A REVIEW ON SOCIAL DISTANCE & FACE MASK DETECTOR

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Abstract: According to World Health Organization, this global pandemic (COVID-19) has severely impacted the world and now the number of people infected is above fifty million. As prescribed by all doctors and scientist across the world Wearing face masks and following safe social distance are two of the enhanced safety protocols need to be followed in public places in order to prevent the spread of corona virus and save human life. We need to create safe environment for humans and animals as well. For that sole purpose, we propose an efficient and reliable computer vision-based approach in the real-time for monitoring people to detect both safe social distancing and face masks in public places by implementing the model using OpenCV. After detection of breach, the system sends alert/notification signal to concerned authority and also give alarm to public. In this proposed system modern deep learning algorithm have been mixed with geometric techniques for building a robust model which covers three aspects of detection, tracking and validation. Thus, the proposed system favors the society by saving time and helps in lowering the spread of corona virus by monitoring social distancing norms. In the current situation when lockdown is eased to inspect persons in public gatherings, shopping malls, etc., It can be implemented effectively. Automated inspection reduces manpower to inspect the public and also can be used in any place.

We have gone through some papers for reference and we have written about them in this paper.

IndexTerms - covid-19, social distancing, restricted zone, region of interest, computer vision.

I.   INTRODUCTION

In the new world of covid-19, multidisciplinary efforts have been organized to slow the spread of the pandemic. COVID-19 is a large family of virus that harms humans and animals. COVID19 first spread in Wuhan, China in December 2019. The outbreak then rapidly affected many countries in the world and had been declared as a pandemic by the World Health Organization (WHO). Based on the information from WHO, the corona virus is spreading from a person to a person via small droplets from the nose and mouth. In other words, social distancing is the best practice where people can minimize physical contact with possible COVID-19 carriers and the distance should be at least one meter [4]. According to the World Health Organization (WHO as of July 12, 2020) report, the current outbreak of COVID-19 has infected over 13,039,853 people and more than 571,659 people have died in more than 200 countries around the world. The mortality is approximately 3·7%, compared with a mortality rate of less than 1% from influenza [5] [6] [7]. In the case of a real-time access control system a holistic approach for characteristics extraction has to be preferred. In particular, the DCT (Discrete Cosine Transform) method appears particularly efficient [8]. With the aid of a regular web camera, a machine is able to detect and recognize a person's face a custom login screen with the ability to filter user access based on the users' facial features will be developed [10].

In this proposed system we have integrated two applications i.e. face mask detection and social distance measuring in public places in real-time. Using different algorithms, we are proposing a system for efficient detection of the face with or without face mask with accuracy. If a person is found without face mask then the proposed function will take picture and generate an alert system to the concerned authority. Similarly, social distancing will be measured in real-time in video surveillance by tracking objects (humans). By measuring the distance between two objects (humans) the proposed system can generate alerts if social distancing is not being followed. Hence, in a real-time scenario, this proposed system could be of great help in post COVID-19 world where social distancing is new normal.

figure1

figure2

II. LITERATURE REVIEW

2.1. Distance and Angle Measurement of Distant Objects on an Oblique Plane Based on Pixel Variation of CCD Image [1]

This paper presented a method to measure the photographing distance of remote objects locating on an oblique plane as well as the incline angle.

Earlier, Image Based Distance Measuring System (IBDMS) was proposed to measure distance and area using two laser projectors and a CCD camera. But the IBDMS is valid only for measuring objects or surfaces that are perfectly perpendicular to the optical axis. So, to overcome the problem an image-based system was proposed in this paper for measuring objects on an oblique plane. [1]

2.2. Real Time Object Detection and Tracking Using Deep Learning and OpenCV [2]

In this paper objects are detected using SSD, Mobile Nets, Single shot detector, YOLO. Additionally, SSD has shown results with considerable confidence level. Main Objective of SSD algorithm is to detect various objects in real time video sequence and track them in real time. This model showed excellent detection and tracking results on the object trained and can further utilized in specific scenarios to detect, track and respond to the particular targeted objects in the video surveillance. [2]

2.3. Real-time Object Detection and Tracking in an Unknown Environment [3]

In this paper their aim was to achieve real-time object detection and tracking system, operational in unknown background. The input to the system was real-time video captured from a standard webcam. The captured frames were pre-processed to enhance the images by using contrast stretching and histogram equalization techniques. The pre-processed frames were then fed into the object detection module where they had undergone series of operations to accurately detect the object of interest and perform tracking. [3]

2.4. Person Detection for Social Distancing and Safety Violation Alert Based on Segmented ROI [4]

Authors proposed a system using Python and OpenCV library to implement two features. The first one is to detect violations of social distancing and the second one is to detect violations of entering in restricted areas.

The results of the tests performed on the system shows that the object detection model is having difficulties in detecting people correctly in public places. [4]

2.5. Deep Learning based Safe Social Distancing and Face Mask Detection in Public Areas for COVID-19 Safety Guidelines Adherence [5]

To avoid the spread of COVID-19, in this paper authors proposed an approach that uses computer vision, MobileNet V2 and raspberry pi4 to help police in physical surveillance in public places by automatically monitoring those places. In their proposed system the camera feeds real time videos of public places to the model which automatically detects whether anyone has worn mask or not and also checks if those people are maintaining safe social distance or not. [5]

2.6. Study of Masked Face Detection Approach in Video Analytics [6]

In this paper, authors proposed a technique for masked face detection. As we know video analytics deals with detection of person and events like walking, eating, falling, etc., author made use of the fact that person and face detector are present in the system. Here the aim is to detect if a person is wearing mask or not. This unique approach for the problem has created a method simpler in complexity thereby making real time implementation more feasible. [6]

2.7. Performance Evaluation of Intelligent Face Mask Detection System with various Deep Learning Classifiers [7]

This paper shows the use of deep learning approaches to identify people who do not wear mask. The proposed System identifies accurately whether a person is wearing a mask or not. When the system identifies person without mask, an alarm gets generated to alert the people around or the concerned authorities nearby, so that the necessary actions can be taken against such violators. [7]

2.8. Face Recognition with Facial Mask Application and Neural Networks [8]

In this paper author have given a very fast image pre-processing method. we can see this done by the help of algorithm of linearly shaded elliptical mask centered over the faces, by introduction of MPL and RBF neural network for classification, this all as a package make face recognition very smooth and fast.

For decrease in image acquisition cost we need a suitable and wide number of real time application with the help of face recognition algorithms and in this the author has proposed to do same.

Authors has proposed the holistic approach in which one considers image as a HD-vector, where each pixel is mapped to a component of vector, this approach helps system to perform faster and with more accuracy. [8]

2.9. Object Detection Algorithms for Video Surveillance Applications [9]

In this paper author have proposed implementation of object detection, skin detection and color detection in a real time video surveillance and given its numerous applications like image retrieval, security, medical and defiance areas.

Authors have proposed a system which includes foreground and background image processing model for real time object detection. First background subtraction process is performed from frame and then in next step it is compared with previous frame to detect the object.

For skin detection the pixels of skins is to be detected by converting input image from RGB to YCbCr and setting the optimum range of Cb and Cr. after skin pixel detection Binary image is displayed classifying skin pixels as white and non - skin pixels.

for color detection RGB Euclidean threshold is being detected and have been simulated and implemented to improve the efficiency of the algorithms for video surveillance applications. [9]

2.10. Facial Recognition using OpenCV [10]

In this model, provided by the author, they have proposed a system for facial recognition using OpenCV in real time where web cam is taken as source to take real time inputs.

most of the face recognition system present have lamination dependency. this proposed system deals with this issue efficiently by using image prepossessing filters before applying face recognition. For better results author have used color face recognition and different enhancement techniques. [10]

Table 1: Comparison Table

Sr. No.	Title of paper	Author Name	Year of Publication	Methodology	Advantage	Disadvantage
1	Face Recognition with Facial Mask Application and Neural Networks	Marco Grassi and Marcos Faundez-Zanuy	2007	They proposed a system to verify if a person is wearing a mask or not using DCT,ML	Use of DCT along with RBF makes system much efficient and faster.	Image processing is slow as there is no pre-processing of image.

				And RBF	Such system is low cost and requires low maintenance.	
2	Distance and Angle Measurement of Distant Objects on an Oblique Plane Based on Pixel Variation of CCD Image	Ming-Chih Lu, Chen-Chien Hsu and Yin-Yu Lu	2010	They proposed a method to measure distance of objects on oblique plane	Distance between any two arbitrary points in the image can be obtained with desired results.	System is focused only to oblique plains.
3	Real-time Object Detection and Tracking in an Unknown Environment	Shashank Prasad and Shubhra Sinha	2011	This paper proposed technique that enables objects detection, recognition and tracking in an unknown background.	environment was extensively tested to operate in complex, real world, non-plain and changing background with 99% accuracy.	Accuracy decreases with luminous effect.
4	Facial Recognition using OpenCV	Shervin EMAMI and Valentin Petruţ SUCIU	2012	They proposed a system for facial recognition using OpenCV in real time where web cam is taken as source to take real-time inputs.	Deals with luminous dependency. Applies facial filter before image processing for better accuracy.	Accuracy is 95% which can be further improved.
5	Performance Evaluation of Intelligent Face Mask Detection System with various Deep Learning Classifiers	Gayatri Deore, Ramakrishna Bodhula, Dr. Vishwas Udpikar, and Prof. Vidya More	2016	Verifies if a person is approaching towards the camera or going away and accordingly face detection occurs.	Distance from camera being more reliable and accurate step compared to other steps.	Eye line detection leads to false detections in poor resolution images.
6	Real Time Object Detection and Tracking Using Deep Learning and OpenCV	Chandan G, Ayush Jain, Harsh Jain, Mohana	2018	Objects were detected using SSD algorithm in real time scenarios.	This model showed excellent detection and tracking results on the object trained and can further utilized in specific scenarios to detect, track and respond to the particular targeted objects in the video surveillance.	Accuracy can be improved further by overcoming background effect and luminous effects in real time.
7	Object Detection Algorithms for Video	Apoorva Raghunandan, Mohana, Pakala Raghav,	2018	In this paper author have proposed implementatio	The model showed excellent accuracy (95%	All three process could have been done in a

	Surveillance Applications	and H.V. Ravish Aradhya		n of object detection, skin detection and color detection in a real time video surveillance.	rate) and the luminous dependency was much stable.	single package.
8	Deep Learning based Safe Social Distancing and Face Mask Detection in Public Areas for COVID-19 Safety Guidelines Adherence	Shashi Yadav	2020	The proposed system uses a transfer learning approach to performance optimization with a deep learning algorithm and a computer vision to automatically monitor people in public places.	This proposed system will operate in an efficient manner in the current situation when the lockout is eased and helps to track public places easily in an automated manner.	The proposed system is high maintenance, need technical skills to monitor and is not economically efficient solution.
9	Person Detection for Social Distancing and Safety Violation Alert based on Segmented ROI	Afiq Harith Ahamad, Norliza Zaini, and Mohd Fuad Abdul Latip	2020	The main purpose of this system is to process captured video footage for person detection and further processing for social distancing or safety violation.	The first feature is on detecting violations of social distancing, while the second feature is on detecting violations of entering restricted areas.	Accuracy decreases when person is to be detected in real-time.
10	Performance Evaluation of Intelligent Face Mask Detection System with various Deep Learning Classifiers	C. Jagadeeswari, and M. Uday Theja	2020	This paper shows a comparison of classifiers like MobileNetV2, RESNET50, VGG16 each with Optimizers ADAM, ADAGRAD, and SGD.	ADAM optimizer performance is very good and test accuracy of SGD is approximately equivalent ADAM for all the 3 classifiers considered above. MobileNetV2 classifier yielded the best results with high accuracy.	Not very cost efficient and maintenance seems to be high and frequent.

III.   PROBLEM IDENTIFIED

There is no proper integrated system which identifies face mask and measures norms of social distancing at public place in real time. the face mask system proposed earlier have many flaws like luminous dependency i.e. If frame is taken in not so bright region or ROI belongs to dark shaded region the face doesn't get recognized and hence face mask is not being recognized. Similarly, there are other issues to like frame being taken in real time situation like moving background. All these reduces the accuracy of the system in real time hence it's not worth to have such system installed for its purpose to be served.

Similarly, the social distancing measuring system proposed earlier is not real time hence not fulfilling its sole purpose. system proposed earlier doesn't send notification or alert to concerned authority if social distancing norms are not being followed which is somewhat important for a real time project of its own kind. The object identification in real time video feed is not near the desired accuracy level which is another reason for it not being real time implementable.

IV. PROPOSED SYSTEM

We are proposing a system with dual usability in and as one package. In this model we will be making application consisting face mask detection technology which verifies if a person in vicinity of camera is wearing a mask or not, we will be eliminating luminous dependency, facial stability and moving background.

When face mask detection which is facial recognition technique is being considered in a system various factors need to be taken in consideration, these factors are responsible for accuracy of proposed system. As the proposed system is in real time, we need to consider many factors like light intensity, stability of face and moving background, in current available system these things has been ignored but in our proposed real time system we have given them importance thus making our system more stable and reliable in real time.

The second feature of our proposed system is to measure social distancing norms in real time at public places.
Our system tracks objects(humans) and measures distance between other objects(humans) in real time and if social distancing norms are not being followed it generates a notification to concerned authority.
Many factors like selection of correct ROI, neglecting all other objects (trees, animals etc.) has to be ignored in real time using optical flow methodology.
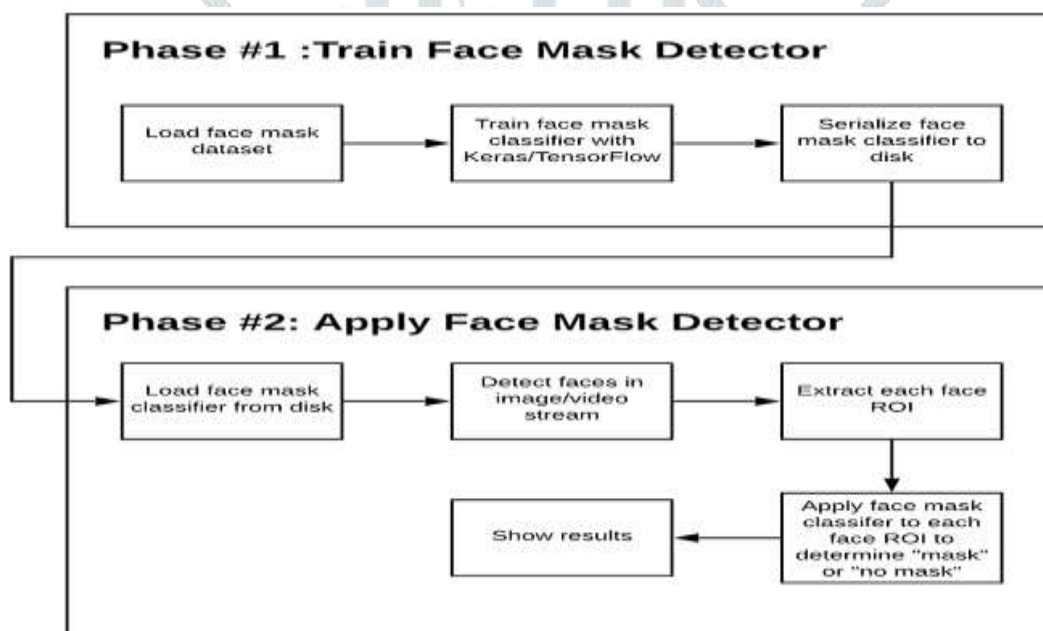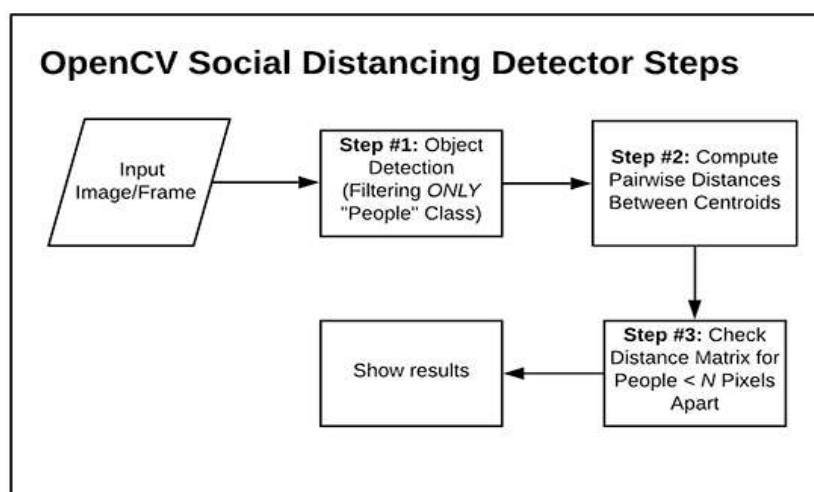

figure3. face mask detection

figure3. social distance monitoring

V.   OBJECTIVES

   i.   To recognize if people are following safe social distance or not in public places.
   ii.   Recognize if a person is wearing a mask or not in public places.
   iii.   To generate an alert system if social distancing norms are not being followed at public places.

VI.   CONCLUSION

    In this paper we have proposed an integrated system in which we have integrated face mask detector to detect if a person is wearing a mask or not and the other system i.e. social distancing measuring norms in which system detects if at any public place social distancing is being followed or not, and if any violation is made an alert will be sent to concerned authority. This proposed system is being in real time helps to measure social distancing norms for public safety.

The face mask detection system also maintains a database of people not wearing mask so that strict action could be taken against individuals not following social distancing norms.

Accuracy of the system is maintained by focusing on various areas in which the accuracy could be compromised and hence it is very much implementable in real world with real time aspect as its key point. So, the proposed system can be of major use for human safety against covid-19 when lockdown is being eased and we are moving to transact our live in post COVID-19 world.

VII.   FUTURE SCOPE

    The current system is evaluated with different classifiers. The above mentioned use cases are only some of the many features that were incorporated as part of this solution. We assume there are several other cases of usage that can be included in this solution to offer a more detailed sense of safety.

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