Real Time Communication System for Specially Abled

Machine Learning Techniques for Indian Sign Language Recognition

Kusumika Krori Dutta, Sunny Arokia Swamy Bellary *et al* 2017 International Conference on Current Trends in Computer, Electrical, Electronics and Communication (ICCTCEEC-2017) trained the system with Principal Component Analysis (PCA) and Artificial Neural Network (ANN) algorithm in MATLAB. The hand gestures are acquired from different sized and complexion hands and made an image database for having ease image of size 768 by 1024. The images are pre-processed and resized to 256 by 256. Dimensionality reduction technique is applied for faster classification and it plays a vital role for feature extraction and dimension reduction has been done in one step using **P**rincipal **C**omponent **A**nalysis (PCA). Sign Language Dataset has been trained separately using two machine learning techniques which are K Nearest Neighbours and Back Propagation Algorithm. The k-nearest neighbours algorithm (k-NN) is a non-parametric method used for classification and regression. It's a supervised technique where an object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its k nearest neighbours. Features were extracted from the set of images and used for training the conjugate gradient back propagation neural network (supervised learning) also the images has been trained separately using K-NN technique and gives 100% pattern recognition. The single and double handed Indian sign language is acquired and classified English letters and numbers using K NN and Back propagation techniques where PCA is used for dimension reductionality. For K-NN techniques with K=1, achieved 100% recognition rate whereas using back propagation technique achieved 94-96%.

Advantages:

The model results in 100% pattern recognition in training using KNN

The model results 94-96% accuracy using back propagation.

K-Nearest Correlated Neighbor Classification for Indian Sign Language Gesture Recognition using Feature Fusion

Bhumika Gupta, Pushkar Shukla, Ankush Mittal *et al 2016* 2016 International Conference on Computer Communication and Informatics (ICCCI -2016), Jan. 07 – 09, 2016, Coimbatore, INDIA proposed that recognition of gesture of Indian Sign Languages using static images where a test image is first categorized into a single or double handed gesture followed by its classification using a fusion of SIFT and HOG descriptors via K-Nearest Correlated Neighbours. Sub categorizing the gestured alphabets into single-handed or doubled-handed considerably lowered the cost of computation and increased the efficiency of the algorithm due to the reason that there were lesser number of classes in a subgroup compared to the complete set of characters in the Indian Sign Language. Once the two sub categories are created, an identical set of functions are performed on both the sets for the recognition of gestures. The feature uses histograms to depict intensity distributions or to detect local edges in certain areas of interest in an image. This is done by dividing the image into smaller units called cells and constructing single dimensional histograms for the edge orientations of pixels in each cell. After categorizing the features into single-handed and double-handed, the accuracy obtained for classification using HOG was 100% for single-handed gestures and 82.77% for double-handed gestures. Using SIFT descriptors an accuracy of 92.50% was obtained for single-handed gestures and about 75.55% for double handed gestures. For fused features the accuracy was 97.50% for single-handed gestures and 91.11% for double-handed gestures. The proposed method when tested on a dataset of 60 test images for single-handed gestures was able to identify 59 correctly.

Advantages:

This technique, gives substantial accuracy for recognition of this gestures

Disadvantages

The technique is currently restricted to detect static gestures.

Moment Based Sign Language Recognition For Indian Languages

Umang Patel, Aarti G. Ambekar *et al 2017* Third International Conference on Computing, Communication, Control And Automation (ICCUBEA) has proposed that double handed sign language is used for sign recognition. The method which is introduced in this paper will use a web camera for capturing gestures & then it will pre-process images of gesture in MATLAB. After having the processed image, next step is feature extraction & followed by classifier, recognized gestures are displayed as Hindi & English text & played as Hindi & English audio. Different classification algorithms are used such as K Nearest Neighbour (KNN) classifier and Probabilistic Neural Network (PNN) classifier. Using classifier, each group is a form of an individual pattern. English text can be easily displayed using MATLAB inbuilt function. The function is called as system.Speech.Synthesis.SpeechSynthesizer which is used for English speech. Now major task is to implement Hindi text & speech. MATLAB doesn't support Hindi character so Hindi text is displayed by implementing database of each alphabet with the help of images of individual alphabet & display accordingly. Using 7Hu moment techniques for feature extraction & KNN classifier, Appx. 82% accuracy is achieved. Quality of English Speech is very good because of inbuilt MATLAB function. Hindi speech is database of recorded sound therefore quality depends on recorded sound file. In this method .wav audio file format is used for Hindi speech

Advantages

The quality of English speech is very good.

Disadvantages

The quality of Hindi speech depends on audio file format depends on Hindi speech.

Two Hand Indian Sign Language dataset for benchmarking classification models of Machine Learning

Leela Surya Teja Mangamuri, Lakshay Jain , Abhishek Sharmay *et al 2019* 2nd International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT) proposed that Skin filtering techniques are proposed for the extraction of hand from the background. Skin coloured pixels are separated from the non- skin coloured pixels by setting up a threshold. Adaptive Boost algorithm used by Fang is very popular for extracting two hands from the background. In the first stage Hand Segmentation and Filtering is done on the whole training and test set images. The hand is segmented from the background by extracting the skin coloured pixels of the image from the non-skin coloured pixels by setting a threshold limit. In the second stage, HOG features are extracted from the hand segmented images of training and test set. HOG feature bin is the magnitude of gradients to a histogram according to its orientation. HOG does not check the characteristics of the complete image rather the image is decomposed into smaller cells and then the gradient of histogram direction of all edges is calculated for each cell. the HOG features extracted from training and test set images of THISL dataset are passed into various classification models along with their respective labels. THISL dataset was benchmarked on six different classification models of machine learning by changing the parameters. Classification models are evaluated based on the HOG features extracted from the skin filtered image. An overall accuracy of 91.72% was achieved comprising of all machine learning models.

Advantages

Overall accuracy of 91.72% was achieved comprising of all machine learning models

Movements were introduced while images were being clicked so as to capture signals from various angles, thus creating a diversified real-time dataset

Disadvantages

Lighting and shadows were not kept constant when images were being clicked

Double Handed Indian Sign Language to Speech and Text.

Kusurnika Krori Dutta , Satheesh Kumar Raju , Anil Kumar G , Sunny Arokia Swarny *et al 2015* Third International Conference on Image Information Processing The proposed system provides voice to the deaf and mute people and promising them an independent life without any help of human translator. The system is trained with double handed sign language by using a minimum eigenvalue algorithm. Here Logitech web camera is used for image acquisition and processing is performed in MATLAB. The corresponding output is obtained after extracting Shi-Thomasi good features. Five Images of each alphabet are taken and Min Eigen Value algorithm is applied as shown in figure 3, and interesting points are extracted. The Extracted features are stored instead of directly storing the image. This has a main advantage that it takes very less space and computational time will also be less. By this way the system is trained with image features. During real time acquisition. The image is captured by Logitech Web camera of 5MP. The image is pre-processed to reduce noise and artifacts and then its Min Eigen Value features are extracted. The Output Text which is obtained after Image and Word processing is further converted to Speech using Text to Speech Synthesis. The Text is given as Input. The Text is analysed and each and every word is being searched in the Letter to Sound Dictionary. Then its equivalent which is been stored in the dictionary is being played in sequence of the text generated. This text was translated to speech form. Thus, system was developed to translate the double handed Indian Sign Language into both text and speech This system helps and aid the hearing impaired and mute people to live independently. It develops confidence and will power to share their emotions, thoughts, ideas and difficulties with the nonnal people in the society. This eliminates the gaps among the people and achieve better society.

Advantages:

This system is also useful to all the people in the society gets as through this speech translation is possible, system output can be obtained in different languages.

Disadvantages:

If both eigenvalues are large then feature varies significantly in both directions

Comprehensive SVM based Indian Sign Language Recognition

K. Revanth, N. Sri Madhava Raja *et al 2019* Proceeding of International Conference on Systems Computation Automation and Networking proposed that different machine learning algorithms have been applied and SVM (Support Vector Machines) has achieved good result and comparison of different algorithm has been taken place. The classifiers used in this workflow comparison are Support Vector Machines, K – Nearest Neighbour, Logistic Regression and Naïve Bayes. The selected parameter for observations are accuracy, precision, fl score and recall. They are calculated with the inbuilt SK learn metric tool that is especially designed to calculate values for the machine learning model. The model to be found working with highest performance values when SVM is adopted and applied to the dataset, without any performance issues The accuracy can be increased by providing more diverse set of data in different requirements. The accuracy achieved by SVM is 90%

Advantages:

Feature extraction is done by Oriented FAST and rotated BRIEF (ORB). It is an efficient alternative to SURF in terms of computation cost and performance.

Disadvantages:

The accuracy can be increased by providing more diverse set of data in different requirements

Indian Sign Language Animation Generation System

Sandeep Kaur, Maninder Singh et al 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India, 4-5 September 2015 proposed that Indian Sign Language animation generation system is a based system in which HamNoSys corresponding to words are generated based on ISL. Then SiGML corresponding to HamNoSys is generated that is given as input to JA SIGML URL APP to check the accuracy of these notations. Database is also maintained which stores SiGML file corresponding to Punjabi

words. This system has been tested on 100 words. In this system HamNoSys for 100 words are generated according to ISL (Indian Sign language). If the user wants to generate animation corresponding to word then firstly HamNoSys will be generated for words. Then after generating SiGML from HamNoSys animation can be produced. This system generates HamNoSys for simple words only. One handed and two-handed sign symbols are covered in this system. Some of the example words used for testing and their corresponding HamNoSys generated in this system. This paper describes a system which generates HamNoSys corresponding to 100 words. These Notations are generated according to the Indian Sign Language. This system covers all the simple words to generate HamNoSys. This system has been tested on 100 words and results of the system are very encouraging. Accuracy of HamNoSys is checked with the help of Tool named as JA SIGML SERVICE PLAYER APP. Generated signs are verified with the help of Indian Sign Language Dictionary and results of theses notations are very encouraging. One-handed and two-handed signs are covered in this system. In future this system will be extended to generate HamNoSys corresponding to complex words and complex sentences. This system can be extended to a complete system which generates animation corresponding to words

Advantages:

Accuracy of HamNoSys is checked with the help of tool named as JA SIGML SERVICE PLAYER APP

Disadvantages:

The above system currently supports 100 words only which make it relatively less scalable