MASK DETECTION USING MATLAB

A MINI PROJECT REPORT

Submitted by

HARSHITHA M S	**113219031051**
YUKTHA SRI K H	**113219031166**
ZAINAB NUSAIBA	**113219031169**

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

VELAMMAL ENGINEERING COLLEGE

[An Autonomous Institution]

ANNA UNIVERSITY: CHENNAI 600 025

APRIL 2021

BONAFIDE CERTIFICATE

Certified that this Mini project report "**MASK DETECTION USING MATLAB"** is the bonafide work of **HARSHITHA M S (113219031051), YUKTHA SRI K H (113219031166)** and **ZAINAB NUSAIBA (113219031169)** who carried out the Mini project work under my supervision.

SIGNATURE

MRS. APARNA P

SUPERVISOR

Computer Science and Engineering

Velammal Engineering College

Ambattur – Red hills Road,

Chennai – 600066.

SIGNATURE

DR.B.MURUGESHWARI

HEAD OF THE DEPARTMENT

Computer Science and Engineering,

Velammal Engineering College,

Ambattur–Red hills Road,

Chennai – 600066.

MINI PROJECT EXAMINATION

The MINI PROJECT Examination of this project work "**MASK DETECTION USING MATLAB"** is a bonafide record of project done at the Department of Computer Science and Engineering, Velammal Engineering College during the academic year 2020 – 2021 by

HARSHITHA M S	**113219031051**
YUKTHA SRI K H	**113219031166**
ZAINAB NUSAIBA	**113219031169**

of Third year Bachelor of Engineering in Computer Science and Engineering submitted for the university examination held on

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ABSTRACT

After the breakout of the worldwide pandemic COVID-19, there arises a severe need for protection mechanisms, face masks being the primary one. According to the World Health Organization, the corona virusCOVID-19 pandemic is causing a global health epidemic, and the most successful safety measure is wearing a face mask in public places. Convolutional Neural Networks (CNNs) have developed themselves as a dominant class of image recognition models. The aim of this research is to examine and test machine learning capabilities for detecting and recognizing face masks worn by people in any given video or picture or in real time. This project develops a real-time automatic Face detection and recognition system. It can be used as an entry management device by registering an organization's employees or students with their faces, and then recognizing individuals when they approach or leave the premises by recording their photographs with faces. The proposed methodology makes use of IMAGE PROCESSING technology using matlab. Based on the performance and accuracy of our model, the result of the binary classifier will be indicated showing a warning whether a person is wearing a mask or not, it shows the person wearing a mask improperly will also show a warning.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF THE PROJECT:

Face Recognition is a technique that matches stored models of each human face in a group of people to identify a person based on certain features of that person’s face. Face recognition is a natural method of recognizing and authenticating people. Face recognition is an integral part of people's everyday contact and lives. The security and authentication of an individual is critical in every industry or institution. As a result, there is a great deal of interest in automated face recognition using computers or devices for identity verification around the clock and even remotely in today's world. Face recognition has emerged as one of the most difficult and intriguing problems in pattern recognition and image processing. With the aid of such a technology, one can easily detect a person's face by using a dataset of identical matching appearance. The most effective approach for detecting a person's face is to use Python and a Convolutional Neural Network in deep learning. This method is useful in a variety of fields, including the military, defence, schools, colleges, and universities, airlines, banks, online web apps, gaming, and so on. Face masks are now widely used as part of standard virus-prevention measures, especially during the Covid-19 virus outbreak. Many individuals or organizations must be able to distinguish whether or not people are wearing face masks in a given location or time. This data's requirements should be very real-time and automated. The challenging issue which can be mentioned in face detection is inherent diversity in faces such as shape, texture, colour, got a beard\moustache and/or glasses and even masks. From the experiments it is clear that the proposed image processing technology using matlab is very efficient and accurate in determining the facial recognition and detection of individuals.

1.2 MATLAB

MATlab is a programming platform designed specifically for engineers and scientists to analyse and design systems and products that transform our world. The heart of MATLAB is the MATLAB language, a matrix-based language allowing the most natural expression of computational mathematics.

1.3 PATTERN OF MATLAB

MATLAB combines a desktop environment tuned for iterative analysis and design processes with a programming language that expresses matrix and array mathematics directly. It includes the Live Editor for creating scripts that combine code, output, and formatted text in an executable notebook. It extends its functions and developments of all kinds of discipline through a set of characteristics called toolbox.

1.4 SCOPE OF THE PROJECT

Due to Covid-19 pandemic it is essential for every responsible citizen to be a part of society to reduce the impact of the spread of the virus. So, this project indeed helps the presence and absence of the mask. It is really very useful in all organizations to make sure everyone is wearing a mask or not or is wearing the mask properly or not. Therefore, this project helps us in one responsible way.

CHAPTER 2

SYSTEM ANALYSIS

2.1 EXISTING SYSTEM:

The Partially Occluded Face Detection (POFD) problem is addressed by using a combination of feature-based and part-based face detection methods with the help of a face part dictionary. In this approach, the devised algorithm aims to automatically detect face components individually and it starts from a mostly un-occluded face component called Nose. Nose is very hard to cover up without drawing suspicion. Keeping the nose component as a reference, the algorithm searches the surrounding area for other main facial features.

Existing standards which were developed for recognizing faces with masks on them do not work well due to the unique structure of the human faces. Face recognition is one of the latest technologies being studied in biometrics as it has a wide area of applications. But Face detection is one of the challenging problems in Image processing. The basic aim of face detection is determining if there is any face in an image & then locating the position of a face in an image. Evidently face detection is the first step towards creating an automated system which may involve other face processing. The neural network is created & trained with a training set of faces & non-faces. All results are implemented in the MATLAB 2013 environment.

2.1.1 DISADVANTAGES IN THE EXISTING SYSTEM

Difficulty in usage: The source code is not compact, so the utilization is not so easy and optimal.

More requirements: Requirement of hardware and software components are comparatively higher.

2.2 PROPOSED SYSTEM

Since Covid-19 cases are increasing, this mask detection will be quite useful, so the presence or absence of the mask can be detected.This project is about the mask detection using matlab image processing.A person who stands in front of the detector, it captures the snapshot of the person's face and detects the presence or absence of the mask.With the snapshot taken, it detects whether the person is wearing a mask or not, also wearing properly or not.

By detecting nose and lips, it detects whether the mask is properly worn or not. If a person wears a mask, but if it detects either nose or lips, it generates a warning to wear the mask properly.If both lips and nose are covered completely, it detects a person is wearing a mask and generates an audio output, (i.e) " Thanks for wearing mask" .

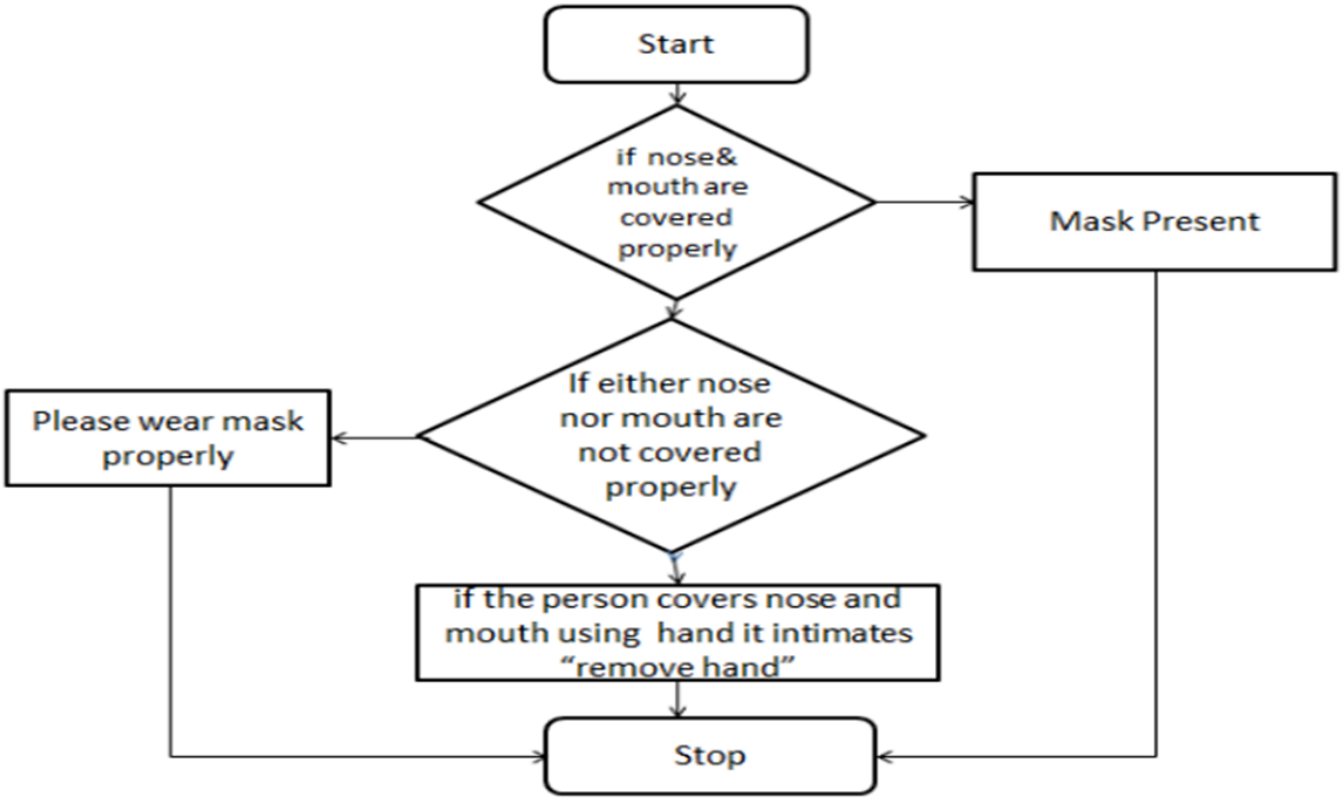
The algorithm used for mask detection is the SIFT (Scale-Invariant Feature Transform) Algorithm.

- The scale-invariant feature transform (SIFT) is a computer vision algorithm to detect, describe, and match local features in images.
- Major advantages of SIFT are
    - **Locality:** features are local, so robust to occlusion and clutter (no prior segmentation)
    - **Distinctiveness:** individual features can be matched to a large database of objects
    - **Quantity:** many features can be generated for even small objects

    - **Efficiency:** close to real-time performance
    - **Extensibility:** can easily be extended to a wide range of different feature types, with each adding robustness.

- Accurately locate the key feature points on the face in the picture (5 key points such as eyes, nose, mouth, etc.), used to determine the face posture and face alignment.
- A conventional face identification system can be tricked by placing a photo in front of the camera. We are able to prevent this by using photographs.

2.2.1 FLOW CHART



2.2.1 ADVANTAGES IN THE PROPOSED SYSTEM

- A health application is designed for reinforcing the sensitizing campaigns launched with posters towards informing the general public about the correct way of mask wearing (a tool for limiting inter-human contamination).
- An original mask-related approach is designed toward being accessible (high accessibility for crowded places).
- The designed approach directly works from real-time analysis (fast and easy checking).
- The designed mask-related checking application takes place upstream of crowd monitoring applications of validating the correct wearing of masks for travelers at airport gates to limit the spread of COVID-19.

2.2.2 DISADVANTAGES

- Faces are occluded; the face detector may fail to detect properly sometimes.
- Processing time is more.

2.2.3 APPLICATIONS

- Airports
- Hospitals
- Offices
- Auditoriums
- Movie Halls
- Stadiums
- Schools & Colleges
- Shopping Malls

CHAPTER 3

SYSTEM SPECIFICATION

3.1 HARDWARE REQUIREMENTS

- CPU: Intel core I3 – 4130 CPU @ 3.40GHz.
- OPERATING SYSTEM**:** Windows 7 or above
- RAM**:** 4GB.
- HARD DISK**:** 32GB
- CAMERA (iSM-IMX224/iSM-AR0144/iSM-AR0521)
- Red Indicator

3.2 SOFTWARE REQUIREMENTS

- MATLAB - MATLAB is a proprietary multi-paradigm programming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms,

creation of user interfaces, and interfacing with programs written in other languages.

3.3 TECHNOLOGIES USED

- MATLAB
- Image processing

CHAPTER 4

SYSTEM IMPLEMENTATION

4.1 MODULES

- Execution
- Capturing snapshot
- Detection
- Warning

4.2 MODULE DESCRIPTION

4.2.1 EXECUTION

The source code is to be implemented and executed.

4.2.2 CAPTURING

When user's face is detected, it captures the snapshot and analyses whether the user is wearing the mask or not.

4.2.3 DETECTION

It detects the face of a person, nose and lips using image processing and SIFT algorithm and therefore it warns about wearing a mask, properly or not.

4.2.4 WARNING

It generates a warning message that the person is wearing a mask or not, properly or not.

CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 CONCLUSION

Our proposed system can detect and recognize human face(s) in a real-time world. Compared to the traditional face detection and recognition system, the face detection and recognition based on image processing using MATLAB has shorter detection and recognition time and stronger robustness, which can reduce the miss rate and error rate. It can still guarantee a high-test rate in a sophisticated atmosphere, and the speed of detection can meet the real time requirement, and achieve good effect. The proposed model shows greater accuracy and prediction for detecting and recognising human faces. The results show us that the current technology for face detection and recognition is compromised and can be replaced with this proposed work. Therefore, the proposed method works very well in the applications of biometrics and surveillance.

5.2 FUTURE WORK

The system can be expanded in the future by integrating it with biometrics and temperature detection, which can also be used to sense temperatures that are being very mandatory during this pandemic.

APPENDIX 1

SOURCE CODE

```
clc
clear all
close all;
cam=webcam;
while true
e=cam.snapshot;
FDetect=vision.CascadeObjectDetector('Mouth','MergeThreshold',100);
I=e;
BB_Mouth=step(FDetect,I);
imshow(I);
hold on;
%%
FDetect=vision.CascadeObjectDetector('Nose','MergeThreshold',16);
I=e;
BB_Nose=step(FDetect,I);
imshow(I);
hold on;
if(sum(sum(BB_Nose))==0 && sum(sum(BB_Mouth))==0)
    FDetect=vision.CascadeObjectDetector('FrontalFaceLBP','MergeThreshold',10);
    BB_Mouth=step(FDetect,I);
    if(sum(sum(BB_Mouth))~=0)
    title('Remove Hand Please');
    defaultString = 'Remove Hand from face.';
NET.addAssembly('System.Speech');
obj = System.Speech.Synthesis.SpeechSynthesizer;
obj.Volume = 100;
Speak(obj, defaultString);
    else
        title('Mask Present');
    defaultString = 'Thank You for wearing Mask.';
```

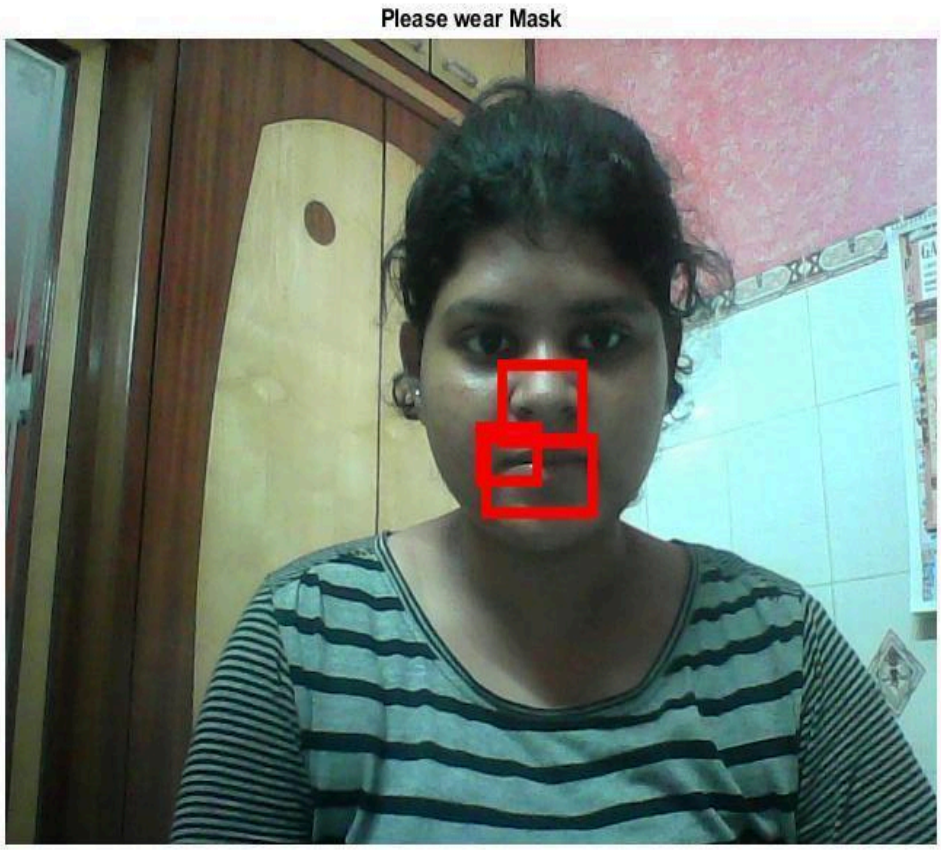
```
NET.addAssembly('System.Speech');
obj = System.Speech.Synthesis.SpeechSynthesizer;
obj.Volume = 100;
Speak(obj, defaultString);
    end


elseif((sum(sum(BB_Nose))~=0 && sum(sum(BB_Mouth))==0)||(sum(sum(BB_Nose))==0 &&
sum(sum(BB_Mouth))~=0))
for i=1:size(BB_Nose,1)
rectangle('Position',BB_Nose(i,:),'Linewidth',5,'LineStyle','-','EdgeColor','r');
end
for i=1:size(BB_Mouth,1)
rectangle('Position',BB_Mouth(i,:),'Linewidth',5,'LineStyle','-','EdgeColor','r');
end
title('Please wear mask properly');
defaultString = 'Please wear mask properly.';
NET.addAssembly('System.Speech');
obj = System.Speech.Synthesis.SpeechSynthesizer;
obj.Volume = 100;
Speak(obj, defaultString);
else
    for i=1:size(BB_Nose,1)
rectangle('Position',BB_Nose(i,:),'Linewidth',5,'LineStyle','-','EdgeColor','r');
end
for i=1:size(BB_Mouth,1)
rectangle('Position',BB_Mouth(i,:),'Linewidth',5,'LineStyle','-','EdgeColor','r');
end
title('Please wear Mask');
defaultString = 'Please wear Mask.';
NET.addAssembly('System.Speech');
obj = System.Speech.Synthesis.SpeechSynthesizer;
obj.Volume = 100;
Speak(obj, defaultString);
end
pause
end
```

APPENDIX -2

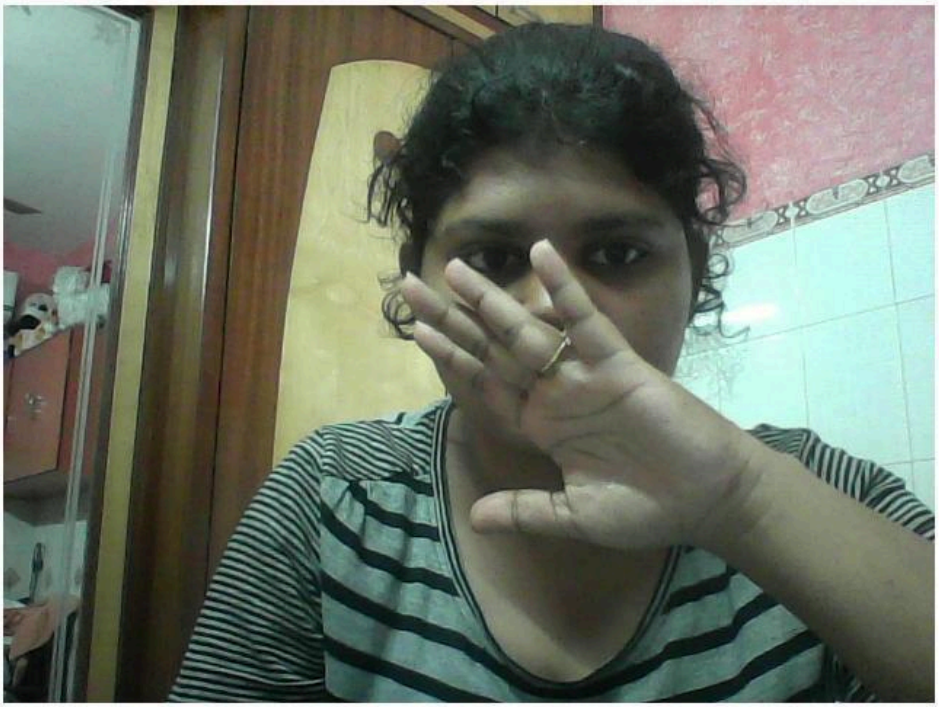
SNAPSHOTS

WARNING FOR WEARING A MASK


Please wear Mask

Please wear mask properly

Remove Hand Please



THANK YOU FOR WEARING THE MASK

Mask Present

REFERENCES

1. Z. Allam and D. S. Jones, “On the Coronavirus (COVID-19) Outbreak and the Smart City Network: Universal Data Sharing Standards Coupled with Artificial Intelligence (AI) to Benefit Urban Health Monitoring and Management,” Healthcare, vol. 8, no. 1, p. 46, 2020.

2. M. Jiang, X. Fan, and H. Yan, “Retina Mask: A Face Mask detector,” 2020. *Online+. Available: http://arxiv.org/abs/2005.03950.

3. M. Gupta, M. Abdel Salam, and S. Mittal, “Enabling and Enforcing Social Distancing Measures using Smart City and ITS Infrastructures. A COVID-19 Use Case,” 2020. *Online+. Available: https://arxiv.org/abs/2004.09246

. 4. J.Won Sonn and J. K. Lee, “The smart city as time-space cartographer in COVID-19 control: the South Korean strategy and democratic control of surveillance technology,” Eurasian Geogra , Econ., pp. 1–11, May. 2020.

5. J. W. Sonn, M. Kang and Y. Choi, "Smart city technologies for pandemic control without lockdown", Int. J. Urban Sci., vol. 24, no. 2, pp. 149-151, 2020.

6. R. Jaiswal, A. Agarwal and R. NEGI, "Smart Solution for Reducing the COVID-19 Risk using Smart City Technology", IET Smart Cities, vol. 2, pp. 82-88, 2020