

# Hand Sign Identification System Using Convolutional Neural Network

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**ABSTRACT:** Hand gesture is defined as a tool that is mainly used by mute/deaf people for communication. It reduces the communication gap between those mute/deaf people and the normal people. So hand gesture recognition is of great importance in the area of communication. Hand gesture recognition is done with the help of computer vision technology. In our project hand gesture recognition is done by developing a CNN model. The dataset is created with letters from A to Z of 64×64 size. There are three major steps included for recognizing the hand gestures. They are creating the dataset, training a CNN on the captured dataset and predicting the data. A webcam is used for capturing the hand gestures. When a hand gesture is shown to the webcam, the gesture is recognized according to the dataset and result is displayed as text and also a voice is played corresponding to the text.

**KEYWORDS:** CNN, Hand Gestures

## I. INTRODUCTION

Hand gesture recognition refers to recognize the meaningful hand movements of human that contains information useful for human interaction. Computer is used by many people on during their work time or in their spare time. A person can perform in numerable gestures at a time to communicate. In the world there are so many people with speech and hearing problems. So, this is one the easiest way to communicate. Thus, hand gesture recognition is important for human computer interaction. This paper describes the technology behind the conversion of hand gestures into text this

project uses CNN algorithm to perform the conversion. CNN is a type of artificial neural

network used in image recognition that builds the invariance properties into a structure of network. The technology behind the project is mainly developed to help speech impaired deaf and normal people to communicate, which uses the CNN algorithm or hand gesture recognition. So, CNN is more capable to detect the right object in image. The purpose of the project is to give a more convenient way of interactions between humans and computer and that can make a way to process data from the sign language and process it into a useful information. This is very helpful for speech impaired people and for the own's who communicate with them as they can understand the sign language delivered by the speech impaired.

## II. RELATED WORKS

### Gesture recognition using shape features

- Hand gesture recognition using shape features is done by capturing image through a web camera and it is further processed for the removal of background noise and the algorithm used for gesture recognition is k-means clustering algorithm.
- Then it is further processed for segmenting the hand gesture from the rest of the background.
- Then a voice processor is connected to the micro controller as micro controller act as a recorder and plays the voice through the speaker.

### Talking gloves

- There exists a drag of communication gap between deaf individuals and normal people. So, to bridge this communication gap, talking gloves is introduced. Talking gloves consists of various set of movements of fingers and hands. Every motion and bending of fingers have its own that means.

- The gloves scan the motion and orientation of each hands through accelerometer and flex sensors.
- According to this, respective sound file is played by the audio module. Once no sign is made the system has the capability to switch to its sleeping mode, which enable the talking gloves to save the power so this system is affordable to everyone.

#### Two-Antenna doppler radar for gesture recognition

- Hand gesture recognition is employed to facilitate interaction between normal people and the deaf and dumb people.
- One amongst the foremost common gesture recognition refers on image recognition and it is done by the camera sensors.
- Using the two antenna Doppler microwave radar for gesture sensing the gesture recognition become efficient.
- Two antenna Doppler radar maintains high gesture recognition accuracy. 14 different hand gestures are used to convey the idea of hand gesture recognition using two Doppler radar with DCNN.

#### Recognition of dynamic hand gestures

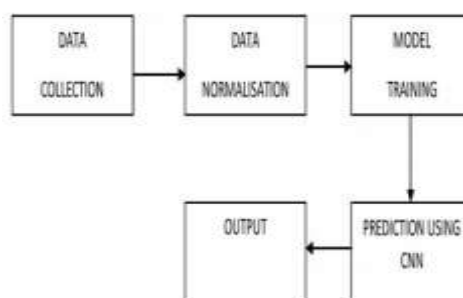
- One among the natural ways to interacting with computer is by using hand gesture. The algorithm behind this is by using natural networks and computer vision.
- Real time hand tracking and extraction algorithm has used to trace the moving hand. So that hand region can be extracted from the dynamic hand gestures.
- A Fourier descriptor was utilized in order to characterize the facial expressions from the dynamic hand gestures.
- The system is used to develop a real time gesture recognition from a dynamic gesture of hand. This technique is primarily accustomed to develop and establish your gestures that are swipe up, swipe down, swipe left, swipe right. Implementation is done, using python programming language and open cv is used.

#### Gesture controlled Robot

- Gestures are used to control the robot by using an accelerometer. When placing an accelerometer, it works with the movement of hand and it is similar to a robot.
- There are different ways to communicate with a robot. So, gesture-controlled robot is one of the easiest ways to control a robot.
- This is a real time monitoring system by which humans can interact with robots through hand gestures.

- In this, gestures are detected using Webcam and then data is extracted from the image which is used to control the robot.

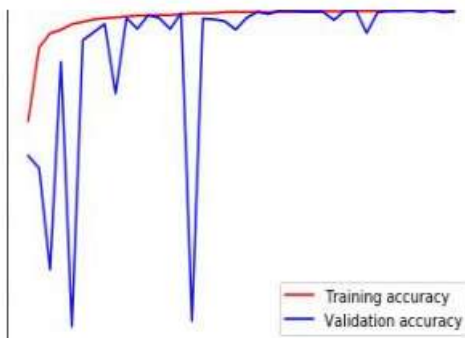
### III.METHODOLOGY



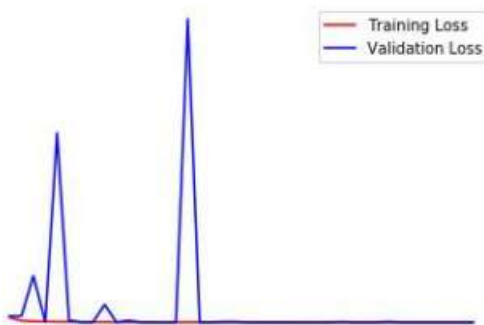
This is the block diagram of the proposed system. The dataset is created which consists of hand gestures of letters A to Z. Webcam is used for capturing the images of these gestures. Each letter is having a dimension of 64\*64. Normally image is in RGB format and it is converted to grey scale during dataset collection. In this project normalisation is done to improve the data integrity. In our project data normalisation is used to make all gestures into a standard size 64\*64 since the trained image is in this dimension. So, the same quality must be used. The next stage is the model training. For that a CNN is trained on the captured dataset. Our model consists of 2 convolutional layer and 2 max pooling layer. ReLU is used as the activation function. Two dense layers are added for creating a fully connected network. For getting maximum accuracy Adam optimiser is used. Model is trained using the code and then it is saved. Next is prediction using the CNN. Here the frames from the video while training on the camera is taken as the region of interest (ROI) is applied and the image which we needed is taken and it is given to an already trained model for testing. The prediction of hand gestures using CNN can be done. After prediction the output is displayed on the screen as text and according to that text a voice is played.

### III.RESULT AND DISCUSSION

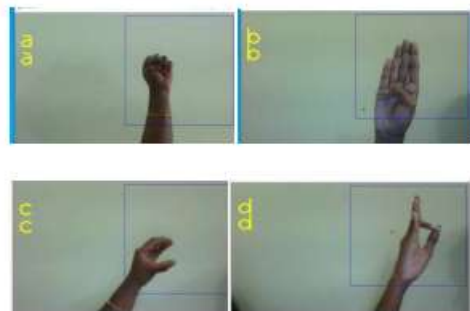
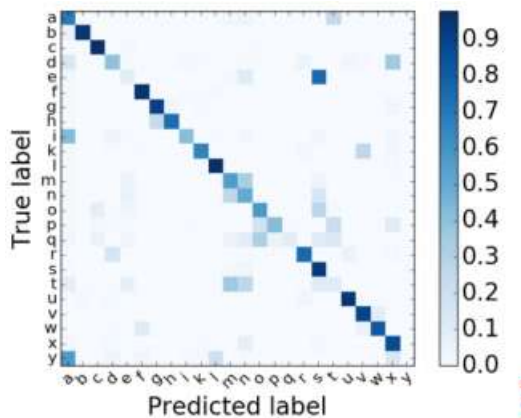
Hand gesture recognition is the process of identifying the gestures shown by the hand. A CNN model is trained for this process. Letters from A to Z are trained. A webcam is used for capturing the images. According to the captured gesture output is predicted and we can able to see it as text on screen and also we can able to hear the voice of corresponding text.



The accuracy and loss of training as well as validation is assembled after twenty epochs. The accuracy of training and testing is 86.8.



With the use of learning rate decay there is not a lot of distinction within the accuracy between the models. If we are not using the learning rate decay then there are more possibilities for gaining the peak the comparison between original output and predicted output is shown here.



These are the final output that we get from the trained CNN model.

#### IV.CONCLUSION

Human hand gestures provide the most important means for non-verbal interaction among people. We proposed a system that aims to translate the human hand gestures to text and also to voice. It is a best device for deaf and dumb people to overcome their disability. This project is outlining a hand gesture recognition system which is highly reliable and efficient. So, this proposed model is highly reliable. The requirements and implementation technology is clearly explained. This technology can be used to help deaf and dumb people. Some future scopes are enhancing the recognition capabilities for various lighting conditions and also identifying multiple number of gestures at a time. In this project the selected RGB image is converted to gray scale as RGB images take long time to be trained but in future RGB image can also be used for training. This project recognizes hand gestures and use it for real time purpose.

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