**[1] Title: Low cost approach for Real Time Sign Language Recognition**

***Author:*** *Matheesha Fernando, Janaka Wijayanayaka*

Sign Language is the language of people who suffer from speech and hearing defects. Still the rest of the world doesn’t have a clear idea of sign language. The communication between speech impaired people and other people is very inefficient. To overcome this problem technology can act as an intermediate flexible medium for speech impaired people to communicate amongst themselves and with other individuals as well as to enhance their level of learning / education. The suggested solutions in the literature for sign language recognition are very expensive for day to day use. Therefore, the main objective of this research is to find out a low cost affordable method of sign language interpretation. This paper discusses the possible ways to deal with the sign language postures to identify he signs and convert them into text and speech using appearance based approach with a low cost web camera. Further this approach ill be very useful to the sign language learners to practice sign language. During the research available human computer interaction approaches in posture recognition were tested and evaluated. A series of image processing techniques with Hub-moment classification was identified as the best approach. The system is able to recognize selected Sign Language signs with the accuracy of 76% without a controlled background with small light adjustments.

**Advantage:**

* Helps in identifying a low cost, affordable method that can facilitate hearing and speech impaired people to communicate with the world in more comfortable way where they can easily get what they need from the society and also can contribute to the well-being of the society.
* Can be used as a learning tool for sign language where hearing and speech impaired people can practice sign language using the application.

**Disadvantage:**

* This project only looks at the hand postures not on hand gestures.

# 2) Static Hand Gesture Recognition Based on Convolutional Neural Networks

**Author:** Raimundo F. Pinto Jr. , Carlos D. B. Borges, Antoˆnio M. A. Almeida , and Ia´lis C. Paula Jr

**Year:**2019

this paper proposes a gesture recognition method using convolutional neural networks. \*e procedure involves the application of morphological filters, contour generation, polygonal approximation, and segmentation during preprocessing, in which they contribute to a better feature extraction. Training and testing are performed with different convolutional neural networks, compared with architectures known in the literature and with other known methodologies. All calculated metrics and convergence graphs obtained during training are analyzed and discussed to validate the robustness of the proposed method.

**Advantages:** proposed methodology are much simpler and have a lower computational cost.

**Disadvantages:** the proposed methodology approaches only cases of gestures present in static images

3) Hand Gesture Recognition Systems with the Wearable Myo Armband

**Author:** Engin Kaya, Tufan Kumbasar

**Year:**2018

To accomplish such a goal, they have utilized machine learning techniques to recognize the hand gestures. In this context, seven different time domain features are extracted from the raw EMG signals using sliding window approach to get distinctive information. Then, the dimension of the feature matrix is reduced by using the principal component analysis to reduce the complexity of the deployed machine learning methods. The presented study includes the design, deployment and comparison of the machine learning algorithms that are k-nearest neighbor, support vector machines and artificial neural network. The results of the comparative comparison show that the support vector machines classifier based system results with the highest recognition rate.

**Advantages:achieve good accuracy**

**Disadvantages:need** to testing the proposed method with recording signals from different people and for more complicated hand gestures.

**4)** Gesture Recognition to Make Umpire Decisions

**Author:** Lesha Bhansali ,Meera Narvekar

**Year:2019**

With the growing increase of the utilization of technology in sports; our novel project the Umpire gesture Recognition System aims squarely to introduce a more robust technology to show Umpire choices with the assistance of Gesture Recognition and trailing of hand movement of the Umpire. This technology helps to alleviate the burden of the scorekeepers. It conjointly minimizes errors in displaying Umpire choices therefore adding to a more robust viewing expertise. This paper presents four easy but economical ways to implement hand gesture recognition specifically Subtraction, Gradient, Principal elements Analysis and Rotation Invariant. The ways used were in to retrieve the right matches

**Advantages:** capable of recognising a group of six umpire gestures from the game of cricke

**Disadvantages:no** performance of segmenting gestures

**5)** Automatic Labeling of Sports Video Using Umpire Gesture Recognition

**Author:** Graeme S. Chambers, Svetha Venkatesh, and Geoff A.W. West

**Year:2004**

Authors present findings from an extension of our approach to automatic Annotating sports videos Data from accelerometers is used to augment sports video.Umpires in the game wear wrist bands. Authors use a hierarchical hidden Markov model to solve the problem of automatic segmentation and robust gesture classification.model in tandem with a filler model We can use the hierarchical model to Consider gestures at various levels of abstraction, and the filler model allows us to do so. to deal with extraneous umpire movements The results of video labelling are presented. for a cricket match. The concept of a filler model from speech recognition is used in this proposed system to aid in detecting unknown movements and classifying them accordingly

**Advantages:** the system performs well overall with the exception of handling unknown movements which have similarities to known movements.

**Disadvantages:** filler ratio requires further investigation for deciding when a known gesture occurs.

**[6] Title: Vision-Based Sign Language Translation Device**

***Author:*** *Yellapu Madhuri, Anitha.G, Anburajan.M*

This report presents a mobile VISION-BASEDSIGN LANGUAGE TRANSLATION DEVICE for automatic translation of Indian sign language into speech in English to assist the hearing and/or speech impaired people to communicate with hearing people. The authors proposed a real-time vision-based system for recognizing finger spelling continuous Sign Language (ASL) using a single camera to track the user's unadorned hands. This system is broken down into three main parts starting with the image acquisition followed by image processing to extract features for recognition and last comes the recognition stage where signs are identified and audio output is given. The program starts with image acquisition, i.e. sign images capturing by the camera. The acquired images are pre-processed to differentiate static and dynamic signs, and also the start and end of a sign. The images are processed to identify the region of interest. The unique features of each sign in the region of interest are extracted to be used in the recognition stage. In the recognition stage, the features extracted are compared with the available database of pattern matching templates. A threshold value is set for the maximum difference between the input sign and the database, if the difference is below the maximum limit, a match is found and the sign is recognized. Corresponding audio file is played on audio device. The program can be implemented in a laptop, desktop or an IOS mobile phone to operate with its inbuilt camera, processor and audio device.

**Advantage:**

* It can be used as a translator between deaf and people that do not understand sign language, avoiding by this way the intervention of an intermediate person.
* The proposed system is highly consistent, reproducible, with fairly high precision and accuracy.

**Disadvantage**:

* This project did not focus on facial expressions although it is well known that facial expressions convey important part of sign-languages.

**[7] Title: RGB-H-CbCr Skin Color Model for Human Face Detection**

***Author:*** *Nusirwan Anwar bin Abdul Rahman, Kit Chong Wei and John See*

While the RGB, HSV and YUV (YCbCr) are standard models used in various color imaging applications, not all of their information are necessary to classify skin color. This paper presents a novel skin color model, RGB-H-CbCr for the detection of human faces. Skin regions are extracted using a set of founding rules based on the skin color distribution obtained from a training set. The segmented face regions are further classified using a parallel combination of simple morphological operations. This model utilises the additional hue and chrominance information of the image on top of standard RGB properties to improve the discriminality between skin pixels and non-skin pixels. In the proposed approach, skin regions are classified using the RGB boundary rules introduced byPeer et al. and alsoadditional new rules for the H and CbCr subspaces. These rules are constructed based on the skin colour distribution obtained from the training images. The classification of the extracted regions is further refined using a parallel combination of morphological operations.

**Advantage:**

* Able to deal with various brightness and illumination conditions as well as very effective compare to the other existing systems.

**Disadvantage:**

* Doesn't provide success of a robust face detector.

**8)** **A wearable biosensing system with in-sensor adaptive machine learning for hand gesture recognition**

**Author:** Ali Moin  1,5 ✉, Andy Zhou1,5, Abbas Rahimi2 , Alisha Menon1

**Year:2017**

Wearable devices that monitor muscle activity based on surface electromyography could be of use in the development of hand gesture recognition applications. Such devices typically use machine-learning models, either locally or externally, for gesture classification. However, most devices with local processing cannot offer training and updating of the machine-learning model during use, resulting in suboptimal performance under practical conditions. Here we report a wearable surface electromyography biosensing system that is based on a screen-printed, conformal electrode array and has in-sensor adaptive learning capabilities. Our system implements a neuro-inspired hyperdimensional computing algorithm locally for real-time gesture classification, as well as model training and updating under variable conditions such as different arm positions and sensor replacement. The system can classify 13 hand gestures with 97.12% accuracy for two participants when training with a single trial per gesture. A high accuracy (92.87%) is preserved on expanding to 21 gestures, and accuracy is recovered by 9.5% by implementing model updates in response to varying conditions, without additional computation on an external device.

**Advantages:** low-cost and low-complexity

**Disadvantages:**Clssification accuracy is less

**9)** A Dataset and Preliminary Results for Umpire Pose Detection Using SVM Classification of Deep Features

**Author:** Aravind Ravi\*, Harshwin Venugopal\*, Sruthy Paul†, Hamid R. Tizhoosh‡

**Year:**2018

In this paper, authors present SNOW, a new dataset for umpire pose estimation.Cricket detection in action The proposed dataset is assessed. as a preliminary aid in the development of systems for automatically producing cricket highlights The umpire in cricket has the authority to make critical decisions about on-field events The umpire communicates important events through distinct hand signals and gestures. They Determine four such events for classification: SIX, NO BALL, OUT and WIDE based on detecting the umpire's pose from the video frames from a cricket game Convolutional neural networks have been pre-trained. As primary networks, Inception V3 and VGG19 are chosen. potential feature extraction candidates The results are obtained by employing a SVM linear classifier .which achieve 81.09% on dataset

VGG19

**Advantages:** the proposed system is an effective solution for the application of cricket highlights generation

**Disadvantages:Time** complexity is high

**10)** An Approach to Automate the Scorecard in Cricket with Computer Vision and Machine Learning

**Author:** Md. Asif Shahjalal1, Zubaer Ahmad2, Rushrukh Rayan3, Lamia Alam4

**Year:**2017

The traditional approaches that have been considered so far involve wearing a specialized hand glove, which collides with the beauty of the originality in the field. In this paper, an approach is proposed and a prototype is implemented to automate the umpires decision by interpreting his hand gesture. The region of interest is selected using a Haarcascade-classifier and then the particular gesture is recognized using logistic regression. This process would eliminate the manual updating of scorecards and thereby reduce the game duration notably. In addition, it excludes the prerequisite of wearing special gloves involving sensors. The efficiency of the algorithm is then cross-checked with the training and test data.

**Advantages:** This proved to be a very simple but efficient algorithm for umpires gesture detection

**Disadvantages:** Multiple classifiers were need to be trained in order to make it work