

Sign Language Classification for Alphabets using Neural Network

Dissertation submitted in fulfilment of the requirements for the Degree of

BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING

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ABSTRACT

Sign Language Classification is used to translate the sign language gesture into a text or speech. So the deaf people can communicate with ordinary people in a well manner. This task has a very powerful effect on our society but still it is very challenging for us because of its complexity and huge variations. There are various Sign Language Classification project that uses handmade features which is use to describe Sign Language Recognition and performs the classification based on the available features. However, it is difficult to adapt the large variation of hand gestures. To solve this problem we are using 3D CNN .CNN used to extract the important specifications from a set of specifications without any prior knowledge that avoid the designing features. To increase its performance we used segmented feature as input to the 3D Convolutional Neural Network. Then we validate that model on a real data set and show the accuracy of the model.

Keyword: Sign Language Recognition, Convolutional Neural Network, Deep Learning.

DECLARATION STATEMENT

I hereby declare that the research work reported in the dissertation/dissertation proposal entitled "**Sign Language Classification for Alphabets using Neural Network**" in the fulfilment of the requirement for the award of Degree for Bachelor of Technology in Computer Science and Engineering at Lovely Professional University, Phagwara, Punjab is an authentic work carried out under supervision of my research supervisor **Mr.Sagar Pande**.

I have not submitted this work elsewhere for any degree or diploma.

I understand that the work presented herewith is in direct compliance with Lovely Professional University's Policy on plagiarism, intellectual property rights, and the highest standards of moral and ethical conduct. Therefore, to the best of my knowledge, the content of this dissertation represents authentic and honest research effort conducted, in its entirety, by me. I am fully responsible for the contents of my dissertation work.

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SUPERVISOR'S CERTIFICATE

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1.1 Introduction

Sign language is one of the most commonly used communication means for the hearing-impaired people in the world, which is expressed by the movements of the body, hands, and even the facial expressions also. Since we know that it is very difficult to understand the information expressed by the movement of body, hand gestures or facial expression that's why this model is still very challenging for us.

Here our main aim to convert the different hand gestures into the alphabets. If we talk technically, the main challenge for developing the sign language recognition is to convert the various hand gestures into their descriptions [1]. In a particular way, we can say that hand gestures involves the movement of hands, then the hand shaped image is segmented into the complex background frame and the gestures.

To overcome with this problem, we use 2D Convolutional Layer for best learning of the hand gestures or facial movements [5]. Instead of using color images as an input to the network, we use segmented images which has a great hand gestures or movements for the good accuracy. We convert the color and depth in pixel image which is very useful for differentiating different sign actions. Since we provide multiple types of visual inputs, the CNN works very well not only in color but also in the depth of the images.

1.2 Sign Language

Sign language is a language that transmits a symbolic pattern in real terms, rather than communicating in an audible sound pattern to indicate meaning — in which to express the ideas of the lounge fluently, the shape, configuration, and hand of the lounge. Conduction, abundance or body and facial expressions are used together.

People who cannot hear or speak, that is, the language of conversation with the hands, face and body gestures of the deaf people is called Sign Language. Although Sign Languages are not just indications, like any other language, it has its own grammar and rules, but it is not written and like English-Hindi, there is no need to make complete sentences to say it. Sign language is natural language. There is also an international sign language which is used by deaf people during international seating or traveling abroad [2]. It is also considered as a mixed form of sign language which is not more complicated and its dictionary is also limited. The use of sign language is encouraged and encouraged during the rights of person's convention with disabilities. Sign language has been given the same level and importance as spoken languages.

Fingerspelling	Word level sign vocabulary	No manual features
Used to spell words letter by letter.	Used for the majority of communication.	Finger expressions and hand, and body position.

Table 1

1.3 Convolutional Neural Network (CNN)

CNN is a deep learning algorithm. It is a type of neural network which is used to analyze the image its takes an input image, assign some weight and biases on the dataset of the image and can perform and it is able to perform a classification on the dataset. CNN can help to differentiate the properties of various dataset. Now a day's CNN is on demand for its successful image recognition capacity. Now a day's various industry like flipkart, google, facebook and many social media and E-commerce website are CNN model. CNN is just like the visual context of the human brain. Neural networks, as their name suggests, are a form of machine learning arranged behind the brain structure. Contains a network of study unit scaled neurons. These neurons learn to modify input signals in the corresponding output signals (e.g. label "sign"), form the basis for automatic recognition. CNN is a type of artificial network in which weights and biases are forwarded to the next neuron that's why neural network is also called forward type network. So the pattern of connections between its neurons inspired by the visual context of animals. CNNs have duplicate blocks of neurons used throughout the space (of pictures) or time.

For photography, these are nerve blocks can be translated as 2D convolutional heads, used more often each photo patch. Technically, it can be seen as 1D convolutional characters used in all time windows. During training, the weights of these duplicate blocks are 'shared', meaning weight gradients are read differently Photo pockets rated.

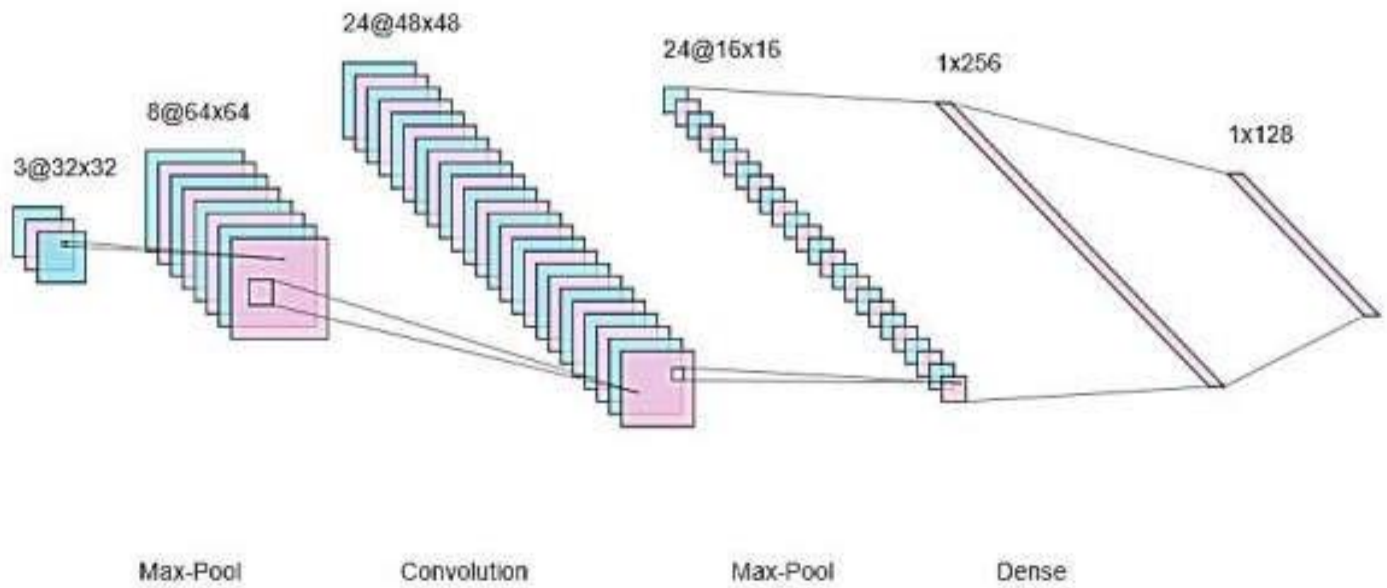


Figure 1 simple CNN Architecture

CHAPTE 2

REVIEW OF THE LITERATURE

2.1 Literature review

- ✓ In-depth reading there are two patterns of pattern recognition: one Vision-based approach relies heavily on the exterior nature. Another sensor is derived — requiring sufficient light and background. This method is done out in such a way that in the data collection they use the attitude sensor and the data is collected in bulk. The next stage data capture i.e., the first and last points of the action must have active signal segments to be processed. Next, they will use the data to show better input signals. Eventually they will split the major ones data rates and then post-process. The conclusion is that they use a touch detection algorithm sensor.

- ✓ Action recognition is a mathematical expression of human movement through a computer device. This app is usually divided into two categories namely contact- based approach and viewing method [6]. The vision-based approach is also simple it to process video image and pattern recognition. In this paper they trained the CNN division to clarify the structure offhand. In a vision-based approach they avoid skin color separation. The goal is six- and eight-static recognition dynamic gestures while maintaining the accuracy and speed of the system and the gestures used are used as a command in computer.

- ✓ The handheld system was widely used these days because it facilitates interaction between humans and machines. In This paper has used hand recognition because it provides useful information compared to other genres of hands. A key part of the hand-to-hand detection system involves separating and tracking hand from the background and the feature is removed from the split hand image using various techniques and eventually it will go see hand touch. Hand recognition is used in many applications such as HCI, robotics, sign language, digital and number of numbers. In this paper they have used the Kinect sensor which is widely used compared to the technology based on theory and method based on gloves. Powerful hand touch detection requires more calculation compared to vertical hand gestures.

- ✓ Research on dynamic motion dynamics tells us how feature vectors are obtained using unique angles. The element vector is obtained by the flexible angle of the hand movement method. Troubleshooting identification problem, use the Forward- backward algorithm and use the Viterbi algorithm that solves the correct trajectory sequence. To train the parameter model use the Baum-Welch algorithm. In the final stage they have He used DS proof theory to make the integration of the model element to obtain dynamic action recognition.
- ✓ This paper gives us details about it requiring sufficient space and length resolution support by related hardware as well high efficiency. To determine the speed and range of different movements and achieve hand recognition [3]. Also, use soundwave technology as speakers as well microphones installed on a computer to detect hand gestures. Consider a decision-making drug algorithm separating the original signal they have considered in four cases of physical contact. This action recognition is described in in such a way that the acquisition of an action uses hand pushing, hand pulling, hand raising and handshake and hand signing.
- ✓ Blind people face many challenges in their daily lives and extremely serious literacy. They feel it communication is difficult because they cannot access the computer. The actual embedded system is used for communication by external nature, which can be any living thing. In Braille text six dots represent six fingers. They have it use microcontrollers in this paper that uses gestures and send input to a computer touch and print on the display as output. The system is more expensive compared to other typographical types system.
- ✓ According to them, the handwriting program provides computerized human interaction. Two great applications they have using Sign Language adoption and manual control. Gestures are sensible, sensible physical gestures that are involved movement of fingers, hands, arms, head, face, or body. A hand detection system is considered a method to find an accurate and efficient computer communication tools.

- ✓ Introducing visually continuous real-time touch signals - first by inserting inputs followed by statistical analysis by position, position, posture, and movement [6]. Sign language is the most audible way to hear the disabled, the presenter must be able to recognize the continuous sign names in real at same time. We use last-Point problem to do determine the end points in order of touch inserts Sign language is a language that communicates a symbolic pattern in a visual form, rather than communicating in an audible sound pattern to convey meaning in which the shape, configuration, and hand of the speaker are able to convey the ideas fluently. Operations, arms or body and facial expressions are used simultaneously.
- ✓ Sign language is the most recognizable way for these who cannot speak, the identifier should be able to see the continuous sign languages in real time. Emotional sensitivity-sensing perception is an emerging field of pattern recognition research of the sign. Experimental tests prove the high performance and accuracy of any proposed device.
- ✓ The most common way to use a handwriting recognition system is when we give some instructions to our system by hand indication first you take our command as an images and comparing this with in the database and if there is an images found in the database then the function is assigned that will be done.
- ✓ First you take our command as a sign- images and comparing this with the database and if there is an image found in the database then the function is assigned that will be done. The most common way to use a handwriting recognition system is when we give some instructions to our system by hand gesture first you take our command as an sign-images and comparing this with the database and if there is an image found in the database then the function is assigned that will be done.
- ✓ The most important thing in modern life is communication - literacy. They feel difficult to communicate with the place because can't access a computer. On one page they used a Braille script for reading and writing purposes, which would not be the case translated by existing Computers. Six fingers represent six dots in Braille. Few papers focus on Human Computer

Interaction. On another piece of paper they used a Braille script when reading again the purpose of writing, which cannot be translated by existing computers. Six fingers represent six dots in Braille. A smart camera can be described as a high-quality vision system understanding the scene and generating specific application data to be used in the system. Skin color based on Mono Divorce techniques are used to separate the hand form into a complex image sequence. Typical features of histogram with various geometric elements are extracted.

3.1 Methodology

There are two main values: Segmentation of hand Recognition of hand sign. The features of a hand are an importance criterion to the classifier. Sign languages is a language that transmits a symbolic pattern in real terms, rather than communicating in an audible sound pattern to indicate meaning in which to express the ideas of the lounge fluently, the shape, configuration, and hand of the lounge[8]. Conduction, abundance or body and facial expressions are used together. People who cannot hear or speak, that is, the language of conversation with the hands, body and face gestures of the deaf people is called sign languages. Recently, sign language is not just English, but like any other languages, it has its own rules and grammar, but it is not written and like English-Hindi and other and many more.

3.2 Conditional Image Generation

The advancement of in Deep learning, the field of photography and sign production has seen a variety of methods that use network-based formats. Similarly, Pixel CNN has been developed, which magnifies images vector-based, which can be sign images tags or input inserts provided by various networks. Also, evaluated the use of Recurrent Neural Networks for image reproduction and signature completion [5]. All of these methods rely on rich or current and local information such as input, semantic label maps, or suffer from blurring and unstructured location since the arrival of Generative Adversarial Networks.

Very much about the work of image production. Shortly after their emergence, it developed a conditional model of Generative Adversarial Networks by providing conditional data to both Generator and Discrimination. This is proposed by Deep Convolutional a GAN (DCGAN) sets out the standard structure of a conditional GAN with a set of construction constraints, such as changing the spatial joints and linear contracts. These changes have made the system more resilient to training and ready for the task of producing realistic and consistent geographical images. Model modeling models are conditional on extending the DCGAN model. We have developed a system

for producing bird images based on status input information and text definition, using embedded text embedding and binary temperature maps. It. used conditional opposition nets in the Related Sign-to-image translation field. Another approach to GAN-based image production models is provided by Vibrational Auto Encoders, similarly to older auto-encoders, VAEs consist of dual networks, encoder and decoder. However, VAEs decrease the installed network following the Gaussian unit distribution. These develop a conditional, competent VAE producing consistent, but blue images, a trend of many VAE-based approaches. Most importantly in our work, the GAN hybrid models are used for image capture to produce a fixed image. It uses a two-step process to individual images of people in the basics. They achieve this by determining the input image of a person and then merging it with a pose heat map, before using another network to update the image and use two networks to produce man-directed images. First read a person's appearance, second read the hand-altering modification of the Hand use the override connection.

3.3 Related work

The sign language is classified into two phases. First is static sign language and second is dynamic sign language [4]. To define as sign language uses hand gesture, representation as finger gesture, Static sign language is suitable for it. And dynamic sign language uses hand poses as characterization. Static sign language classification can be advanced to different methods. They are finger detection, skin color and color gloves (custom made). The dynamic sign language classification defines gesture classification. To solve the problem of recognizing sign language hand poses there are different approaches have been proposed. Signer-independent is suitable to adequate of classifying hand gestures of any user. Our job is viable to make a Signer Independent recognition of images. But in contrast to these works our classifier is including the Feature extraction with completely deep neural network [9]. We uses Microsoft Kinect as sensor device to an approach to extract appearance-based hand gestures and track the hand position in 2D and 3D. The isolated gestures accuracy result was 99.7% and 84.8% on more realistic gestures. The depth data from Kinect could be used to improve data validity where they used temporary specification on images from the RGB camera and depth map for gesture analysis.

New network architectures such as performance for large-scale image recognition it recommended Very deep convolutional networks architecture, for computer vision rethinking the inception architecture and for image recognition used deep residual learning also done valuable subscription and developed performance and developed network architecture [7]. This aim of work is to use the advances in deep learning techniques and apply them to make a durable and to build sign language classifier as real-time finger spelled for classification using Convolutional Neural Network (CNN). It gives a successive result. Zin very first use couple of convolutional neural network (CNN). Each network has 3 deep layers for hand and upper body to extract from gray scaled images. To decrease the excess fitting and result comes 90.3% validate accuracy, they applied dropout and data augments in training. The subnetworks are one is for high resolution network and the second one is for low resolution network (LRN). On VIVA Challenge the classification rate of dataset is 77.5%. In a more present work a unique model architecture Dense Convolutional Network was introduced to densely connect convolutional networks [20]. By use Dense Net connects each one layer to another layer in a feed-forward fashion to present a plan to solve the vanishing gradient problem. Dense Net explores results to small number of parameters based on the potential of the network through specification reuse. With these merits, our network model was based on Dense Net.

3.4 Some sign languages are

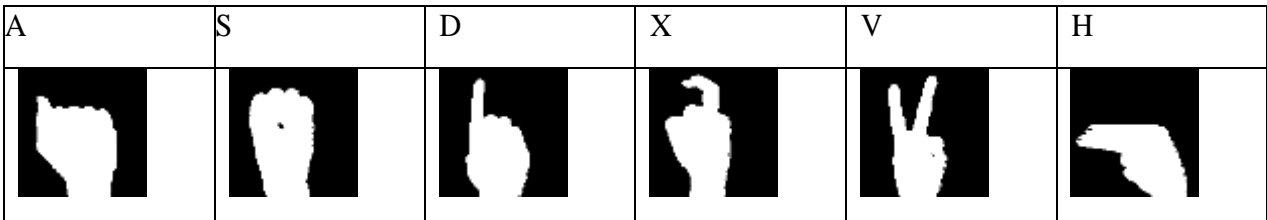


Figure 2

3.5 Sign language DFD

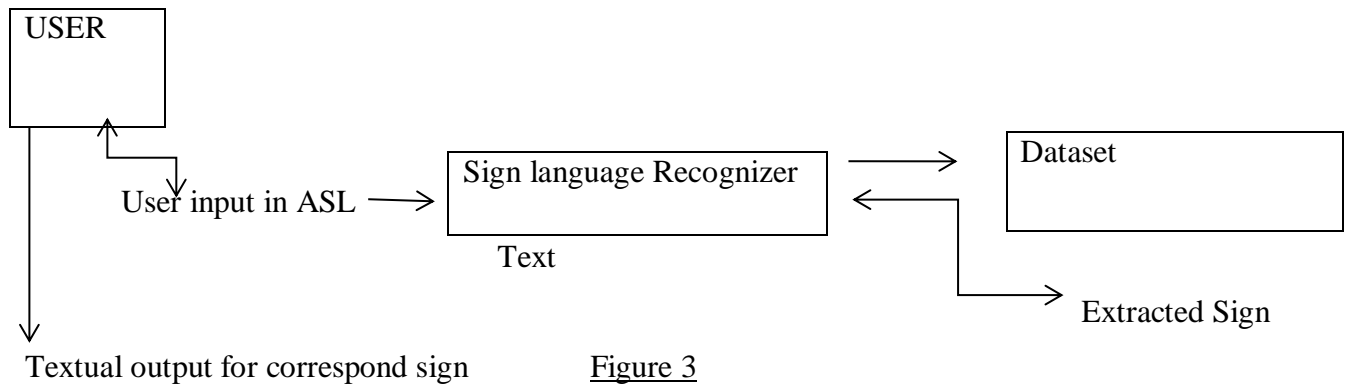


Figure 3

In this, a method for hand indication recognition of sign language is proposed. The accurate classification of hand indications plays an important role to develop an efficient hand indication recognition system. To implement this approach they have utilized a simple to capture hand indication sign images. They have attempted to propose a system to recognize alphabets characters (A-Z).sign languages data set extracted to the data frames. Dataset "A" is a 256 image which shows different types of directions. In the same way up to 256 images of A-Z which shows different signals.

3.6 Data set used

We are using self-made data which contain various hand gesture images in the segmented form that is User index which contains the place of the users in the depth map.



Figure 4

Here we are using 52000 different hand gesture image dataset for alphabet in our experiment in that 45500 image dataset for training. The remaining 6500 dataset for testing the model for better accuracy.

3.7 Preparing the dataset

We are created a dataset which contains 26 English language alphabets as hand gestures. Each sign hand indication is performed by signal with a hand structure to the hand indication. Frame by frame to images and adjusted to 26 frames and then augmented to get about 1750 images for each sign. The data was then divided into 1750 images for training and 23200 images for testing.

3.8 Flowchart

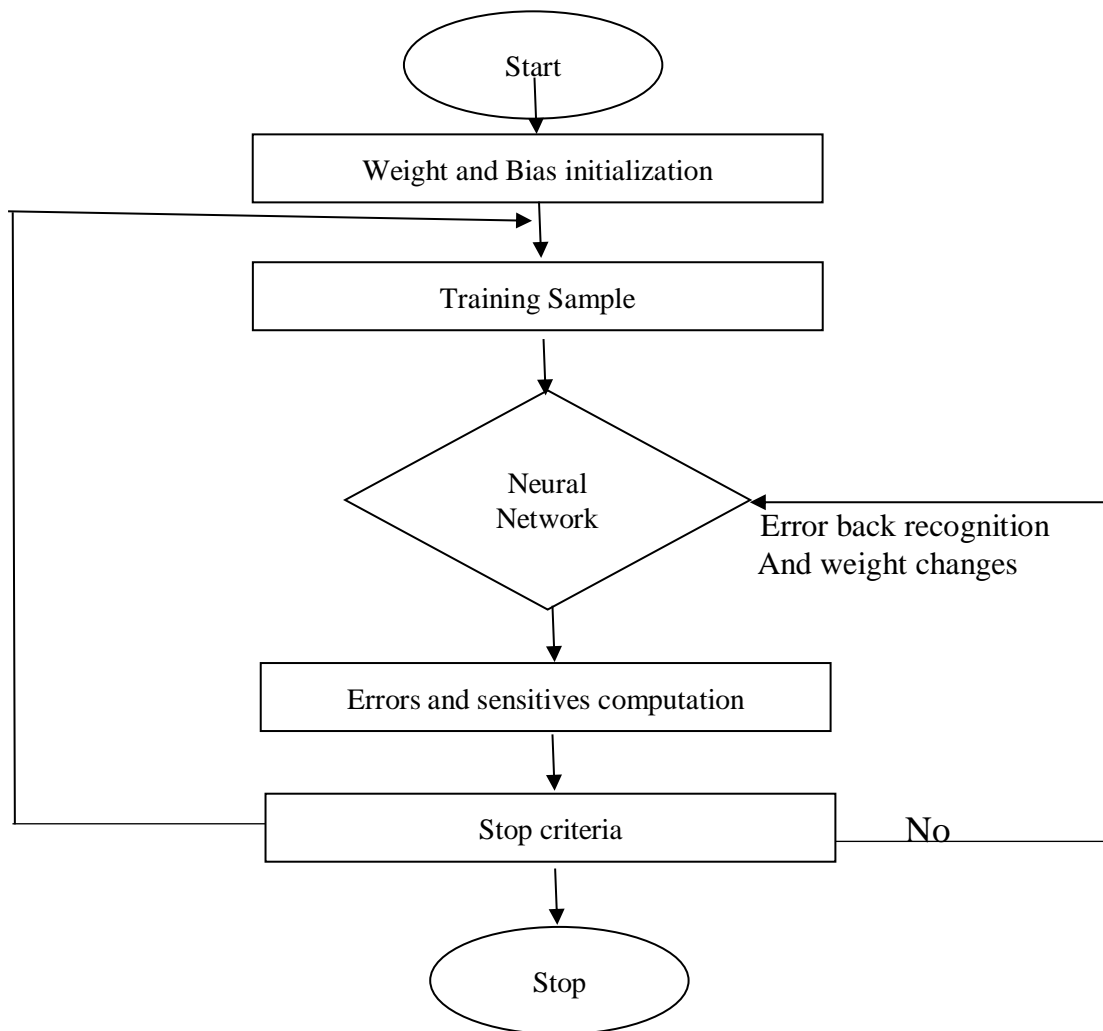


Figure 5 Flowchart

3.9 Algorithm

Convolutional Neural Networks (**CNN**) is a classification machine learning algorithm which is used for supervised learning. This performs to make labeling the dataset and then proceeding into the algorithm for training. For this project, the classification algorithm is used Convolutional Neural Networks (**CNN**).

Feature extraction algorithm which is used for dimensionality reduction to create a subset of the initial features. So to use those initial features to make only important data is passed to the algorithm. Then only it can be convert into a reduced set of features.

Convolutional Neural Network (**CNN**) is a deep neural network [23]. This is used to process the dataset that have a grid like topology. For an example images that can be represented as a 2-D array of pixels. A Convolutional Neural Network model consists four main operations. They are Convolution, on-Linearity (Relu), Pooling and Classification.

The algorithms used are as follow:

Convolution: Extracting features from images for the purpose of convolution is worth it. It uses small amount of data to reserve the connection between image pixel by feature of learning image. Mostly it is followed by Relu.

Relu: This function is performed to replace all bad pixel values on the feature map with zero because it is a smart operation. Its function is to introduce non-linear compliance in convolution network.

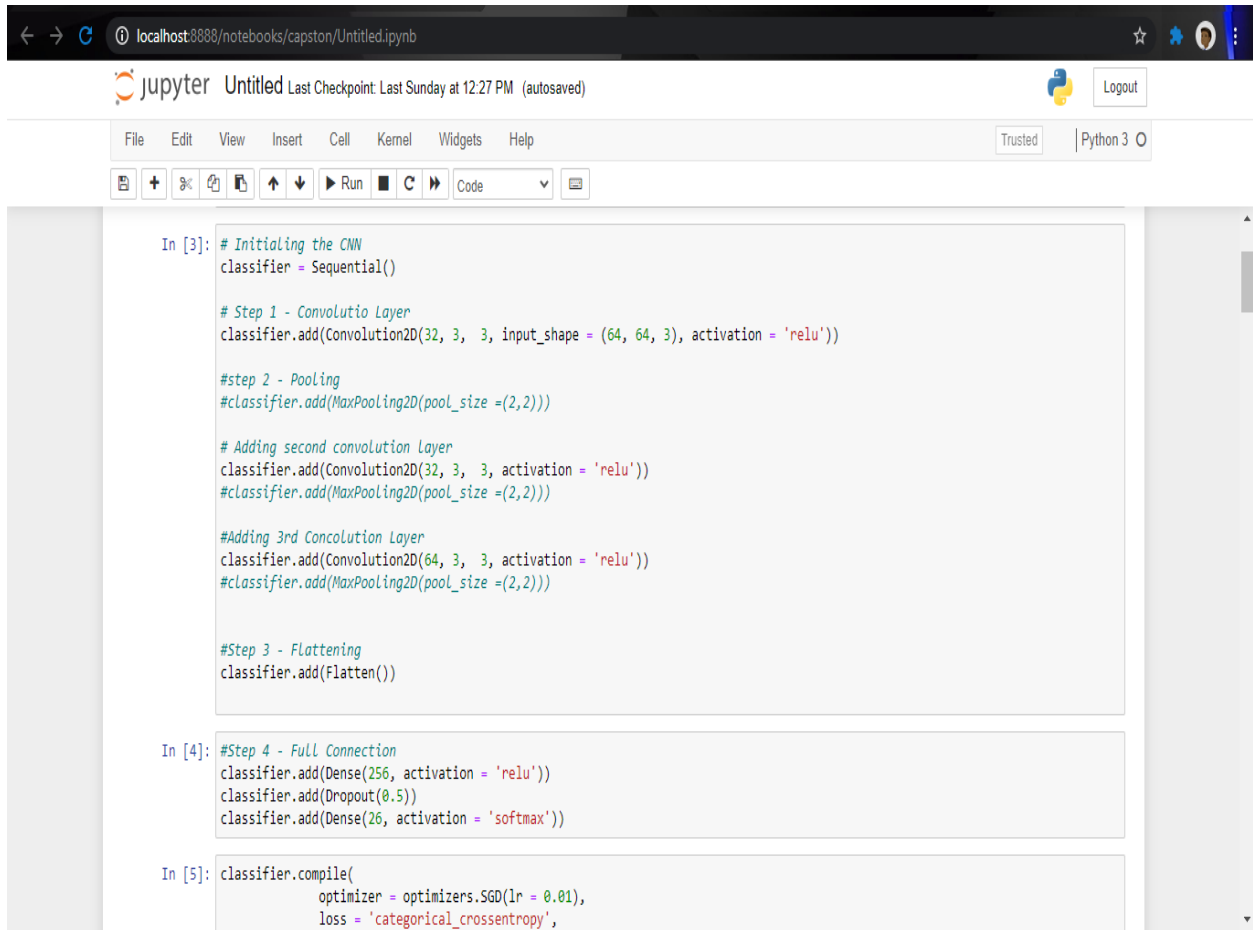
Pooling: It is also called down sampling; this reduces the size of the map for each feature but saves important data.

Fully-connected Layer: It is a multi-layer perception. The softmax function is used for output layer. It uses the feature from previous layer and it is the main purpose of fully connected layer. These factors are used to classify image inclusion into different categories based on training data

3.10 Convolutional Neural Network (CNN)

CNN is a deep learning algorithm. It is a type of neural network which is used to analyze the image. It takes an input image, assigns some weights and biases on the dataset of the image and can perform and it is able to perform a classification on the dataset. CNN can help to differentiate the properties of various datasets. Now a day's CNN is in demand for its successful image recognition capacity. Now a day's various industries like Flipkart, Google, Facebook and many social media and E-commerce websites are CNN models. CNN is just like the visual context of the human brain. Neural networks, as their name suggests, are a form of machine learning arranged behind the brain structure. It contains a network of study unit scaled neurons. These neurons learn to modify input signals in the corresponding output signals (e.g. label "sign"), form the basis for automatic recognition. CNN is a type of artificial network in which weights and biases are forwarded to the next neuron that's why neural network is also called forward type network. So the pattern of connections between its neurons is inspired by the visual context of animals. CNNs have duplicate blocks of neurons used throughout the space (of pictures) or time. For photography, these are nerve blocks can be translated as 2D convolutional heads, used more often each photo patch. Technically, it can be seen as 1D convolutional characters used in all time windows. During training, the weights of these duplicate blocks are 'shared', meaning weight gradients are read differently. Photo pockets rated.

3.11 CNN algorithm



```
In [3]: # Initialing the CNN
classifier = Sequential()

# Step 1 - Convolutio Layer
classifier.add(Convolution2D(32, 3, 3, input_shape = (64, 64, 3), activation = 'relu'))

#step 2 - Pooling
#classifier.add(MaxPooling2D(pool_size =(2,2)))

# Adding second convolution Layer
classifier.add(Convolution2D(32, 3, 3, activation = 'relu'))
#classifier.add(MaxPooling2D(pool_size =(2,2)))

#Adding 3rd Concolution Layer
classifier.add(Convolution2D(64, 3, 3, activation = 'relu'))
#classifier.add(MaxPooling2D(pool_size =(2,2)))

#Step 3 - Flattening
classifier.add(Flatten())

In [4]: #Step 4 - Full Connection
classifier.add(Dense(256, activation = 'relu'))
classifier.add(Dropout(0.5))
classifier.add(Dense(26, activation = 'softmax'))

In [5]: classifier.compile(
    optimizer = optimizers.SGD(lr = 0.01),
    loss = 'categorical_crossentropy',
```

Figure 6 Screenshot of CNN Algorithm (Python programming)

CHAPTER 4

ARCHITECTURE AND DESIGN

4.1 Architecture

The architecture of our model contains one ANN, pair of CNNs. To extract features we use CNN and we use ANN to categorize the features into classes. To extract hand features from color data we use first CNN. To extract hand features from depth data we use second CNN. Convolutional Neural Network consists four 2D Convolution layers [3]. Each layer in CNN is followed by the max-pooling operator, the class-membership estimates by output of Softmax layer and two fully connected layers. The input of the CNN is an image sequences in the state of color data (256 pixels x 256 pixels x 32 frames).

ACCURACY AND THE LOSS OBTAINED.

Epoch	Accuracy (%)	Loss
1	86.34	0.892
2	91.55	0.956

Table 2

This loss is a minimum value of 0 which is the ideal training and test loss.

4.2 Layers for installing pools

Transformation networks include global and local layers with traditional layers for resolution. Pools to insert pools lower the size of data by combine with output of every neuron in single layer with one neuron in the next layer. Spatial integration consists of small clusters. Global integration applies to every neuron in the feature map .There are two types of integration commonly act. They are quantity, scale. Max integration explores the highest value of every local group of neurons in the feature map and the average integration takes normal values.

4.3 Fully connected layer

The fully connected layer connects each neuron of each layer with each neuron of other layer. This is similar to a sequential network with multiple number of layers of perceptron neural. The flat matrix passes through a layer that is fully connected to separate the fully sign images.

3.3 Field

In the neural network, every neuron takes inputs from its last layer. In the convolutional layer, every neuron accepts inputs from the restricted area of the last layer called the receptor area. The field is usually square. While, in the fully integrated layer, the area accepts the fully last layer. Thus, in each convolutional layer, every single neuron absorbs inputs from the largest area of inputs than the last layer. When use of filtered layer, the number of pixels of the reception field still constant, but the area has very few people as its size increases when combine the result of many layers.

3.4 Weights

Every neuron in the neural network comprises the output volume through a particular different function in the input values obtained from the receiving area in the last layer. This function used in input values which is defined by the vector of weights and selections. Learning consists of optional adjustment for this selection and rating.

Bias and Vector weights are called filters and modify represent certain input specification (e.g. specific size). One distinctive specification of CNN is that multiple neurons can use the same filter. This decreases the memory measurement because one vector of weights and one bias are used in all the receiving areas that use this filter, unlike every receiving area with its own vector weighting and tendency.

5.1 Preprocessing and Image Augmentation

There are many phases to process the dataset. Implementation of the program is the first step. It is used to set the appropriate location for the sign data. Downloading system for user presence and their number. The system only continues if only one user is found to sign the index and another step is to start the action / recording of the identifier. At the beginning of the recording, the system saves the left and right user position to be used as the signal pivot. The next step is used to adjust the image sequence to prepare for segmentation. The processes receive the same treatment for Both Depth Data and Color Data. If the difference between the current and previous positions was fixed at 26 frames each by deleting the image [12]. The range is calculated from the widest point between the left and right hand between the touch, and the height is found at the higher point of the head and at the lower point of the hip center between the touch. After that the images increase their static size of 256 x 256 pixels. 26 gray effects are scaled from Color Data and 256 grayscale grays are from Depth Data.

5.2 Training

During training, data additions and dropout are using the main methods to less the over fitting. Data extensions are made in real time in a file CPU during the training phase where trains are modeled on the GPU. This consists of rounds of up to 60%, local translation up pixels in the x and y direction, and temporal conversions up to 26 frames [12]. Over fitting occurs when we have a small database, and the model is trying to learn from it. By using large amounts of data, an excess can be avoided. But if we have a small database and are forced to build a model based on that, then we can use a process known as cross-validations.

When we look at the sign language stubbornly, then it changes the condition per movement. To overcome this condition, Nesterov Accelerated Gradient are used.

The Nesterov Accelerated Gradient method has gradient descent steps, followed by something that looks similar to the time force, but is not exactly the same as that found in classical dynamics. I would call it the “momentum Stage” here. It is important to note that the NAG-reduced parameters, you will see that? Is a parameter sign after the gradient downtrend is reviewed, but before the dynamic phase.

5.3 Testing

In Testing we observe the Validation Accuracy of 94.2% and error rate 5.8% for our best model. The test result is greater than Validation result. Because Validation set doesn't have user and backgrounds in the training set.

5.4 Validation Testing

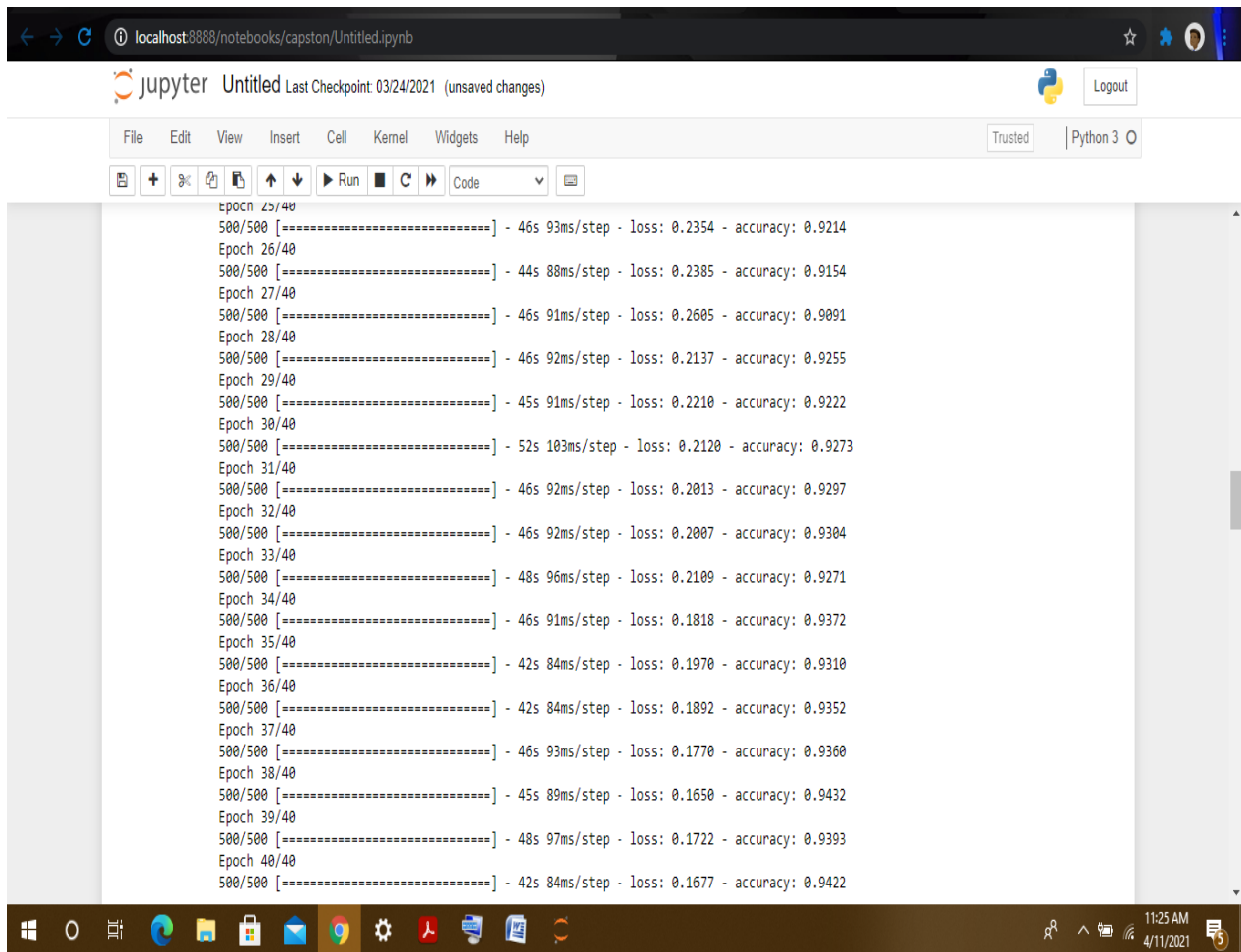


Figure 7 Testing Accuracy

5.5 Validation Accuracy Graph

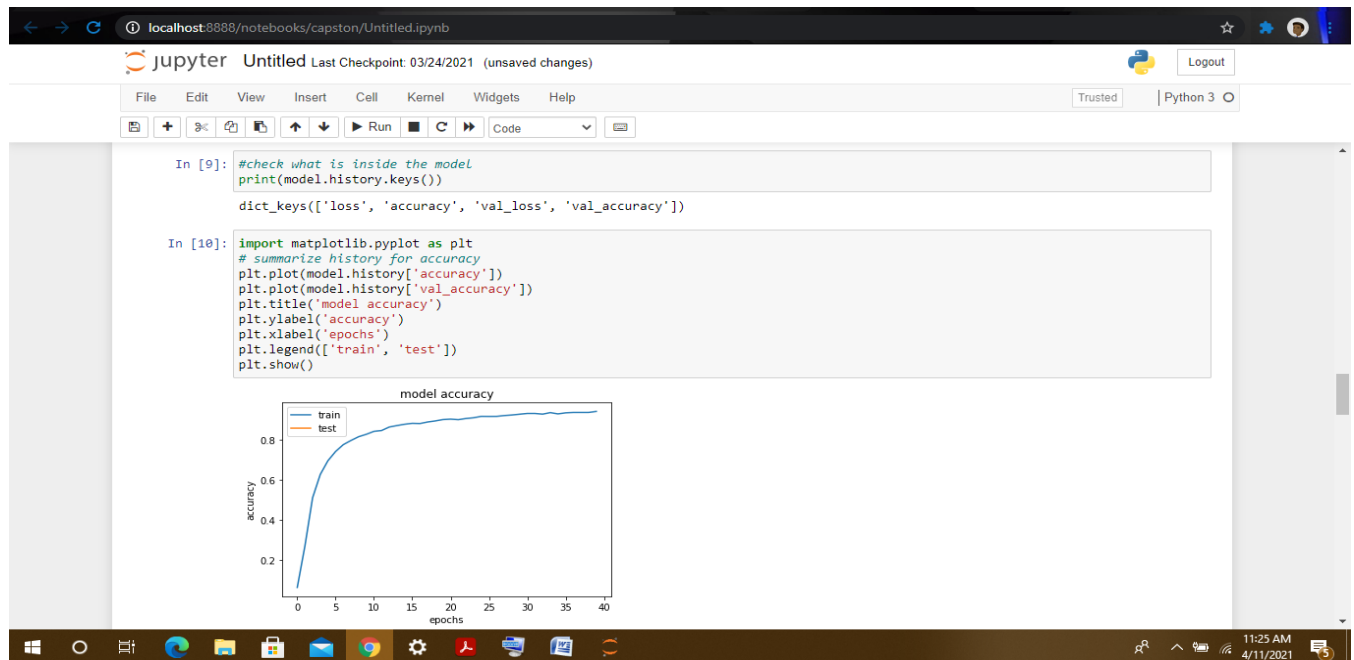


Figure 8 validation Accuracy graph

5.6 Validation Loss Graph

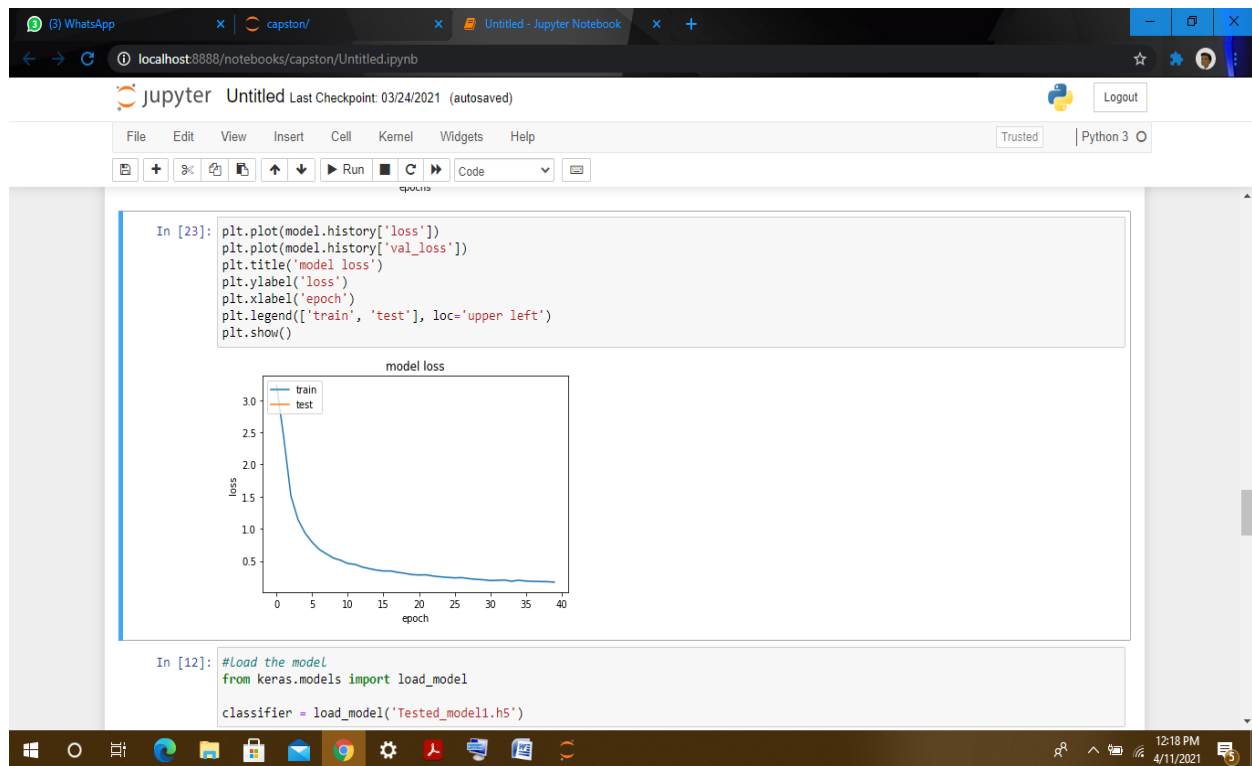


Figure 9 validation Loss graph

5.7 Result

The most notable experiment are the models with Deep Learning, data augmentation and Convolutional Neural Network. The validation scores of these experiments. We comply a validation accuracy of 93.10% for Validation error of 11.90% for our best model. Furthermore, deep learning or CNN proves to be very emphatic with a reclamation of 23.8% with regard to ten units. This accuracy that comes after setting the complete accuracy would be our best accuracy and then the signal partition after loading the image of sign languages. When the image is loaded then we write an alphabet from alphabets A to Z so whatever output dataset the alphabet may have the output alphabet will show. The accuracy of the test set is 89.10% and we get to know 11.90% false positive accuracy rates, caused by the momentum. The test result is improved than the validation result. Because the validation set doesn't contain users and backgrounds in the training set.

Training result:

epoch	Validation loss	Validation accuracy
1	2.073	71.02
2	1.2133	75.23
3	0.8923	70.69
4	0.7147	76.44
5	0.2777	80.33

Table 3

5.8 Implementation Details of sign language

The dataset was split to allocate 10% to testing and 90% of the data to training. Whatever the datasets we have used for testing, it came from hand recognition system specially the data of image come from that person who had never seen in entire training. It would be measure how better the network was working. We have used CNN and Keras to train and implement the network. Here we are calculating the accuracy of the classification along with the test on various real time dataset along with great prediction. We are generalizing the algorithm on data with the help of various network ability and it has not been seen earlier by people. With the help of this method it becomes very easy to test the reliability an accuracy of the network on which the various environment might be changed. Depth image with the method had greater accuracy in comparison to color image. Color image are used here for good result on our network. Again the networks are using various sources of data so that there might be a difference between the testing accuracy on testing and training datasets.

5.9 System Overview

When the researcher searches for someone, she does it keeping in mind one thing. If he is doing on deaf, then he would use sign language. Or if the blind person is per tax, then he will use the dot to recognize the sign language signal. These phases are images acquisition, pre-processing, features detection, segmentation and extraction to sign images, and finally the classification or recognition phase [16]. These structure is illustrated Image pre-processing stages are performed to modify the image inputs to upgrade the overall performance.

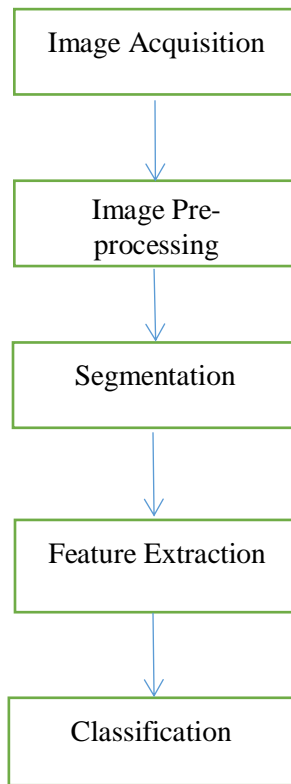


Figure 10 System overview

5.10 Overview of Sign Languages

S.no	Location	Population	Time	References
Adamorobre SL	Ghana	35-45deat signers	200 years	David el al.1971; Nyst 2007 a,b 2008
<i>Al-sayyiid Sl</i>	israel	130 deaf and approximately 700 Hearing signers	4 Generation	Aronoff et al, 2005,2008,2005,2011
Algerian jewish SL	France	Unknown	At least five Generation	Lanesman and Meir 2012
Alipurr SL	India	150-deaf signers	At-least six Generation	Panda 2012, Zeshan et al,2013
Bankhor SL	Thailand	24-deaf-and approximately 400 hearing signers	First two deaf signers in the 1930s	Woodward003, Nonaka 2004,2009,2011,2012
YucatechMaya n SL	Mexico	17-deaf-and-332 hearing-signers	3 generation of deaf signers	Shuman 1980, johnson 1991, fox tree 2009, Escobedo Delgado 2012
Kata kolok	Bali,Indonesia	46 deaf and more than 1,200 hearing signers	5 generation of deaf signers	MacDougall 2001; Schuit et al, 2011, 2012
Input SL	Canada	47 deafsigners Ispread over various villages	Unknown	Dikyuva 2012, Zeshan et al 2013
Mardan SL	Turkey	40 deaf signers and their extended family	Unknown	Groce 1985
Marthas vineyad	US	19 deaf signers	At least three generation	Washabaugh et al, 1978, washabaugh 1979,80,86
Uruubu Kaapor	Brazil	7-deaf signers	Unknown	Kakumasu 1968, Brito 1990

Table 4

CHAPTER 6

LITREATURE SURVEY

6.1 Literature Survey

Many types of research has been done on sign language translation using in-depth learning. In the proposed program, one should place oneself in the Kinect viewing field and make a gesture of sign language. Using a multiclass Support Vector Machine it can detect strong and powerful gestures. During recognition, touch features are extracted, standardized, and filtered based. The program translates sign language to English language. We can use the Fast Fourier Transform (FFT) algorithm to represent the boundary points and to calculate Fourier series. Extracted data is very large compressed using vector quantization. Then this data is stored into a codebook. For testing purposes, the vector of the code generated by touch is compared to the existing codebook, and the action is known.

There are too many mute people in the world. They have no power to speak. Conversation with in the hearing and hearing aids is always challenging compared to talking between the blind and the general public. From this it makes little more space to those people to talk which is very important in our life. This type of people uses their body and hand movement to explain their meaning such as movement if finger to tell their meaning. This is not a type of language as we talks in regular basis; this is the type of language which speaks in some area. This project can find the result of hand gesture.

Sign Language is a natural and one of the most understandable languages to understand those people who have disabilities. In Indian Sign Language uses hand and finger to represent alphabet and their action. The Indian Sign Language is also available in British and French Sign Language. Mostly Researcher focuses on American Sign Language. The most interesting feature of American Sign Language that has already available database. If we compare American Sign Language and Indian Sign Language both are depend on hand but Indian Sign Language depend on both hand that's why Indian Sign Language recognition is more complex. Many of the existing Sign language inspired by French Sign Language System.

Recently many researchers have been researched on the basis of tracing of hand to hand suggestion. They use the algorithm that is Monte Carlo in Management section to introduce Outlook Handwriting. They use of separation the idea to capture the appearance of the hand symbol and communicate with finger. On the basis of sampling process, they track the algorithm.

In other country they respect the deaf people, they do not use the Indian Sign Language but out of India, there is millions of adults' deaf people use Indian Sign Language to communicate. Many of the deaf people who live in village area. They cannot use the Sign Language but in cities and town, most of the deaf people use non-sign language which many of the people do not know.

In 1970, the language started on Indian Sign Language with the American research team. Indian Sign Language found the language in itself. And it was found 75% symbol were the same in Indian. After this, in 1998 another researcher compare the symbol from different subcontinent of India, including Bangalore, Chennai, Darjeeling, and Orissa. And they have noticed that 75% of the symbols were almost the same in many of the regions. After this Survey we found there if 405 deaf schools is there in India. And many schools use their own sign language to communicate and teach the deaf people. The use of standard Indian Sign Language to teach and it is done by many of the Indian Sign Language cells and NGO to help the deaf and dumb people to communicate between them. Most common misunderstanding of sign language reported in Indian Sign Language publications: -

- Most of the Sign Language almost same in all the country.
- It is an incomplete language, Sign language is a form of touch.
- It is the delivery to understand and to communicate.

Sign Language defines to communicate with deaf and dumb people. Since the average person does not know the grammar or meaning of the various actions that are part of sign language, it is limited to their families or the deaf and dumb people. In this age of technology, it is important that these people feel part of the community by helping them to communicate effectively. Therefore, an intelligent computer program needs to be developed and educated. Investigators have been attacking the issue for some time now and the results show some promise.

The technology of interest is designed for speech recognition but no real marketing product of brand recognition is actually available in the current market.

Research in this field is mainly done using a glove system. In the glove system, sensors such as potentiometers, accelerometers etc. are attached to each finger. Depending on their reading the corresponding letters are shown. Christopher Lee has developed a glove touch system. This system can detect 14 letters from the hand alphabets. This learns new touches and be able to update every action model in the system in online mode. The biggest problem facing this glove-based program is approx. that it should be recalculated every time a new user on finger tips so that the toes are pointed by Graphics unit. We run our project using Image Processing. The main advantage of our project is that it is not limited to use with a dark background. Can be used with any domain. And wearing colored belts is not required in our system.

Sensor based gesture recognition

Sensor based gesture classification is a technique which is used based on sensors action recognition research. Methods designed for the senses it usually depends use of physical senses which are attached to users to collect hand data, position, movement and movement patterns fingerprint. By using these methods it decreases the need of the pre-processing phase and classification phase. It is important to visual perception-based touch. Features like flex angle of fingers, posture and perfect posture Hands occupy a 3D space, so it contains depth useful information in telling the stage of the action away from the sensory source [17]. Frequently designed sensors require users to put a glove with sensors or probes attachment to the arm of the users. These instruments are necessary pre-recognition setup, and this is usually limited to methods of setting up a laboratory.

Image Acquisition

Image acquisition of the person who signed it, that person sign language delivery, can be accessed via using the camera. Acquisition implementation can make by hand. Camera sensor required for order to capture the signature features / movements of the signature. Shape, mounting, distance, gravity center etc. These can be used for the sign language recognition. Using geometric features, such as, hand mount, finger detection, and finger detection. Symptoms can be seen.

But these features are not possible to always available or unreliable. Therefore the images used may be fed to SharePoint to choose specification automatically .Following methods are useful to feature removal.

Feature Extraction

Feature extraction is an important element of sign language recognition. To reduces calculation time without sacrificing accuracy we can use feature detection [10]. The appearance of the visual action depends upon the status of the camera and the distance of the person from the camera etc. These method should keep the balance between accuracy and computer complexity in real-time performance

Hand Segmentation

Before segmentation step separation is the first step in processing an input image. The camera takes the photo is split to find the location of the hand. One of the separation methods uses a detector on the canny edge. Canny edge detector is used to determine the boundary from the image. When using the detector, a very important role is determining the appropriate edges from the image. To face the detector on the edge, Elliptical Fourier Adjectives can be an option as function in. To the skin adoption another method that can be applied. This method's job is to locate the location of the skin in a picture. However, the method cannot determine the exact path of hand area. It can solve the problem when the image is provided includes a face area, which will also be available. Therefore, skin discovery should be combined with hand gestures. That can track by counting the boundary of the hands and then determine centric hand point. Other variations mentioned is to distinguish the area of the head from face to face It is thought that the head area is very vertical and large there is a surface area. Similarly in, facial detection an algorithm is used to remove the facial region.

Practical Framework for Sign Language Identification Using Wavelet Transformation

The proposed system is considered a process of knowing a pattern with two important modules. They are feature subtraction and separation. By using of Discrete Wavelet Transform based on features. It is nearby neighborhood planning which is used to sign language classification.

The test result shows that the proposed hand detection system achieves a high accuracy of 99.23% when used to differentiate the cosine range [10].

PCA Hand Touch Recognition

In this paper, the authors introduced a program using database-driven touch recognition based on skin modeling process and method of blocking. Active template matching can be used successfully for human robotics applications and other similar applications. Initially, the hand circuit is separated by use. In the next step, the block is used to separate the front and back. Finally, a template-based simulation process is developed using Principal Component Analysis (PCA) recognition.

Deaf Visual Identification System

Authors have introduced a stand-alone handwriting system using digital image processing. For the hand touch feature the vector SIFT algorithm is used. SIFT features are calculated at fixed edges for growth, rotation, and volume additions.

Default Indian Sign Language Recognition System

In this paper, the default sign recognition method is introduced on the basis of structural features. Hand Region separation from images, last algorithm is used, which selects the best limit for in-section reduction contrast of black and white pixels blocked. Distinguished hand features. Fixed Times fed into the Artificial Neural Network to be separated. The performance of the system was assessed on the basis of accuracy, sensitivity, and clarity.

Hand gestures and sign language recognition

It has been suggested in the past by various investigators. For deaf and mute people, Sign Language is the only means of communication. With the help of sign language, these physically handicapped people express their feelings and thoughts to someone else.

7.1 Conclusion

The sign language classification system is very helpful for deaf and muted persons. It is helpful for deaf people because they can be communicated deaf via this system. This system captures hand gestures and show the words in simple text format. It will helpful for deaf persons to see these words and understand the sentences by themselves without hearing a word. By using deep learning we presented an approach alphabet sign language image classification as real time. Our model is based on deep learning and with our dataset it is able to perform with 90.3 % accuracy. We use a web camera to include data gathering to increase the dataset size to more than 6500 RGB images and making our prediction more robust.

7.2 Future Scope

- ✓ In future, the people who cannot speak they will be able to talk with other people. And the people who are deaf and dumb, they will be also talk to the people who belongs to their categories.
- ✓ This project will be converted into an application, in this application there will be various type of sign language of different countries. And we are planning to make a product for deaf and dumb people, so they can easily communicate to other people.
- ✓ For future, we are collecting information and an idea for feasible communication between speechless people and normal people with the help of machine learning and deep learning.
- ✓ In future, Sign Language Recognition system will be implement in various application areas. For example, government website to fill online form by video clip.

- ✓ It will be the better application for deaf and dumb people to overcome their disability. And they can also express their ideas and their view to other people. And it will be the best application of hand gesture recognition system, by this system the people who are deaf and dumb. They can be easily interface between computer and human hand gesture. Because it is well known used technology to help the deaf and dumb community.
- ✓ With this project we can produce a model for Indian Sign Language word and sentence recognition for disable people. It will be require a system to detect the change. We can make a product that can be helpful to speechless and non-hearing people and it can be reduce the communication gap between these people and normal people. In this project we included all alphabet of English Language, in future we may include to recognition of word from dictionary for Indian Sign Language.

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APPENDIX

The software and hardware requirements used to perform the experiments are Explained below:

1. **Processor:** Intel® Core (TM) i5-6200U CPU @2.30GHz
2. **RAM:** 8.00 GB
3. **Graphics Card:** AMD Radeon with 2 .00 GB RAM
4. **System Type:** 64-bit Operating System, x64-based processor
5. **Operating System:** Windows 10
6. **Software Used:** Anaconda Jupyter
7. **Language Used:** Python (version 3.5)