# Hand Gesture Detection Using Machine learning

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## Abstract

*As we know that communication between speech impairment persons and normal person is difficult. So Sign-language recognition is helpful in communication between signing people and non-signing people. Gestures are in line with people's habits of communication, so many researchers have done a lot of work in gesture recognition based on vision based approach.*

*In this project, hand gestures also known as sign language will be converted into voice for mute people and improve recognition of Indian Sign language by using Machine learning Techniques and Algorithms.*

*Keywords: Machine Learning.*

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## I.INTRODUCTION

**MODELS USED**

Machine learning is programming computers to optimize a performance criterion using example data or experience. We have a model defined up to some parameters, and learning is the execution of a computer program to optimize the parameters of the model using the training data or experience. The model may be predictive to make predictions in the future, or descriptive to gain knowledge from data.

The field of study known as machine learning is concerned with the question of how to construct computer programs that automatically improve with experience.

Our proposed system is the single point of contact for freshers and regular students to get all the information about the college. The enhanced version of our application I,e chatbot using machine learning algorithms and DIALOGFLOW. It uses the NATURAL LANGUAGE PROCESSING To train the data. Our HAND GESTURE DETECTION has been trained with few very frequent.

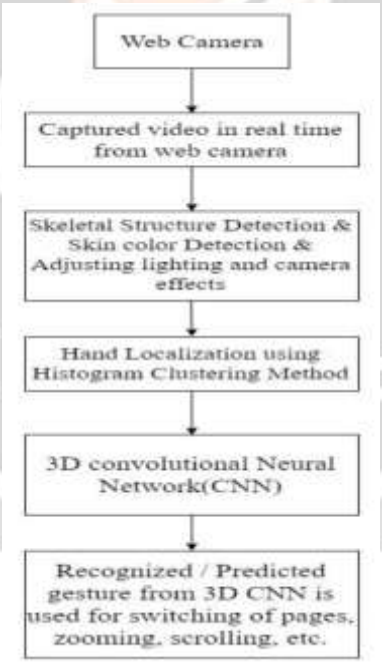
Gesture recognition is an emerging topic in today's technologies. The focus of this is to recognize the human gestures using mathematical algorithms for human computer interaction. Only a few modes of human-computer interaction (HCI) exist, they are through keyboard, mouse, touch screens etc. Each of these devices has their own limitations when it comes to adapting more versatile hardware in computers. Gesture recognition is one of the essential techniques to build user-friendly interfaces. Usually, gestures can be originated from any bodily

motion or state, but commonly originate from the face or hand. Gesture recognition enables users to interact with the devices without physically touching them.

Gesture recognition is a technique which is used to understand and analyse the human body language and interact with the user accordingly. This in turn helps in building a bridge between the machine and the user to communicate with each other. Gesture recognition is useful in processing the information which cannot be conveyed through speech or text. Gestures are the simplest means of communicating something that is meaningful. This paper involves implementation of the system that aims to design a vision-based hand gesture recognition system with a high correct detection rate along with a high-performance criterion, which can work in a real time Human Computer Interaction system without having any of the limitations (gloves, uniform background etc.) on the user environment. The system can be defined using a flowchart that contains three main steps, they are: Learning, Detection, Recognition.

## II.IMPLEMENTATION

A hand gesture recognition system was developed to capture the hand gestures being performed by the user and to control a computer system based on the incoming information. Many of the existing systems in literature have implemented gesture recognition using only spatial modelling, i.e. recognition of a single gesture and not temporal modelling i.e. recognition of motion of gestures. Also, the existing systems have not been implemented in real time, they use a pre captured image as an input for gesture recognition. To overcome these existing problems a new architecture has been developed which aims to design a vision-based hand gesture recognition system with a high correct detection rate along with a high-performance criterion, which can work in a real time HCI system without having any of the mentioned strict limitations (gloves, uniform background etc.) on the user environment. The design is composed of a human computer interaction system which uses hand gestures as input for communication.




Input to the system is from the web camera or a prerecorded video sequence. Later it detects the skin color by using an adaptive algorithm in the beginning of the frames. For the current user skin color must be fixed based on the lighting and camera parameter and condition. Once it has been fixed, hand is localized with a histogram clustering method. Then a machine learning algorithm has been used to detect the hand gestures in consecutive frames to distinguish the current gesture. These gestures are used as an input for a computer application.

The system is divided into 3 subsystems:

3.1. Hand and Motion Detection

The Web-camera captures the hand movement and provides it as input to OpenCV and TensorFlow Object detector. Edge detection and skin detection are performed to obtain the boundary of the hand. This is then sent

to the 3D CNN.

3.2. Dataset

Dataset is used for training the 3D CNN. Two types of datasets are being used – one for the hand detection and the other for the motion or gesture detection. Hand detection uses EGO dataset, Motion or Gesture Recognition uses Jester dataset.

3.3. 3D CNN

CNNs are a class of deep learning neural networks used for analyzing videos and images. It consists of several layers – input layer, hidden layers and output layers. It performs back propagation for better accuracy and efficiency. It performs training and verification of the recognized gestures and human computer interactions take place – turning of the pages, zooming in, and zooming out. The interactions with the computer take place with the help of PyAuto GUI or System Calls.

**MODELS USED**

The UML DIAGRAMS are as follows.

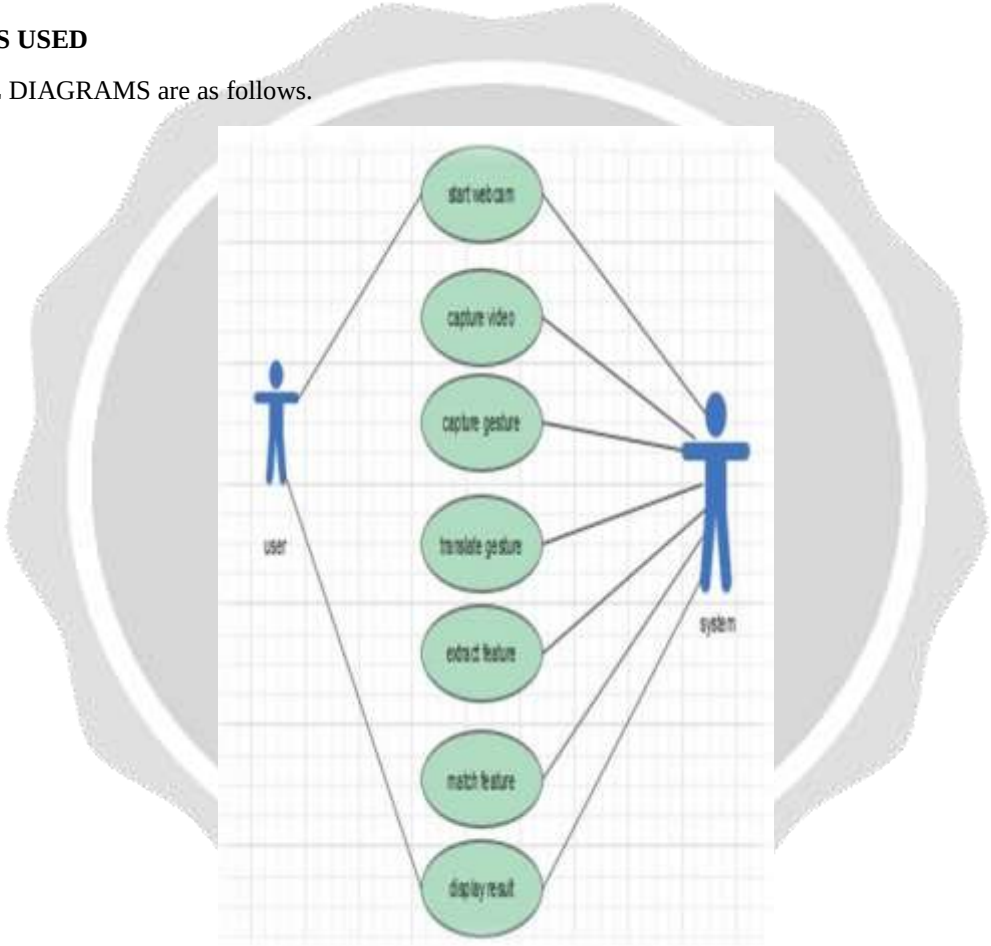



**FIG-1:USECASE DIAGRAM**

The above usecase diagram represents the enhanced application flow.Usecases diagram are one of the five Diagrams in UML Diagrams.It shows a set of Usecases,Actors and their Relationship.It also contains notes and constraints.

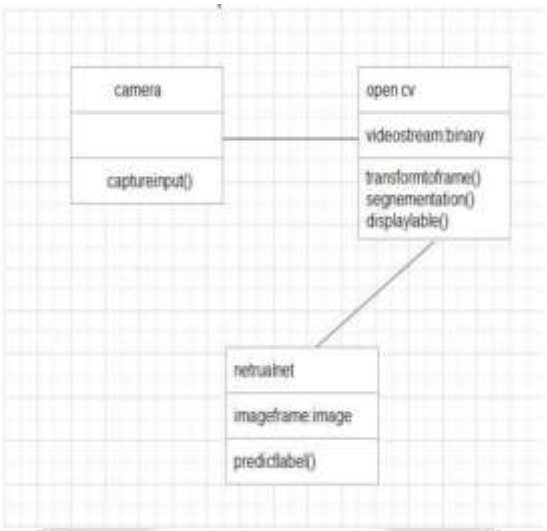
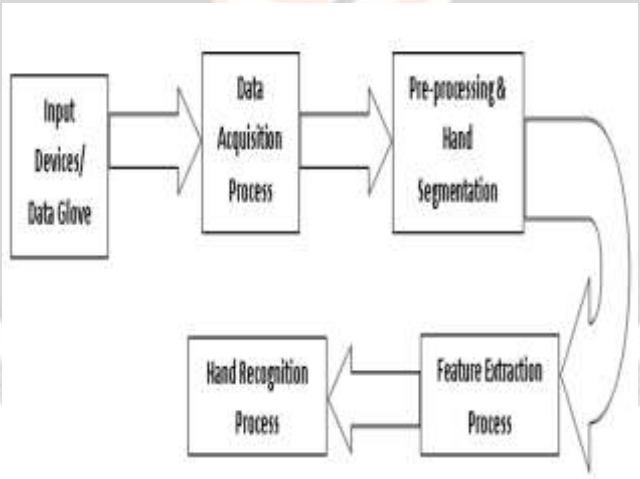



**FIG-2:CLASS DIAGRAM**

Class diagrams model class structure and contents using design elements such as classes, packages, and objects. Class diagrams describe the different perspective when designing a system-conceptual, specification and implementation. Classes are composed of three things: name, attributes, and operations. Class diagram also display relationships such as containment, inheritance, association etc. The association relationship is most common relationship in a class diagram. The association shows the relationship between instances of classes.

**FIG -3 ARCHITECTURE**




## III.RELATED WORK

"Sign language recognition using sensor gloves" by Mehdi, S.A.; Khan, Y. N. Neural Information Processing. Mute people have always found it difficult to communicate with normal people The low accuracy of this paper we are trying to overcome in our project. I think by the technology we use is ML and CNN there was growth in accuracy.

In this project there was no hardware implemented to make this device or project portable. The approach was clear using CNN to convert hand gestures into speech. But we overcome the disadvantage and make the project portable to use with two different and effective approach.

**CODE**

```
import csv

import copy
```

```
import argparse
import itertools
from collections import Counter
from collections import deque

import cv2 as cv
import numpy as np
import mediapipe as mp

from utils import CvFpsCalc
from model import KeyPointClassifier
from model import PointHistoryClassifier



def get_args():
    parser = argparse.ArgumentParser()

    parser.add_argument("--device", type=int, default=0)
    parser.add_argument("--width", help='cap width', type=int, default=960)
    parser.add_argument("--height", help='cap height', type=int, default=540)

    parser.add_argument('--use_static_image_mode', action='store_true')
    parser.add_argument("--min_detection_confidence",
                        help='min_detection_confidence',
                        type=float,
                        default=0.7)
    parser.add_argument("--min_tracking_confidence",
                        help='min_tracking_confidence',
                        type=int,
                        default=0.5)

    args = parser.parse_args()
    return args
```

**IV. RESULTS**

**Input:**

Fig: input photo

Fig: output photo


## V.CONCLUSION

1. Sign language is a tool for communication between the mute community and normal people. As it is difficult for the mute community to communicate with people who don't understand the hand sign language.
2. This system prototype was designed to automatically recognize sign language to help normal people to communicate more effectively with mute people.
3. The importance of gesture recognition lies in building efficient human-machine interaction. This project describes how the implementation of the system is done based upon the images captured. Hand detection is done using OpenCV and TensorFlow object detector. And further it is enhanced for interpretation of gestures by the computer to perform actions.

**Future Work Enhancements:-**

This is an effective hand gesture recognition system to address the problem of extracting frames from a video and processing it. In the future scope, various hand gestures can be recognized and applied as input to the computer. The hand gestures representing numbers can also be converted into commands to perform related tasks in real time. Enhancing the recognition capability for various lightning conditions, which is encountered as a challenge in this project can be worked upon future.

## VI.REFERENCES

1."Sign language recognition using sensor gloves" by Mehdi, S.A.; Khan, Y. N. Neural Information Processing, 2002.ICONIP '02. Proceedings of the 9th International Conference, Volume: 5 Publication Year: 2002, IEEE Conference Publications.

2. “Microcontroller and Sensors Based Gesture Vocalizer” by Salman Afghani, Muhammad Akmal, Raheel Yousaf . Proceedings of the 7th WSEAS International Conference on signal processing, robotics, and automation.Year:2017

3. Akash Shikare1, Pratiksha Patil2, Manisha Gaikwad3 1Akash Shashikant Shikare, Student at PES Modern COE in Department of ECE Engineering, year:03 | Mar 2021