Covid Mask Detection and Social Distancing Using Raspberry pi

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Abstract - *COVID -19 spreads through the air from one person to another person which is close to each other. like this, it forms a chain of infection. In order to stop corona-virus from spreading, is to break the chain of a virus by implementing Small Changes our daily life like wearing putting face mask and social distance & Sanitizing hands Our system helps to check whether a person entering into public or Corporate places have they put a mask on their faces or not and it also checks whether they are maintaining a safe distance from each other. This system Can be easily implemented on any embedded system. To implement this system we have used some algorithms like CNN(Convolutional neural network)and YOLO they are used to train the data and to detect different objects from the live image. Monitoring Social distances regulations and checking people's masks is most likely to lead to a Scarcity of resources and is supposed to allow errors creeping in due to human intervention, So In this Kind of situation, our System Comes in handy This Paper Describes the approach to prevent the increase of the Coronavirus by monitoring in any time if any person is maintaining Social distance and face masks in a public place. using machine learning this system can identify the person with mast and without mask if no mask has occurred then the System will give an alert or it will make Sound using a buzzer.*

Key Words: Machine Learning, CNN, YOLO, Opencv

1.INTRODUCTION

Before December 2019, We never thought that the one Small Virus can stop the whole world and can create a panic situation all the peoples have to stop their works Schools, malls and other places where Crowd can gather together are closed for long period of time. Coronavirus is very dangerous as it is affecting the Social and economic health of the countries

.Coronaviruses is kind of virus which gets spreads when an infected person breaths out droplets and very Small particles that contain the virus. And that droplets get inhaled by other peoples and they get affected by it Same pattern gets continuous, it frames a chain of infection. So to avoid or break the chain of virus all Countries have announced lockdowns in their countries. but in order to feed the families people Can not live forever in lock down's So. WHO (world health organization) Suggests that along with vaccinations.

People should wear a mask and Social distance this will also help to break the chain. In this situation our system Comes handy. Because of machine learning everything is easy and possible to do Our system takes like pictures and video recordings. Converts it into different frames and compare it with trained data set to do that it takes the help of CNN and YOLO algorithms. CNN (Convolutional neural network)is algorithm used to analyzer different visual imagery c and YOLO (You only looks once) is used to detect objects in the images. in public place Some like malls, Schools, corporate offices and many other places they have to monitor it manually monitoring social distance and checking people mask is most likely to lead to scarcity of resources and is supposed to introduced errors due to human interaction.

1.1 Literature Survey

[1] S. S. Paima, N. Hasanzadeh, A. Jodeiri, and &H.Soltanian Zadeh, "Detection of COVID-19 from chest radiographs"in Proceedings of the 2020 27thNationaland 5th International Iranian Conference on Biomedical Engineering(ICBME), IEEE, Tehran, Iran, November 2020. This paper also provides a comparative study of different face detection and face mask classification models.The system performance is evaluated in terms of precision, support, sensitivity and accuracy that demonstrate the practical applicability.

[2] M. Cos¸kun, A. Uçar, O. Yildirim, and Y.Demir, "Face recognition based on convolutional neural network," in Proceedings of the 2017 International Conference on Modern Electrical and Energy Systems ,Kremenchuk, Ukraine,November 2017. This paper proposes a modified Convolutional Neural Network architecture by adding two normalization operations to two of the layers.The batch normalization provided acceleration of the network.

[3] Sultana, Sufian, and Dutta, " In image classification using convolutional neural network(CNN) ," in Proceedings of the 2018 Fourth International Conference on Research in Computational Intelligence and Communication Networks , IEEE, Kolkata, India, November 2018 . In this paper, We have explained different Convolutional Neural Network architectures for image verification. Through this paper, we have shown advancements in Convolutional neural network (CNN) from LeNet-5 to latest SENet model.

[4] Safa Teboulbi ,Messaoud Seifeddine,Mohamed Ali Hajjaji,Mtibaa Abdellatif." perfect time Implementation of AI-Based Face Mask Detection and Social Distancing Measuring System for COVID- 19 "September 2021 . This research paper focuses on mask Detected. Detection model as an machine vision system. The pretrained models such as the MobileNet, ResNet Classifier, and VGG are used in our contex.

[5] A Deep Learning Model for Face Mask Detection A. A.Abd El-Aziz,Nesrine A. Azim, Mahmood A.Mahmood, and Hamoud Alshammari International Journal of Computer Science and Network Security, VOL.21 No.10, October 2021 . In this paper, we propose a simple and effective model for real-time monitoring using the convolution neural network to detect a face mask or not.

2. Block Diagram and System Analysis

When the circuit is powered up the USB camera that is connected to the raspberry pi with begin take picture. Raspberry pi is a series of small signal board computers (SBC3)that can be plugged with input output devices such as monitor, speaker etc

.We are using the pycharm IDE and the spyder.Input image is compared to the image dataset that have already been provided. The output is displayed on the monitor. If it is unable to detect mask & social distance. No output will be displayed. the audio module capture the user's voice. which the controller that convert to text.

Hardware
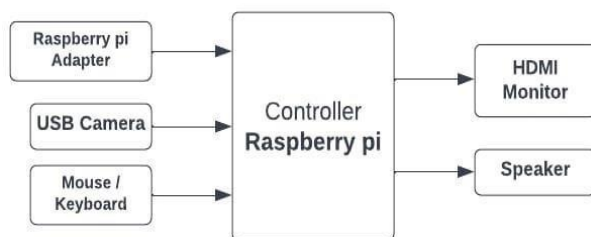
Power supply: The power supply is used to power the circuit. Controller: The Raspberry Pi serves as our controller. It would be possible to save an image dataset. It will compare the extracted image to the saved dataset before sending the results to the monitor and speaker. It can also convert voice to text using Google API since it has built-in Wi-Fi. USB Camera: An optical device for capturing still images or recording moving images. Speaker: Transducers that transform electromagnetic waves into sound waves are known as speakers. The controller sends a signal to the speakers, which then outputs it .monitor: The output will be displayed in text form on the LCD.

2.1 Software

Python 3, Opencv, Tensorflow, Pycharm, Spyder, keras

3.1   Steps for Face Mask Face:-

A) FACE DETECTION -: convolutional neural network based Deep Learning model is used for face recognition, we used this model because it has a great advantage compared to other models, some advantages are convolutional neural network model can detect the faces even in low resolution [224X 224]. Also used MobilenetV2 model of accuracy of 93.9%, pixels of 90X 90 is the base for face size that can be detected. The output gets displayed with the bounding box across the face, then this crop face is loaded into the face mask mod.

B) COLLECTING DATA -: To train data face mask model, we used Face Detection model. Custom datasets are collection in our project consisting of real-time images of a person face with and without protection of face mask. The dataset that we have collected is 3836 photo snaps and then split into two classes, one is with_mask another is without_mask with_mask has 1921 images and without_mask has 1915 images. Initially we have collected more than 4600 photo snaps in which handful are deleted for being blurred, not cleared.The dataset is separated into 79% of training data and 21% of testing data this is done using the help of sklearn lib.The images used for the training set is roughly around 3020 images and for testing data around 816 images.

With Mask

Without Mask

C) **MASK DETECTION** -: OpenCV's face detector based on the SSD framework which comes with MobilenetV2 architecture. To obtaina bounding box for an object in this case object means mask, we need to apply the photo snap with object detection.SSD are originally developed by Google, they are between regions with convolutional neural networks and You Only Look Once Version 3 methods of object detection. This are more straight forward algorithm and faster than regions with convolutional neural networks The current model is combined with both MobilenetV2 architecture and SSD framework, so our model will have the quick, efficient deep learning- based method for Mask Detection.

3.2 STEPS FOR SOCIAL DISTANCING

A) **PERSON DETECTION -:** The Proposed model uses Resnet50 which is a subclass of MobilenetV2 and convolution neural network for the process of person detection using the framework of Tensor Flow. The key feature of this model is that it is able to detect many classes of objects at the same time. The graphics processing unit (GPU)acceleration is enabled which helps in performing faster computation compared to previous models. Various set of features such as mouth, eyes, arms, nose, movement of body are extracted in order to get effective results. Histogram equalization is used to increase the contrast of input live images or video.

B) DISTANCE COMPUTING -: The model used in this application has a very effectively trained MobilenetV2 for person detection in the image

.The model will take the video frame as the input and output a list of coordinate in a bounding box in a rectangular shape across every person detected in the frame. The rectangular bounding box is represented as [x, y, width, height].Every and each person in the video frame will have a centroid for the resulting bounding box. with the help of this centroids of two bounding boxes. He model will calculate the biste distance between .two people for calculating distance We use The Euclidean distance formula, it is used to calculate distance. between two real value of Vectors. As a result of the system is if the distance is less than 3feet, then the system will show display .if it is greater than or equal to 6 feet then it will diplay Social distancing is maintaine by the persons.

4. Algorithm

4.1

Step 1: Take live input image from USB camera.

Step 2: Face Detection .In this step, system will detectthe face and create a box around the face.

Step 3: If face is detected then it will go to the next step which is face processing /feature extraction.& If face is not detected then it will display face is not detected.

Step 4: In this step system will extract some features like Convolution, Alignment, etc from the image.

Step 5: The image will get compared with images in the dataset which we trained previously before implementing the project.

Step 6: If mask gets detected it will label image as mask detected in green.& If not then will label it as mask not detected in red.

4.2

Step 1: Take input image video frame from USB camera
Step 2: Detection of pedestrians

Step 3: Camera view calibration Step 4: distance measurement Step 5: Output or Result display
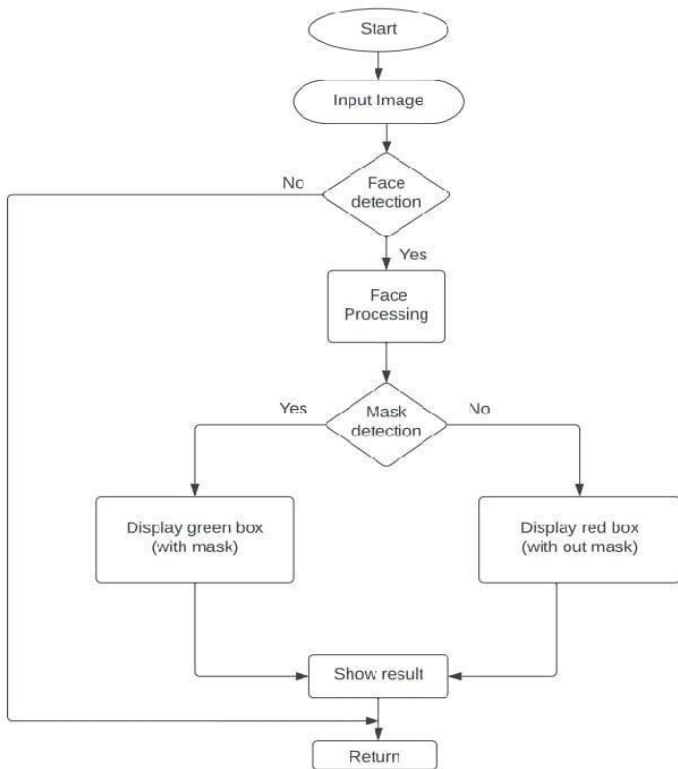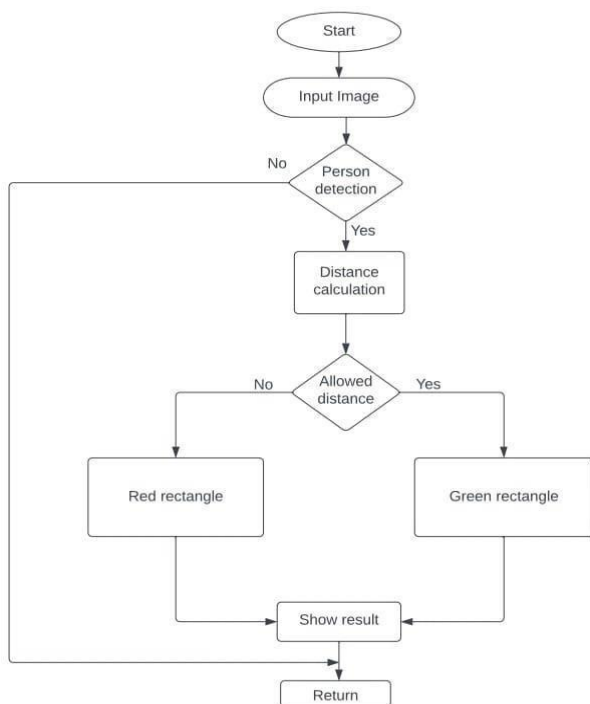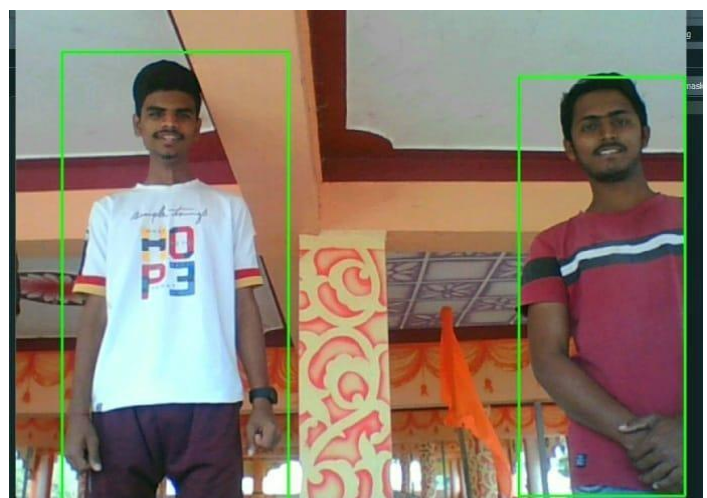
5. FlowChart

Fig (a) - Face Mask Flowchart

Fig (b) – Social distance Flowchart

6. RESULT

7. Acknowledgement

8. Conclusion

In this system we have implemented face mask and social distancing using convolutional neural Network (CNN) and You Only Looks once (YOLO). Methods include quarantines, and the closing of schools, workplaces, stadiums, theatres, or shopping centres. Individuals may apply social distancing methods by staying at home, limiting travel, avoiding crowded areas, physically distancing and using no-contact greetings themselves from others.

9.   REFERENCES

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