Machine Learning Techniques for Indian Sign Language Recognition

Abstract:

Over the years, communication has played a vital role in exchange of information and feelings in one's life. Sign language is the only medium through which specially abled people can connect to rest of the world through different hand gestures. With the advances in machine learning techniques, Hand gesture recognition (HGR) became a very important research topic. This paper deals with the classification of single and double handed Indian sign language recognition using machine learning algorithm with the help of MATLAB with 92- 100% of accuracy. Normal humans can easily interact and communicate with one another, but the person with hearing and speaking disabilities face problems in communicating with other hearing people without a translator. The Sign Language is a barrier of communication for deaf and dumb people. People with hearing and speaking disability are highly dependent on non-verbal form of communication that involves hand gesture. This is the reason that the implementation of a system that recognize the sign language would have a significant benefit impact on dumb - deaf people. In this paper, a method is proposed for the automatic recognition of the finger spelling in the Indian sign language. Here, the sign in the form of gestures is given as an input to the system. Further various steps are performed on the input sign image. Firstly segmentation phase is performed based on the skin color so as to detect the shape of the sign. The detected region is then transformed into binary image. Later, the Euclidean distance transformation is applied on the obtained binary image. Row and column projection is applied on the distance transformed image. For feature extraction central moments along wwit HU's   moments are used. For classification,neural network and SVM are used.

Advantage:

It is a very crucial part of the research works in all the arenas as it is fundamental to foster the development of any machine or <u>deep learning model</u>. However, it is full of challenges. During data collection, the biggest challenge we faced was that there were no standard datasets for Indian sign language available. Studying ASL promotes better awareness of and sensitivity to the deaf and hard of hearing community. As someone proficient in ASL, you will develop a strong appreciation for deaf culture, and you can promote understanding and acceptance of the language among others.

Disadvantage:

Boosts Your Busiess & Creates More Opportunities. Becomes Easier to Learn Another New Language. Improves Your Body Language Skills. Introduces You to the Issue of Deaf Awareness.

Portable Communication Aid for Specially Challenged Conversion of Hand Gestures into Voice and ViceVersa

Abstract—

There has been dramatic increase in the number of people with physical disabilities in recent years. Many people with disabilities have substantial difficulties even moving their hands and legs. The disability has thus become a real challenge since most of the physically compromised people need some kind of assistance at all times. However, a tongue in a human body is one critical anatomical part which is very rarely affected by disabilities. To resolve the physical disability problem, various assistive technologies were taken into consideration with the main objective of allowing the disabled people to seamlessly communicate with their surrounding environments. One of the technologies which was made available for use by disabled people was a tongue drive system. But their existing designs involved some mechanical problems besides having accuracy issues. In the subject paper, we strive to implement an optimized tongue drive system for physically disabled persons that enables its users to generate more than eight distinct commands with the aid of artificial intelligence, thereby enabling the users a full command via a computer keyboard and mouse.

Keywords

Assistive technology, Hall effect magnetic sensors, neural networks, optimized tongue drive system, physically disabled persons.

## TDSDESIGN –AREVIEW ON CURRENT TRENDS

- The TDS is simply a tongue monitoring wireless technology which allows disabled individuals to direct their intents into commands that can be sensed by a small permanent magnet. The permanent magnet is secured on the tongue while the magnetic sensors are organized on the headset to be located outside the tongue .

- To be more specific, the TDS is implemented as part of the AT that provides assistance to the individuals with multiple disabilities. There exist, however, a limited number of AT advances thus far, viz. eye gaze, joysticks, sip-n-puff, etc.

- The speech control mechanism was additionally explored and found that it has high performance in its usefulness for just the exact conditions, but quite inadequate in performance in the noisy environments. From all these different AT advancements, some are found not quite suitable during preparation and testing phases for the individuals with significant spinal cord injuries, because they cannot move their hands or even their feet. For instance, a joystick is not a reasonable tool to help this kind of individuals since it needs the motion from the hands to manage the PWCs.

- The contemporary TDS designs utilize six commands which are capable of handling a wheelchair. The four commands out of the six are used to specify the directions. This

system gives a smoother control contrasted with other types of ATs besides being fast. The operator is allowed to relate some type of tongue motion with any of the six commands but the movements should be unique. It is advised that the TDS commands should be used by moving tongue from its inactive position to the sides or into curls which is up and down. The response of this TDS is 1 sec which is about 90% accurate. The results obtained from the new designs were compared with those of the previous TDS designs . Several maneuvers were checked for hours in order to visualize the performance of these TDS designs and all results showed remarkable improvements .

HAND GESTURE TO VOICE:

Live hand gestures taken lively with which training datasets are developed and with this dataset the gestures are recognized. The entire process is shown in the figure 1
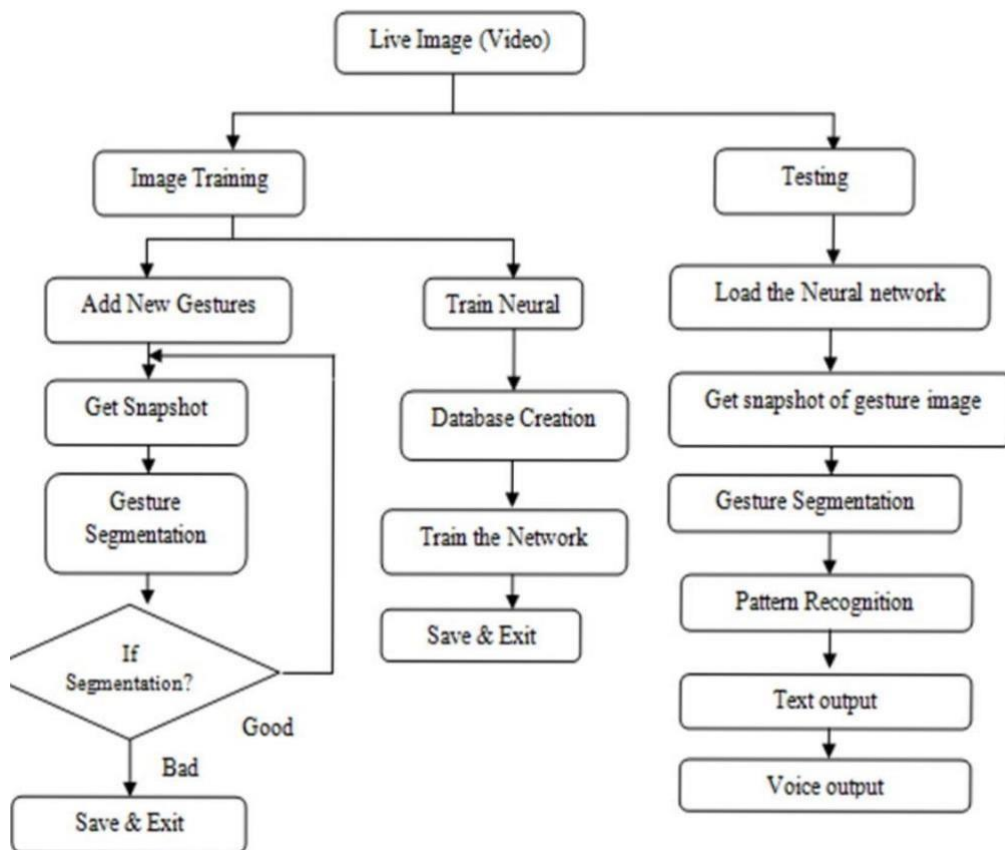
A.Training phase :

- The process involved in the training phase is given in the following steps.
- Training dataset is created by capturing different hand gestures through high resolution camera. For each gesture minimum of ten images are captured.
- The captured images are de-noised using median Filter.

B.Testing phase:

- In this phase the trained system in the previous phase is used reconditioning the gestures. In real time gesture, a dumb person live gesture is captured. This captured image has gone through the filtering and segmentation process and then it is sent to the classifier network
- If the gesture matches with dataset by the testing phase then text output of the corresponding gesture is displayed on the screen of the handheld device. Datasets considered in this project

Advantage & Disadvantages:

- This system has been developed for set of different words and its voice and for different gestures.
- This proposed will be useful for the normal persons to communicate with differently abled persons (The person with hearing loss with mute) and vice versa.
- Economically high
- Less variety of words and voice .

Reference:

- **Aditi Kalsh, N.S. Garewal , "Sign Language Recognition for Deaf & Dumb", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 9, September 2013.**

Two Way Communicator Between Deaf and Dumb People And Normal People

Abstract—

One of the most precious gift of nature to human beings is the ability to express himself by responding to the events occurring in his surroundings. Every normal human being sees, listens and then reacts to the situations by speaking himself out. But there are some unfortunate ones who are deprived of this valuable gift. This creates a gap between the normal human beings and the deprived ones. This application will help for both of them to communicate with each other. The system is mainly consists of two modules, first module is drawing out Indian Sign Language(ISL) gestures from real-time video and mapping it with human-understandable speech. Accordingly, second module will take natural language as input and map it with equivalent Indian Sign Language animated gestures. Processing from video to speech will include frame formation from videos, finding region of interest (ROI) and mapping of images with language knowledge base using Correlational based approach then relevant audio generation using Google Text-to-Speech (TTS) API. The other way round, natural language is mapped with equivalent Indian Sign Language gestures by conversion of speech to text using Google Speech-to-Text (STT) API, further mapping the text to relevant animated gestures from the database.

Keywords- Correlational based approach, Region of Intrest, Region growing,STT, TTS, ISL.

TODESIGN-

- The current era is a zoom of technology. Each and every field has an impact of the technological advancements onto it. One such rapidly growing technical advancement is the increasing impact of mobile phones on human life. The enormous and ever increasing Internet usage along with smart phones has proven a boon to mankind. The smart phone is one of the most important electronic gadget in our life, because it is with the smart phone that we stay connected.

- The hearing disabled and mute people cannot mingle with the social world because of their physical disabilities. Unintentionally, they are treated in an unusual manner by the rest of the society. They cannot be a part of the social events, say students cannot study in schools with normal students, elderly persons cannot work at work places, and much more. Simple activities like going and buying a commodity from the grocery shop is very complicated task for the deaf and dumb person. The gap between normal human beings and deaf and dumb is wide and ever increasing day-by-day. Today, the national count of hearing disabled and mute persons throughout India is approximately 17 lakh. Despite of this large number, very less research is done in order to bridge the communication barrier.

II. PROPOSED METHODOLOGY

In this section, we present an overall description of how we develop the solution. Our solution consists of two main modules, as depicted below:

A. Conversion of real time video(ISL) to equivalent human natural language speech.[1]
  • Frame formation from real time video
  • Pre-processing and noise removal

• Finding ROI using Region growing

   • Mapping using Correlation based approach

B. Mapping of human speech (natural language) to animated videos corresponding to ISL gestures.

   ☐ Generation of text from real time audio speech using Google STT API

   ☐ Mapping text to gesture images in database. ☐ Sequencing the

   images to form video ☐ Display animated gesture video.

III. MODULE I

A. Frame formation from real time video
   Video sequences for sign language gestures are captured using the camera device.

B. Pre-processing and noise removal
   Nosie removal in image processing deals with improving the image in terms of brightness, accuracy and other similar factors.

C. Finding ROI using Region growing [1] Step 1: Computing patch priorities.
   Step 2: Updating Region Growing
   Step 3: Updating Confidence Values
   Step 4: Updating the Absolute Value of Mean Difference

D. Mapping using Correlation based approach. [1]
   Correlation(r) =[√ NΣXY −ΣX.ΣY NΣX2−(ΣX)2].[N Σ Y 2 - (ΣY) 2] E.

Relevant audio generation using Google TTS API.

   At this phase, we have mapped sign language gesture in text format. Generally, thinking it is pretty good processing if successful conversion of sign language gestures to relevant text data is performed.

IV. MODULE 2

- A. Generation of text from real time audio speech using Google STT API

- B. Mapping text to gesture images in database

- C. Sequencing the images to form video

- D. Display animated gesture video

Advantage & disadvantages:

- This invention is associated only with dumb people. Therefore, it is highly desirable to have a new and improved gesture reorganization system, which helps blind, deaf and dumb people to communicate with the normal person.

- The main object of the present invention is to provide a TWO WAY COMMUNICATION SYSTEM FOR BLIND, DEAF AND DUMB people.

- The first major disadvantage is that it contributes to information overload.

- Many managers are simply swamped with communications, with their electronic mailboxes receiving approximately 150 messages per day.

Reference:

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