system are as follows,

- System should pre-process individual images to clean the hand gesture dataset.
- System should develop a deep learning model using Tensorflow framework to classify dataset images.
- System should have a graphical user interface to help end user to use the system easily.
- System should classify input hand images into different alphabet classes.
- System should convert text data into audio data.

V. LITERATURE SURVEY

1. Sign Language Recognition System

In this compelling paper, the authors embark on a mission to create a ―Real-Time Sign Language Recognition System‖ that serves as a bridge between those with speech impairments, like the deaf and mute community, and the rest of society. It's like crafting a symphony of communication through the harmonious union of computer vision and machine learning.Imagine this project as a journey into the world of gestures, where the authors propose a method that not only recognizes sign language but aims to narrow the communication gap for differently-abled individuals. Their approach is akin to choreography, blending the elegance of image processing with the intelligence of Convolutional Neural Networks (CNN) for detecting sign language in real- time. It's not just technology; it's a dance of understanding.The paper sheds light on the prevalence of speech impairment globally, emphasizing the need for effective communication methods. Sign language emerges as a structured language with its own grammar, weaving a narrative that facilitates communication for those familiar with its nuances. Dividing their work into two acts – image processing and machine learning – the authors meticulously detail their steps. Image processing becomes a canvas where hands are captured, preprocessed, and transformed into a dataset of 24 English alphabet signs. Meanwhile, the machine learning segment stars a CNN model trained to identify and classify these signs, turning gestures into a language understood by technology. They gracefully acknowledge related works in the field, acknowledging the broader dance of sign language recognition. The proposed algorithm, a ballet of code, defines regions of interest, undergoes color transformations, and dances through skin color detection, creating a harmonious choreography of hand images saved in a CSV file. The results section is a spotlight moment, revealing the technical intricacies of their performance – Python as the language, OpenCV2, Pandas, Keras, and Numpy as supporting actors, all on the stage of an Intel® Core™ i7 8300H processor. The climax, an 83% accuracy, unfolds as real-time hand detection pirouettes through various signs under different backgrounds and lighting conditions. As the paper gracefully takes a bow in its conclusion, the authors highlight the profound impact of the Sign Language Recognition project. It's not just about numbers; it's about connecting a community with the external world. The project, with its 83% accuracy, becomes a beacon, addressing the limitations of existing datasets in diverse conditions and suggesting a future where continuous sign language recognition and a more diverse dataset elevate this technological ballet to new heights.

2. Sign Language Recognition And Speech-To-Sign Conversion

In this paper ―Sign Language Recognition And Speech-To-Sign Conversion‖ ,the authors present a technological marvel designed to be a beacon of communication for those with vocal and hearing disabilities. It's like a symphony of innovation, where the focus is on the intricate dance of sign language recognition and speech-to-sign conversion. The real star of the show is the improved algorithm, showcasing its prowess in extracting sign language gestures from video sequences, even amidst dynamic backgrounds The paper takes us on a journey through American Sign Language (ASL), covering the alphabet from A to Z (excluding J), and paints a vivid picture of the system's capabilities. Imagine it as a delicate brushstroke – the segmentation process, with its emphasis on skin color segmentation, delicately isolates hands and faces. It's a choreography of technology, where facial features gracefully step aside, allowing the hands to take center stage for thorough analysis. For static gestures, Zernike moments enter the scene like seasoned performers, achieving an impressive 93% recognition accuracy. The paper unfolds the behind-the-scenes magic, explaining the intricacies of feature extraction and the role of SVM classifiers in this digital ballet. And when it comes to dynamic gestures, involving the graceful movements of signs like 'no' and 'bye,' the system achieves a flawless 100% accuracy, capturing the essence of fluidity through the extraction and classification of curve feature vectors.But the magic doesn't end there. The paper introduces speech recognition into this technological symphony, using the Sphinx module to seamlessly map spoken alphabets to text with high accuracy. It's a multi-modal performance, enhancing the system's versatility and opening doors to real-world applications. The paper highlights the contributions of this technological masterpiece – real-time bare hand detection, improved methods for hand posture and dynamic gesture detection, and the triumphant implementation of gesture recognition. Experimental results take center stage, showcasing the system's effectiveness in diverse conditions and its potential to transform communication for those facing speech and vocal disabilities. As the paper takes a moment to look forward, it's like a thoughtful encore. The authors suggest refining the system's performance in challenging environments, envisioning a future where it thrives amidst clutter or poor lighting. There's a call for expansion, urging the system to embrace a broader range of gestures, including those involving two hands or facial expressions, and bravely facing challenges related to co-articulation. The paper doesn't just discuss technology; it's a narrative of potential societal impact, breaking down communication barriers and paving the way for a more inclusive world. It's not just about promising results; it's about the promise of a better tomorrow for those with disabilities.

3. Sign Language Recognition In Computer System

A thorough revie Priyanka C Pankajakshan, a PG Scholar at Karunya University, dives into the world of Sign language recognition, highlighting its vital role in communication for the deaf and hard-of-hearing communities. The paper ―Sign Language Recognition In Computer Vision‖ is like a journey, navigating the challenges in implementing Sign Language Recognition In Computer Systems.With a focus on creating a system that lets mute individuals communicate without interpreters, the paper introduces a vision-based approach, steering clear of cumbersome wearables. It's like crafting a bridge between signing and non-signing individuals using neural networks and classification techniques.The system's heartbeat is in real-time image capture and skin segmentation. Using a webcam, images undergo a grayscale dance, and skin segmentation becomes the choreography, isolating hand gestures effectively. Think of it as painting a canvas with YCbCr color space strokes to enhance skin segmentation.The subsequent sections unfold the story of hand tracking, where the Canny edge detector takes center stage in extracting features. The narrative reaches its climax with the implementation of an artificial neural network (ANN) – a maestro trained to recognize diverse gestures from a predefined library.The system's architecture, like an artist's canvas, reveals a feed-forward ANN with a 6x7 frame as input, producing outputs that speak volumes. The backpropagation algorithm, a diligent learner, determines the network's weights. The story concludes in MATLAB, where the neural network toolbox orchestrates the final act.In a nutshell, the paper introduces a vision- based sign language recognition system powered by artificial neural networks. It's not just technology; it's a tale of image processing, skin segmentation, hand tracking, feature extraction, and ANN-based recognition. The goal is simple yet profound – to offer an effective and efficient means of communication for those with speech and vocal disabilities.

4. Real-Time Sign Language To Speech Translation System

In this transformative paper ―Real-Time Sign Language To Speech Translation System‖, the authors set out to break down communication barriers between hearing and non-hearing individuals by developing a real-time sign language to speech translation system. Their application captures live video inputs of sign language gestures, translating them into speech using Convolutional Neural Networks (CNN) and text-to-speech algorithms.Focusing on Indian Sign Language (ISL), the paper recognizes the need for technological solutions to bridge the communication gap. The proposed system, divided into capturing gestures, CNN-based recognition, translation to text, and conversion to speech, aims for real-time feedback crucial for effective communication.Highlighting the Indian government's initiative for an ISL online dictionary, the paper stresses the importance of accessible learning resources for sign language. It explores recognition of stationary and motion gestures, eventually considering facial expressions and body language for a comprehensive translation system.The literature review discusses existing technologies, emphasizing the challenges of variations in signing styles. The use of CNNs in image processing is proposed, with a focus on diverse datasets to enhance model accuracy.The paper introduces deep neural networks, specifically CNNs, for gesture recognition, underscoring the importance of varied datasets. Text-to-speech algorithms like Google Text-to-Speech are suggested for converting translated text into speech.Motivated to develop ISL technology with scalability to other sign languages, the methodology involves creating an ISL dataset, CNN-based recognition, and text-to-speech conversion in Python. The paper recognizes underdeveloped everyday use technologies in sign language translation.Implemented in Python using Keras on TensorFlow, the model's training cycles show increased accuracy, stabilizing after approximately 50 Epoch cycles. The trained model successfully identifies test signs with varying confidence intervals, reaching 75-95% accuracy.Acknowledging limitations like potential inaccuracies and dependency on an active internet connection, the future scope envisions translating various sign language dialects, incorporating sentiment analysis, and enhancing overall accuracy.The paper concludes by recognizing the societal impact of reducing communication barriers for speech and hearing-impaired individuals. It envisions a future where real-time sign language translation becomes a widely accessible tool, echoing the promise of a more inclusive world.

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7. **Sign Language Recognition System With Machine Learning**

In this paper ―Sign Language Recognition System With Machine Learning‖, the authors embark on a technological journey, weaving an automated Sign Language Recognition (SLR) system with machine learning as their compass, all with the heartfelt mission of enhancing communication for the speech and hearing impaired. Trained on a rich tapestry of hand gestures from a substantial dataset, their vision-based model engages four participants in a controlled environment, achieving a commendable 65% accuracy.The SLR system unfolds like a choreographed dance, with preprocessing gracefully enhancing images through brightness correction and grayscale transformations. Segmentation acts as a stage, dividing images based on color, threshold, or edge, each method playing its part in the intricate performance. Feature extraction, a symphony of techniques like PCA and Convex Hull, elegantly reduces dimensionality, ensuring the essence of gestures is preserved.The cast of characters in this tech tale includes both lazy (like the friendly KNN) and eager learners (SVM, Decision Trees, Naïve Bayes, ANN), each contributing to the grand performance. The KNN algorithm, akin to a reliable friend, using Euclidean distance, takes the spotlight and achieves a 65% accuracy in deciphering isolated hand gestures for numbers 1-5. However, the plot thickens with challenges – hand movements and speed add a layer of complexity, affecting predictions in this digital drama.As the paper takes a moment to reflect, it suggests a sequel filled with improvements – a larger dataset to enrich the storyline, exploring different classifiers as new characters in the plot, and extending the system's capabilities to recognize continuous sign language, envisioning a future where this technology becomes a practical companion in the real world of gestures and communication. It's not just about algorithms and accuracy; it's about creating technology that understands the nuances of human expression, ensuring that every gesture speaks its language in the most meaningful way possible.

8. **Sign Language Recognition Using The Backpropogation Neural Network Algorithm**

A three-step In their research paper ―Sign Language Recognition Using The Backpropogation Neural Network Algorithm‖, Tülay KarayÕlan and Özkan KÕlÕç embark on a mission to create a sign language recognition system, a digital ally designed to transform sign language into text, catering to the communication needs of the hearing impaired—an estimated 5% of the

global population, as compassionately highlighted by the World Health Organization.Their innovative system, much like a digital interpreter, relies on image features extracted from local images or webcam frames. Two classifiers, akin to understanding companions, navigate this visual language landscape—one interprets raw image features, while the other deciphers insights from histogram features. Both classifiers gracefully dance to the rhythm of the Backpropagation Algorithm, a trusted guide in the realm of Artificial Neural Network (ANN) learning.The inspiration behind their creation echoes a deep empathy for breaking down communication barriers faced by the hearing impaired and those unfamiliar with sign language. The authors underscore the importance of cost-effectiveness and heightened accuracy, emphasizing a commitment to making these transformative technologies accessible.As they traverse the landscape of prior research in sign language recognition, the authors share a tapestry of methodologies and techniques from AdaBoost to Haarlike classifiers, Microsoft Kinect for Xbox, and Hand Gesture Recognition Systems. Each technique becomes a unique stroke in the collective effort to address the nuanced challenges of sign language recognition.Their system's journey unfolds through image processing, ANN-based classification, and the poetic transformation of recognized sign language into text—a narrative of understanding. Two classifiers, each with its distinctive approach—one interpreting raw features, the other drawing insights from histogram features—contribute to this symphony. The intricate architecture of the ANN, with its layers of input, hidden, and output, reveals the complexity and beauty of capturing the essence of sign language.In the spotlight of the Marcel Static Hand Posture Database, the experimental results showcase a 70% accuracy for the Raw Features Classifier and an 85% accuracy for the Histogram Features Classifier. The authors, ever humble, acknowledge the moderate nature of these results compared to their peers, yet offer a glimpse of hope by suggesting future work focused on refining image processing for enhanced recognition rates.In their concluding act, Tülay KarayÕlan and Özkan KÕlÕç celebrate the successful birth of a sign language recognition system—a contribution to the collective endeavor of fostering enhanced communication for the hearing impaired. While the accuracy rates stand as a testament to the journey's achievements, the authors echo a hopeful melody, expressing their belief in the system's potential for further refinement through the artistry of improved image processing techniques.

9. **A Real-Time Sign Language Estimation System**

In this innovative paper‖ A Real-Time Sign Language Estimation System‖, the authors unveil a real-time sign language estimation system, deploying the power of a Convolutional Neural Network (CNN) and the fastai deep learning library. Designed to aid individuals with speech and hearing disabilities, the system seamlessly extracts signs from videos, presenting predicted signs as easily readable text. The driving force behind this technology is a noble quest to enhance communication for those unfamiliar with sign language.The authors diligently trained their model on a dataset boasting 87,000 images, with a keen focus on American Sign Language (ASL) alphabets and additional signs crucial for comprehensive communication. The chosen CNN model, ResNet-34, implemented with fastai on PyTorch, impressively achieves an accuracy of approximately 78.5% in real-world testing.Within the narrative of their research, the authors not only share the triumphs but also openly discuss factors influencing system performance. Considerations like lighting conditions and camera quality emerge as pivotal elements that shape the efficacy of the sign language translation. With a forward-looking perspective, the authors suggest future improvements, envisioning enhanced functionality through pre-processing techniques and the integration of text-to-speech conversion.In essence, this ASL translation application emerges as a beacon of promise. While celebrating its current accomplishments, the authors graciously acknowledge areas ripe for refinement and lay out a roadmap for future research, inviting a collaborative journey towards even greater advancements in the realm of accessible communication.

10. A Brief Review Of The Recent Trends In Sign Language Recognition

In their insightful review, Nimisha K P and Agnes Jacob explore the dynamic realm of sign language recognition (SLR), shedding light on its crucial role in the visual language of the deaf and dumb community. They delve into the intricate components of SL, encompassing expressive hand gestures, facial expressions, and eye movements, serving a global community of nearly 90 million users. The paper meticulously dissects two key SLR approaches: the vision-based method, employing cameras susceptible to challenges like light variations, and the sensor-based technique, utilizing gloves with sensors for enhanced accuracy but grappling with recognition complexities. Within this landscape, the authors introduce a spectrum of SLR methodologies, including PCA, HMM, CNN, YOLO, and VGG16, designed for nuanced feature extraction and classification. They eloquently underscore the transformative potential of SLR, bridging communication divides and empowering the non- hearing minority. The paper navigates through SL translation to speech, offering a glimpse into the future of inclusive linguistic accessibility. The comparative analysis within the review, spanning SLR approaches, feature extraction techniques, and classification algorithms like SVM, ANN, and CNN, provides a compass for researchers. It meticulously explores the challenges, limitations, and future trajectories in automatic gesture recognition, presenting a holistic methodology encompassing image acquisition, preprocessing, feature extraction, classification, and translation.

By summarizing recent research papers, the authors paint a vivid picture of the evolving landscape in both vision-based and glove-based SLR approaches, showcasing the strides made in achieving accuracy. The conclusion, acknowledging the quest for perfection in sign translation systems, echoes a commitment to advancing the understanding of automatic hand gesture recognition and sign language interpretation, underlining the profound impact on fostering inclusive communication.

11. Machine Learning-Based Hand Sign Regnition

It is a collaborative effort led by Ms. Greeshma Pala, Mr. Satish Shivaji Kumbhar, Ms. Jagruti Bhagwan Jethwani, and Ms. Shruti Dilip Patil at the College of Engineering Pune. Together, they embarked on a remarkable ―Machine Learning-based Hand Sign Recognition‖project, driven by a noble purpose – to bridge the communication gap for the speechless community, specifically those who use sign language.Their innovative system, powered by KNN, SVM, and CNN algorithms, delves into American Sign Language (ASL), transforming intricate hand gestures into both text and speech. The project's heartbeat is the aspiration to overcome communication barriers between non-speakers and those unfamiliar with sign language, offering a trifecta of modes: translating hand gestures to speech, hand signs to text, and even converting spoken words to hand gestures.Picture a vision-based technique in action, fueled by a robust dataset of 29,000 ASL alphabet images. Through meticulous pre-processing techniques and a symphony orchestrated in Python3 with TensorFlow, Keras, and other libraries, their creation comes to life. The star of the show is the CNN model, stealing the spotlight with an awe-inspiring 98.49% accuracy.Yet,the journey was not without its hurdles. Challenges, such as crafting an extensive dataset, managing memory intricacies, and navigating the delicate dance of overfitting, were faced head-on.In the grand finale, the authors spotlight the unmatched prowess of CNN, crowning it as the hero in enhancing communication for the speechless. Their vision extends beyond, envisioning a future where this technology aids the blind and fosters widespread sign language learning.This collaborative project serves as a beacon, illuminating the immense potential of machine learning to foster inclusivity and transcend communication barriers.

12. Sign Language Recognition System Focusing On American Sign Language (ASL)

The text introduces a ―Sign Language Recognition System Focusing On American Sign Language (ASL)‖, aiming to convert sign language into text for improved communication. It addresses the global prevalence of hearing disabilities, emphasizing the system's potential to bridge communication gaps. The image-based classifiers, namely the Raw Features Classifier and Histogram Features Classifier, showcase promising accuracies of 70% and 85%, respectively, in recognizing ASL letters.The literature survey delves into diverse methodologies, from AdaBoost to Microsoft Kinect, presenting a rich landscape of gesture recognition solutions. The methodology provides intricate details on image processing, feature extraction, and classification, utilizing an Artificial Neural Network and Backpropagation Algorithm, with the Marcel Static Hand Posture Database as the training dataset.In evaluating the system, the experimental results section meticulously discusses accuracy, precision, recall, and F1 score metrics. The authors explore optimization techniques, experimenting with different hidden layer sizes and achieving a notable peak accuracy of 70.52% for the Raw Features Classifier with a 50-size hidden layer.In essence, the proposed sign language recognition system holds promise in leveraging machine learning for text conversion, underlined by a thorough performance evaluation and an in-depth exploration of sign language recognition nuances.

13. Advancements in Automatic Sign Language Recognition: A Decadal Literature Survey

Sign Language (SL) is a vibrant visual language for Deaf individuals, expressing through gestures, facial expressions, and body movements. The past decade has seen remarkable evolution in Automatic Sign Language Recognition (ASLR), fueled by the integration of computer vision, machine learning, and deep learning. This survey navigates through the intricate channels of SL, delving into historical insights, recent ASLR systems, challenges, and the promising avenues that lie ahead. Within SL, the eloquence lies in the articulation of hands, the nuance in facial expressions (FE), and the rhythm of body movements. Reflecting on historical approaches, we uncover the roots in direct measurement devices and computer vision-based methods from the 90s. Recent ASLR systems now weave innovation into the fabric of SL, leveraging techniques that merge computer vision, machine learning, and deep learning. However, challenges persist, including the intricacies of SL, the phenomenon of movement epenthesis, and historical constraints when compared to Automatic Speech Recognition (ASR). The survey not only captures the current landscape but peers into the future of ASLR. Emerging trends include augmented reality integration and multimodal approaches, promising enhanced inclusivity. Challenges around data diversity and real-world applicability beckon solutions. In conclusion, the strides in ASLR present a beacon of hope for more inclusive communication. It underscores the imperative of addressing challenges and embracing emerging technologies to empower and uplift the Deaf community.

13. Design Of Sign Language Recognition Using E-CNN

In this paper, the authors present an ingenious system tailored to address communication hurdles faced by individuals with vocal and hearing impairments. By focusing on both sign language recognition and speech-to-sign conversion, the algorithm demonstrates adaptability to diverse environmental conditions. Through the innovative use of skin color segmentation, the system adeptly extracts signs from video sequences, discerning between static and dynamic gestures and creating precise feature vectors. The classification process relies on Support Vector Machines (SVM), complemented by the integration of the Sphinx standard module for speech recognition. Experimental results underscore the system's success in sign segmentation across varied backgrounds, showcasing commendable accuracy in both gesture and speech recognition. The promising potential of this system to bridge communication gaps for individuals with vocal and hearing impairments represents a significant stride forward in enhancing accessibility.

14. A Real-Time Sign Language Estimation System

In this collaborative effort by Kshitij Bantupalli and Ying Xie, the authors delve into the intricate realm of communication challenges faced by those with speech impairment. Their innovative solution, rooted in deep learning and computer vision, introduces a vision-based application that translates sign language into text. This breakthrough not only facilitates communication between signers and non-signers but also embraces inclusivity. The model, employing both Inception Convolutional Neural Network (CNN) for spatial features and Recurrent Neural Network (RNN) for temporal features, showcases a nuanced understanding of sign language expressions. Grounded in the American Sign Language Dataset, the research is a promising stride toward accessible communication for individuals with speech impairments.

VI. REQUIREMENT SPECIFICATION Hardware requirements

- Processor : 1 GHZ or higher CPU
- Hard disk : 500 MB available internal storage
- Memory: 8 GB of RAM is minimally recommended
- Display : 2.8 inches or larger

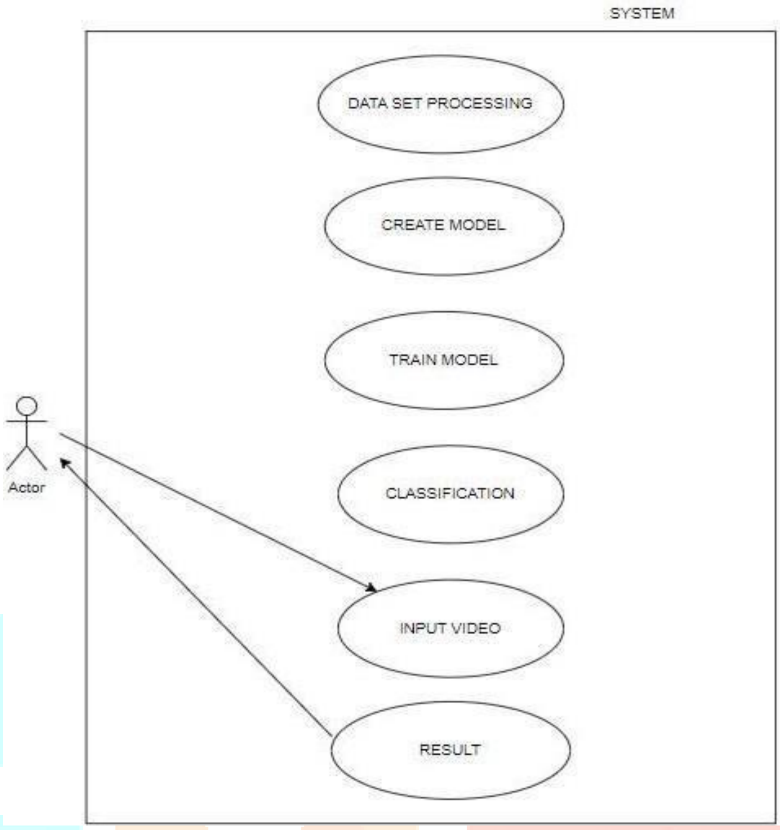
Software requirements

- Web Server : Django
- Programming Languages : Python, CSS, JS,
- Web browsers : Google chrome/Mozilla Firefox/internet explorer
- Database : MYSQL
- IDE : Visual Studio Code
- Database : MYSQL

FUNCTIONAL REQUIREMENTS

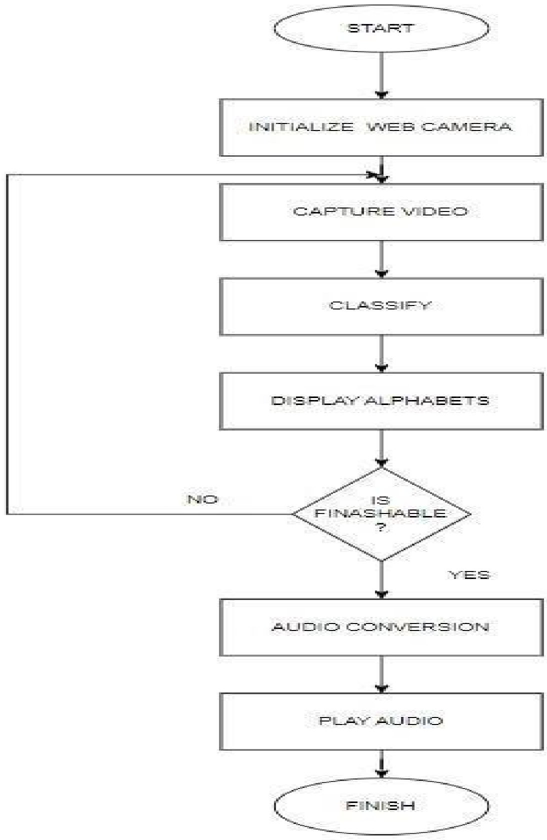
- **Pre-processing module:** This module is used to pre-process the dataset images by resizing and image augmentation.
- **Upload Module:** This module allows the user to upload hand image to server.
- **Model Create Module:** This module is used to create a deep learning model by using Keras framework.
- **Prediction Module:** This module is used to predict the hand gesture from the image.
- **Text to voice convertor:** This module is used to convert text data into a audio data.

VII. SYSTEM DESIGN



User Case Diagram

Think of a use case diagram as a storyteller for your system – the circles or ellipses are like the plot points, showcasing different tasks and functions. The actors, depicted as stick figures, are the characters interacting with your system, giving it life and purpose. It's like a visual script that captures how users, the main protagonists, navigate through the system's world. So, in essence, a use case diagram your system's storyteller, unfolding the dynamic tale of user-system interactions.



System Diagram

System design is as the architect sketching the blueprint for a grand building – it's about crafting a structure where different parts seamlessly come together, much like creating a symphony of components and modules. System design is the mastermind behind making sure all the pieces fit harmoniously, understanding where the data comes from, and envisioning how everything collaborates to meet the specific needs of businesses. It's like painting a canvas where intuition guides the creation of a system that not only satisfies requirements but also weaves a story of efficiency and functionality.

VIII. CONCLUSION

In conclusion, the Sign-Talk project successfully leverages machine learning for recognition of hand gestures and sign language, enabling a seamless translation into text and voice messages. This transformative capability addresses a critical communication gap, allowing deaf and mute individuals to express themselves effectively to those without proficiency in sign language. The bidirectional communication feature further enhances inclusivity, facilitating non-impaired individuals to communicate through converted sign language displayed on the screen. The integration of mapping technologies adds a spatial dimension to communication, enhancing the overall user experience. SignTalk stands as a testament to the power of technology in fostering understanding and connectivity, paving the way for a more inclusive and compassionate society.

IX. ACKNOWLEDGE

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REFERENCES

[1] Real time sign Language using computer vision -based on structured Feature network for continuous sign language recognition in [2019] by Jinalee Jayesh and Kumar Raval

[2] Sign language Recognition -based on hand guester recognition using haar-like features in 2007 by Anup Kumar,karun Tankachan and Mevin M Dominic

[3] Sign language Recognition system -based on user independent for sign language finger spelling recognition in 2014 by Priyanka c pankajakshan

[4] Sign language to speech translation -ISL dictionary launched in 2019[online],2nd edition of Indian sign language launched in 2019[online] by Aishwarya Sharma,Dr sibha panda prof.saurav Verma india

[5] ML based Sign language Recognition system -based on "progress in automated computer recognition of sign language"Lecture notes including computer science ,vol 3118,2004 by -Amrutha k, Prabhu p Mangalore India

[6] Sign language Recognition -based on "Deafness and hearing loss",World health organization [online] in 2017 by Tulay Karayilam,ozkan kilic Turkey

[7] Real time sign language Estimation system -based on "Sign language learning system with Image sampling and convolutional Neural network " in 2017 and "American sign language Recognition using Leap motion sensor " in 2014 by pushkar kurhakar,janvi phadtare.

[8] A brief Review of the Recent Trends in Sign language Recognition -based on "Interactive systems for Sign language learning" in 2012 by Nimisha kp and Agnes Jacob.