
MINI PROJECT
MACHINE LEARNING

PROBLEM DEFINITION

Hand Gesture recognition is a computing process that can recognize and interpret hand gestures through the use of mathematical algorithms.

LITERATURE SURVEY

APPLICATIONS

- **Controlling Robots Using hand gestures** ⟶ Controlling the robot using gestures is one of the interesting applications in this field. For example a system that uses numbering to count the five fingers for controlling a robot using hand signs. The orders are given to the robot to perform a particular task , where each sign has a specific meaning and represents different function for example, “one” means “move forward”, “two” means “move backwards”, etc.

- **Hand Gesture Recognition System For Dumb People** ⟶

Many researchers presented the static hand gesture recognition system using digital image processing. For hand gesture feature vector SIFT algorithm is used. The SIFT features have been computed at the edges which are invariant to scaling, rotation, addition of noise.

- **Hand Gesture Recognition for Sign Language Recognition** ⟶
  Many researchers presented various method of hand gesture and sign language recognition. For deaf and dumb people, Sign language is the only way of communication. With the help of sign language, these physical impaired people express their emotions and thoughts to other person.

- **Numbers Recognition** ⟶ Another good application of hand gesture is recognizing numbers. proposed an automatic system that could isolate and recognize a meaningful gesture from hand motion of Arabic numbers from 0 to 9 in a real time system using HMM.

EXISTING WORK IN DOMAIN

Colour Based Recognition

In this we use four types of colored markers red, blue, yellow and green mounted on our two hands. With this posture the user can perform different gestures. The colors on the glove enable the camera sensor to track and detect the location of the palm and fingers, which allows for the extraction of geometric model of the shape of the hand.

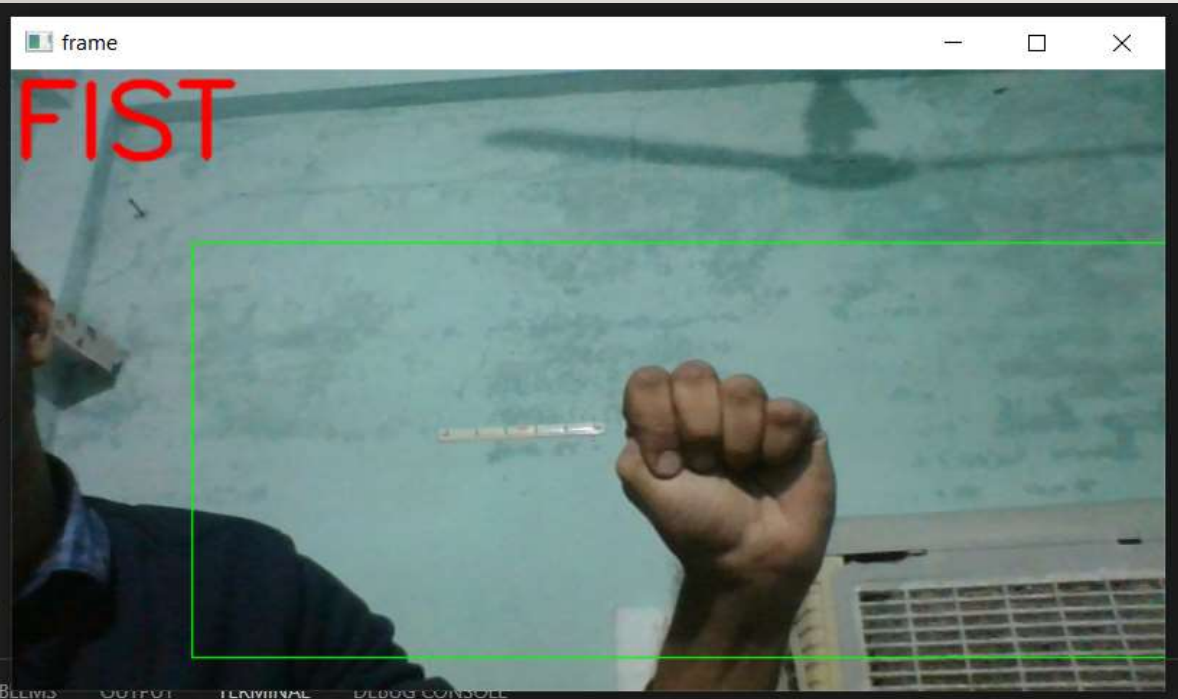
Hand Gestures Based on Instrumented Glove Approach

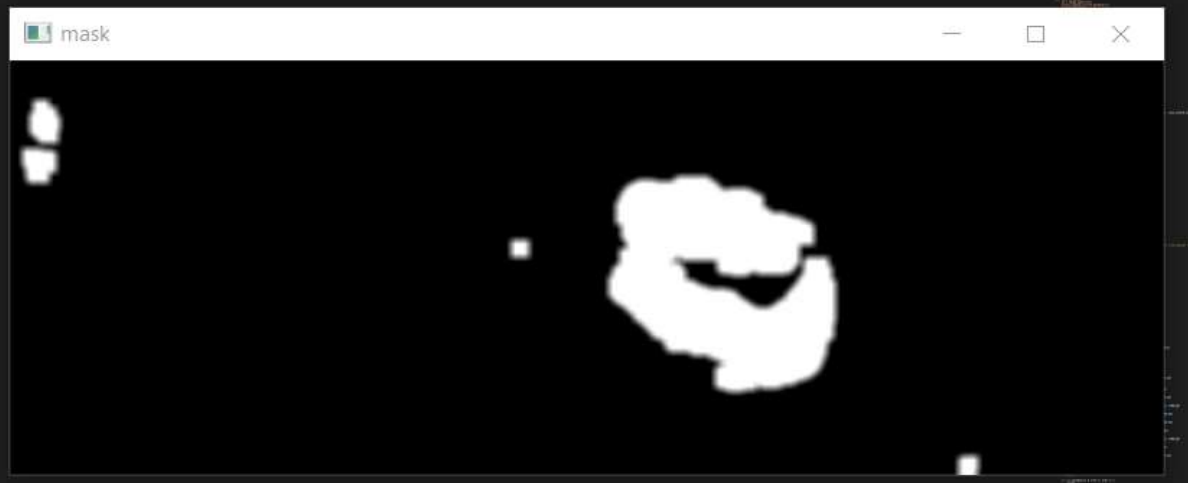
The wearable glove-based sensors can be used to capture hand motion and position. In addition, they can easily provide the exact coordinates of palm and finger locations, orientation and configurations by using sensors attached to the gloves

3D Model-Based Recognition

The 3D model essentially depends on 3D Kinematic hand model which has a large degree of freedom, where hand parameter estimation obtained by comparing the input image with the two-dimensional appearance projected by three-dimensional hand model. In addition, the 3D model introduces human hand feature as pose estimation by forming volumetric or skeletal or 3D model that identical to the user's hand. Where the 3D model parameter updated through the matching process.

RESULTS





Python


frame
PALM


mask


frame
L


mask

CONFUSION MATRIX

122	4	0	0	0	0	0	4	0	0
0	115	0	0	0	0	0	0	0	0
0	0	113	0	0	0	0	0	0	0
0	0	0	127	0	0	0	0	0	0
0	0	0	0	109	0	0	0	0	0
0	0	0	0	2	118	0	0	0	0
0	0	0	0	0		118	0	0	0
0	0	0	0	0	0	0	115	0	0
0	0	0	0	0	0	0	2	121	0
0	0	0	0	0	0	0	0	0	133

ACCURACY

0.9900249376558603

RESULT ANALYSIS

In this I used Logistic regression in one vs all approach with batch Gradient Descent.

The result is presented as Frame and Mask, mask has dimensions (640 , 240) which is same as the dimension of images present in dataset and mask extracts skin color image. The text predicting hand gesture is visible on the top left in the frame.

After Using Logistic Regression to train the model I have extracted Confusion matrix and Accuracy which tells us that predictions are good