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ENABLING ALTERNATIVE ACCESSIBLE STRATEGIES FOR PERSONS WITH SPEECH IMPAIRMENT

[1]G. Tejo Lakshmi, [2]L. Manjunath, [3]N. Tirupati Rao, [4]N. Purna Chandra Sekhar, [5]K. Mani Deep

[1]Assistant Professor, Dept of CAI, KKR & KSR Institute of Technology and Sciences, Vinjanampadu, Guntur, India
[2,3,4,5]B.Tech Student, Dept of CSE, KKR & KSR Institute of Technology and Sciences, Vinjanampadu, Guntur, India

ABSTRACT: As we know that language takes a major portion for communication between two people or many people. But What about deaf people and deaf and dumb people? Over an estimation18 billion people are deaf and and There is only one language to them is SIGN LANGUAGE to communicate to others. Sign languages are visual-based natural languages used by the deaf people for their communication. Since most hearing people cannot understand sign language, sign language translation (SLT) has become an important application to bridge the communication gap between deaf and hearing people. Here we developed an application which will remove all the difficulties for communication between duff and dumb people and normal people. And anyone who are difficulty in communication deaf people are also use this application. Sign language is the only tool of communication for the person who is not able to speak and hear anything. Sign language is a boon for the physically challenged people to express their thoughts and emotion. In this work, a novel scheme of sign language recognition has been proposed for identifying the alphabets and gestures in sign language. With the help of computer vision and neural networks we can detect the signs and give the respective text output. In our application we want to add different alternative strategies like sign language to text/voice, text/voice to sign language, text to speech and speech to text.

KEYWORDS: Sign Language Recognition, Image Processing, Edge Detection, Hand Gesture Recognition, Text to speech, speech to text.

I. INTRODUCTION

Speech impaired people use hand signs and gestures to communicate. Normal people face difficulty in understanding their language. Hence there is a need of a system which recognizes the different signs, gestures and conveys the information to the normal people. It bridges the gap between physically challenged people and normal people.

Sign Language:

SIGN LANGUAGE It is a language that includes gestures made with the hands and other body parts, including facial expressions and postures of the body. It used primarily by people who are deaf and dumb. There are many different sign languages as, British, Indian and American sign languages. British sign language (BSL) is not easily intelligible to users of American sign Language (ASL) and vice versa. A functioning signing recognition system could provide a chance for the inattentive communicate with non-signing people without the necessity for an interpreter. It might be wont to generate speech or text making the deaf more independent. Unfortunately, there has not been any system with these capabilities thus far. during this project our aim is to develop a system which may classify signing accurately. American Sign Language (ASL) is a complete, natural language that has the same linguistic properties as spoken languages, with grammar that differs from English. ASL is expressed by movements of the hands and face. It is the primary language of many North Americans who are deaf and hard of hearing, and is used by many hearing people as well.

Sign Language and Hand Gesture Recognition:

The process of converting the signs and gestures shown by the user into text is called sign language recognition. It bridges the communication gap between people who cannot speak and the general public. Image

processing algorithms along with neural networks is used to map the gesture to appropriate text in the training data and hence raw images/videos are converted into respective text that can be read and understood. Dumb people are usually deprived of normal communication with other people in the society. It has been observed that they find it really difficult at times to interact 4 with normal people with their gestures, as only a very few of those are recognized by most people.

Since people with hearing impairment or deaf people cannot talk like normal people so they have to depend on some sort of visual communication in most of the time. Sign Language is the primary means of communication in the deaf and dumb community. As like any other language it has also got grammar and vocabulary but uses visual modality for exchanging information. The problem arises when dumb or deaf people try to express themselves to other people with the help of these sign language grammars. This is because normal people are usually unaware of these grammars. As a result, it has been seen that communication of a dumb person are only limited within his/her family or the deaf community. The importance of sign language is emphasized by the growing public approval and funds for international project.

At this age of Technology, the demand for a computer-based system is highly demanding for the dumb community. However, researchers have been attacking the problem for quite some time now and the results are showing some promise. Interesting technologies are being developed for speech recognition but no real commercial product for sign recognition is actually there in the current market. The idea is to make computers to understand human language and develop a user-friendly human computer interface (HCI). Making a computer understand speech, facial expressions and human gestures are some steps towards it. Gestures are the non-verbally exchanged information. A person can perform innumerable gestures at a time. Since human gestures are perceived through vision, it is a subject of great interest for computer vision researchers. The project aims to determine human gestures by creating an HCI. Coding of these gestures into machine language demands a complex programming algorithm. In our project we are focusing on Image Processing and Template matching for better output generation.

IMAGEPROCESSING:

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps:

• Importing the image via image acquisition tools.
• Analysing and manipulating the image.
• Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

Digital image processing:

Digital image processing consists of the manipulation of images using digital computers. Its use has been increasing exponentially in the last decades. Its applications range from medicine to entertainment, passing by geological processing 2 and remote sensing. Multimedia systems, one of the pillars of the modern information society, rely heavily on digital image processing. Digital image processing consists of the

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manipulation of those finite precision numbers. The processing of digital images can be divided into several classes: image enhancement, image restoration, image analysis, and image compression. In image enhancement, an image is manipulated, mostly by heuristic techniques, so that a human viewer can extract useful information from it. Digital image processing is to process images by computer. Digital image processing can be defined as subjecting a numerical representation of an object to a series of operations in order to obtain a desired result. Digital image processing consists of the 14 conversions of a physical image into a corresponding digital image and the extraction of significant information from the digital image by applying various algorithms.

Pattern recognition:

On the basis of image processing, it is necessary to separate objects from images by pattern recognition technology, then to identify and classify these objects through technologies provided by statistical decision theory. Under the conditions that an image includes several objects, the pattern recognition consists of three phases, as shown in Fig. Fig1.1: Phases of pattern recognition The first phase includes the image segmentation and object separation. In this phase, different objects are detected and separate from other background. The second phase is the feature extraction. In this phase, objects are measured. The measuring feature is to quantitatively estimate some important features of objects, and a group of the features are combined to make up a feature vector during feature extraction. The third phase is classification. In this phase, the output is just a decision to determine 3 which category every object belongs to. Therefore, for pattern recognition, what input are images and what output are object types and structural analysis of images. The structural analysis is a description of images in order to correctly understand and judge for the important information of images.

II. LITERATURE REVIEW

The author Brandon Garcia [1] explained A real-time sign language translator is an important milestone in facilitating communication between the deaf community and the general public. We hereby present the development and implementation of an American Sign Language (ASL) fingerspelling translator based on a convolutional neural network. We utilize a pre-trained GoogLeNet architecture trained on the ILSVRC2012 dataset, as well as the Surrey University and Massey University ASL datasets in order to apply transfer learning to this task. We produced a robust model that consistently classifies letters a-e correctly with first-time users and another that correctly classifies letters a-k in a majority of cases. Given the limitations of the datasets and the encouraging results achieved, we are confident that with further research and more data, we can produce a fully generalizable translator for all ASL letters.

The author Sawant Pramada [2] explained Computer recognition of sign language is an important research problem for enabling communication with hearing impaired people. This project introduces an efficient and fast algorithm for identification of the number of fingers opened in a gesture representing an alphabet of the Binary Sign Language. The system does not require the hand to be perfectly aligned to the camera. The project uses image processing system to identify, especially English alphabetic sign language used by the deaf people to communicate. The basic objective of this project is to develop a computer based intelligent system that will enable dumb people significantly to communicate with all other people using their natural hand gestures. The idea consisted of designing and building up an intelligent system using image processing, machine learning and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate easily recognizable form of outputs. Hence the objective of this project is to develop an intelligent system which can act as a translator between the sign language and the spoken language dynamically and can make the communication between people with hearing impairment and normal people both effective and efficient. The system is we are implementing for Binary sign language but it can detect any sign language with prior image processing.

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The author Anup Kumar [3] explained a novel system to aid in communicating with those having vocal and hearing disabilities. It discusses an improved method for sign language recognition and conversion of speech to signs. The algorithm devised is capable of extracting signs from video sequences under minimally cluttered and dynamic background using skin colour segmentation. It distinguishes between static and dynamic gestures and extracts the appropriate feature vector. These are classified using Support Vector Machines. Speech recognition is built upon standard module - Sphinx. Experimental results show satisfactory segmentation of signs under diverse backgrounds and relatively high accuracy in gesture and speech recognition.

The author Ashish S. Nikam [4] explained Hand gesture is one of the methods used in sign language for non-verbal communication. It is most commonly used by deaf & dumb people who have hearing or speech problems to communicate among themselves or with normal people. Various sign language systems have been developed by many makers around the world but they are neither flexible nor cost-effective for the end users. Hence in this paper introduced software which presents a system prototype that is able to automatically recognize sign language to help deaf and dumb people to communicate more effectively with each other or normal people. Pattern recognition and Gesture recognition are the developing fields of research. Being a significant part in nonverbal communication hand gestures are playing key role in our daily life. Hand Gesture recognition system provides us an innovative, natural, user friendly way of communication with the computer which is more familiar to the human beings. By considering in mind the similarities of human hand shape with four fingers and one thumb, the software aims to present a real time system for recognition of hand gesture on basis of detection of some shape-based features like orientation, Centre of mass centroid, fingers status, thumb in positions of raised or folded fingers of hand.

The author Aryo Pradipta Gema [5] a novel approach in a dataset of argumentation relations. This task is intended to analyse the presence of a support relation between two sentences. To be able to identify relations between two sentences or arguments, one is obliged to understand the nuance brought by both sentences. Our models are modification of siamese network architectures, in which we replace the feature extractor into Long Short-Term Memory and implement cosine distance as the energy function. Our models take a pair of sentences as their input and try to identify whether there is a support relation between those two sentences or not. The primary motivation of this research is to prove that a high degree of similarity between two sentences correlates to sentences supporting each other. This work will focus more on the modification of siamese network and the implementation of attention mechanism. Due to the difference in dataset setting, we cannot arbitrarily compare our results with the prior research results. Therefore, this work will not highlight the comparison between deep learning and traditional machine learning algorithm per se, but it will be more of exploratory research. Our models are able to outperform the baseline score of accuracy with a margin of 17.33% (67.33%). By surpassing the baseline performance, we believe that our work can be a stepping stone for deep learning implementation in argumentation mining field.

The author Shih-En Wei [6] told that pose machine consists of a sequence of multi-class predictors that are trained to predict the location of each part in each level of hierarchy. It also has an image feature computation module and a prediction module, both of which can be replaced by a convolutional architecture allowing for both image and contextual feature representations to be learned directly from data. This idea is what led to Convolutional Pose Machine (CPM), which is the first Deep Learning-based pose estimation model.

The author Ajeet Ram [7] have shown that Deep CNNs have been extensively used for object detection. CNN is a type of feed-forward neural network and works on principle of weight sharing. Convolution is an integration showing how one function overlaps with other function and is a blend of two functions being multiplied. Image is convolved with activation function to get feature maps. To reduce spatial complexity of the network, feature maps are treated with pooling layers to get abstracted feature maps. This process is repeated for the desired number of filters and accordingly feature maps are created. Eventually, these feature maps are

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processed with fully connected layers to get output of image recognition showing confidence score for the predicted class labels. For ameliorating the complexity of the network and reduce the number of parameters, CNN employs different kinds of pooling layers. Pooling layers are translation-invariant. Activation maps are fed as input to the pooling layers. They operate on each patch in the selected map.

The author M.K. Bhuyan [8] explained One very interesting field of research in Pattern Recognition that has gained much attention in recent times is Gesture Recognition. In this paper, we consider a form of dynamic hand gestures that are characterized by total movement of the hand (arm) in space. For these types of gestures, the shape of the hand (palm) during gesturing does not bear any significance. In our work, we propose a modelbased method for tracking hand motion in space, thereby estimating the hand motion trajectory. We employ the dynamic time warping (DTW) algorithm for time alignment and normalization of spatio-temporal variations that exist among samples belonging to the same gesture class. During training, one template trajectory and one prototype feature vector are generated for every gesture class. Features used in our work include some static and dynamic motion trajectory features. Recognition is accomplished in two stages. In the first stage, all unlikely gesture classes are eliminated by comparing the input gesture trajectory to all the template trajectories. In the next stage, feature vector extracted from the input gesture is compared to all the class prototype feature vectors using a distance classifier. Experimental results demonstrate that our proposed trajectory estimator and classifier is suitable for Human Computer Interaction (HCI) platform.

III. REVIEW FINDINGS

Sign Language Recognition (SLR) system, which is required to recognize sign languages, has been widely studied for years. The studies are based on various input sensors, gesture segmentation, extraction of features and classification methods. This paper aims to analyse and compare the methods employed in the SLR systems, classifications methods that have been used, and suggests the most promising method for future research. Due to recent advancement in classification methods, many of the recent proposed works mainly contribute on the classification methods, such as hybrid method and Deep Learning. This paper focuses on the classification methods used in prior Sign Language Recognition system. Based on our review, HMM based approaches have been explored extensively in prior research, including its modifications. This study is based on various input sensors, gesture segmentation, extraction of features and classification methods. This paper aims to analyse and compare the methods employed in the SLR systems, classifications methods that have been used, and suggests the most reliable method for future research. Due to recent advancement in classification methods, many of the recently proposed works mainly contribute to the classification methods, such as hybrid method and Deep Learning. Based on our review, HMM-based approaches have been explored extensively in prior research, including its modifications. Hybrid CNN-HMM and fully Deep Learning approaches have shown promising results and offer only single solution for the problem but not providing any alternative solutions.

IV. PROBLEM IDENTIFICATION

• The only way the speech and hearing impaired (i.e dumb and deaf) people can communicate is by sign language.
• The main problem of this way of communication is normal people who cannot understand sign language can’t communicate with these people or vice versa.
• Our project aims to bridge the gap between the speech and hearing-impaired people and the normal people.
• The basic idea of this project is to make a system using which dumb people can significantly communicate with all other people using their normal gestures.
• The system does not require the background to be perfectly black. It works on any background.

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• The project uses image processing system to identify, especially 4 English alphabetic sign language used by the deaf people to communicate and converts them into text so that normal people can understand.
• Hence there is a need of a system which recognizes the different signs, gestures and conveys the information to the normal people. It bridges the gap between physically challenged people and normal people.

V. CONCLUSION

Nowadays, applications need several kinds of images as sources of information for elucidation and analysis. Several features are to be extracted so as to perform various applications. When an image is transformed from one form to another such as digitizing, scanning, and communicating, storing, etc. degradation occurs. Therefore, the output image has to undertake a process called image enhancement, which contains of a group of methods that seek to develop the visual presence of an image. Image enhancement is fundamentally enlightening the interpretability or awareness of information in images for human listeners and providing better input for other automatic image processing systems. Image then undergoes feature extraction using various methods to make the image more readable by the computer. Sign language recognition system will help all the deaf and dumb people for communicate anyone they want. This also help the normal people who fells difficulty to communicate the deaf and dumb People and other features in our application will help the people to communicate in any situation.

VI. FUTURE SCOPE

The proposed sign language recognition system used to recognize sign language letters can be further extended to recognize gestures facial expressions. Instead of displaying letter labels it will be more appropriate to display sentences as more appropriate translation of language. This also increases readability. The scope of different sign languages can be increased. More training data can be added to detect the letter with more accuracy. This project can further be extended to convert the signs to speech.

VII. REFERNCES

[1] Nasser H. Dardas and Nicolas D. Georganas, "Real-time handGesture detection and recognition using bag-of-features and support vector machine techniques", IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, 2018.
[2] Emil M. Petriu, Qing Chen and Nicolas D. Georganas, Real-time vision-based hand gesture recognition using haar-like features, 2017.
[3] P.K. Bora, M.K. Bhuyan and D. Ghosh, "Trajectory guided recognition of hand gestures having only global motions", International Science Index, 2018.
[4] "Thad Eugene Starner", Visual recognition of american sign language using hidden markov models, 2015.
[5] Shih-En Wei, Varun Ramakrishna, Takeo Kanade, and Yaser Sheikh. Convolutional posemachines, 2016.
[6] Emil M. Petriu, Qing Chen and Nicolas D. Georganas, Feature extraction from 2d gesture trajectory in dynamic hand gesture recognition, 2016.
[7] Manisha M. Ingle Neelam and K. Gilorkar, A review on feature extraction for indian and american sign language, 2019.
[8] ATHIRA P K, ALEENA K RAJ and DEEPA I K., Sign language conversion software for people with hearing and vocal disabilities, 2013.
[9] Real-Time Palm Tracking and Hand Gesture Estimation Based on Fore-Arm Contour, 2017