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Application Development for Mask Detection using Raspberry Pi

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Abstract: ***In our daily life, humans are discovering new technology, and scientists also discovering new viruses. In recently scientists are discovered COVID-19 (coronavirus). COVID-19 pandemic has apace affected our everyday life-disrupting world trade and movements. Carrying a protecting mask has become a brand new tradition. Our planned technique detects the face from the video properly then it identifies if it's a mask wear on that or not. This project aims to develop a face mask detection system to detect any kind of face mask. The current study used OpenCV, Python, and Tensor Flow to detect whether a person wearing a face mask or not. The model was tested with real-time video streams.***
Keywords: Face mask detection, Face detection, mask detection, coronavirus, OpenCV, Tensorflow, Deeplearning

I. INTRODUCTION

Recently, Along with India world's most massive and tiny countries declared emergency conditions for the novel coronavirus (COVID-19). Much, the world's overall population is underneath internment and other people square measure maintaining social distances as recommended by the World Health Organization (WHO). This unpredictable virus has infected tens of lakhs of people and continues to unfold globally. As per recent reports, consequent few months square measure dangerous within the current efforts to carry COVID-19 unfold among communities. Across Bharat, persons square measure losing jobs, acting from home, being hospitalized, and even vanishing life as a result of COVID-19 infections. The epidemic placed nice stress on medical professionals. Hospitals square measure experiencing beyond traditional patient masses and treating all patients quickly and effectively-currently becomes an awfully difficult task. Because of concern, country-wise internment, and suspended OPDs in Hospitals regular patients are ineffectual to approach doctors. Computer vision is an associate knowledge base scientific field that involves computers gaining advanced understanding from digital pictures or videos. Ancient laptop vision tasks embrace image process, image classification, object detection, and image recognition. Object discovered will detect instances of visual objects of an explicit category within the pictures, which may be a correct resolution for the matter mentioned above. Consequently, mask detection has become an important vision task to assist worldwide society. One of the foremost vital tools is that the mask detector. This method allows spotting United Nations agency is while not a needed mask. These systems work with existing police investigation systems in conjunction with innovative neural network algorithms to ascertain whether or not an individual has worn a mask or not.

II. OBJECTIVES

To detect whether a person is wearing a mask or not.COVID-19 pandemic caused by novel coronavirus is continuously spreading until now all over the world. A bounding box drawn over the face of the person describes weather the person is wearing a mask or not. The training set developed contains number of images categorized as masked or non-masked, which analyses & classifies the given Video stream (Live camera) or image input to the module.

III. HARDWRAE UNIT IMPLEMENTATION

A. Raspberry Pi

Raspberry Pi is a lightweight, credit card-like device. It includes a multi-core, GPU, RAM DDR, ROM, I/O, Ethernet, Host, and a very limited HDMI processor. It is also included in the processor. Compared with modern-day computers and notebooks, the Raspberry Pi is relatively sluggish, but with low power usage, it can fulfill demands from the right Linux framework. The company is able to link to the world outside and is used in diverse areas of automated manufacturing ventures, music machinery, meteorological stations, and indoor tweeting rooms. Its hardware that is available. Most raspberry pi projects are available and can be also opened. The majority of raspberry pi projects are available and can be both manufactured and updated by ourselves. The picture collected by the camera is processed. CAMERA: The camera captures the live streaming photos. Then these frames are analyzed and the result obtained.

B. Camera

The camera captures the live streaming photos. Then these frames are analyzed and the result obtained. The Pi camera module is a lightweight camera that can be connected to Raspberry Pi and is portable. It connects with Raspberry Pi victimization the MIPI camera serial interface protocol. It is normally utilized in image processing, machine learning, or surveillance projects. It is commonly utilized in surveillance drones since the payload of cameras is extremely less.

Fig.1. Connectivity of Camera with Raspberry Pi

C. Algorithm Used

1) Algorithm: Face Mask Detection

2) Input: Dataset including faces with and without masks Output: Categorized image depicting the presence of face mask

a) For each image in the dataset do.
- Visualize the image in two categories and label them.
- Convert the RGB image to Gray-scale image.
- Resize the gray-scale image into 100 x 100.
- Normalize the image and convert it into 4 dimensional arrays.
- end.

b) For Building the CNN model do.
- Add a Convolution layer of 200 filters.
- Add the second Convolution layer of 100 filters.
- Insert a Flatten layer to the network classifier.
- Add a Dense layer of 64 neurons.
- Add the final dense layer with 2 outputs for 2 categories.
- end.

c) Split the data and train the model.

D. Working Of the System

1) Collection of Datasets: We have collected number of data sets with face masks and without masks. We can get high accuracy depends on collecting the number of images.

2) Extraction of Datasets: We can automatically extract the features using deep learning model from inputted image dataset. Without model feature can be extracted using mobile internet v2 of mask and no mask sets.

3) Models Training: We have trained the model using OpenCV (python library). Now that we have collected the face samples, we have passed them on to the neural network and started the training process to automatically detect whether a person is wearing a mask or not.

4) Facemask Detection: We can detect Pre-processing images and also detect via live video. If people wear masks, it will permit them, if not then it will show no mask wear.

E. Advantages

1) We can keep peoples safe from our technique.
2) This system can be implemented in Bank, Airports, Hospital, Restaurants, Malls, Banks etc.
3) It has fast and high accuracy.
4) Easy to integrate.
5) No new hardware to install
6) Manual Monitoring is very difficult for officers to check whether the peoples are wearing mask or not. So in our technique, we are using web cam to detect people's faces and to prevent from virus transmission.

F. Disadvantages

1) If power supply is lost then the connection between raspberry pi and camera get disconnect.
2) If there are too many faces the accuracy of system gets low.

G. Applications

We can deploy this project at the start-up entry/exit point. Relieving entries from extra tasks.

1) Points within offices are located properly.
2) Measurement/Institutions
3) Shopping Centre
4) Juice Shops
5) Walking Square
6) Hall Audience.
7) Seminar rooms.
8) Any location where the mask is required.

IV. RESULTS AND DISSCUSSIONS

This model accurately predicts a person is wearing a mask or not. It also displays the name of the person if it is available in the database. Red Colored Square is drawn around person's face to indicate he has not worn a mask. Green Colored Square is drawn around person's face to indicate he has worn a mask.

Fig.2 Detection of face without mask

Fig.3 Detection of face with mask

Fig.4 Detection of face with mask from side angles

Fig.5.Detection of People with mask and non-mask

We can detect crowded places where it can be easily captured who have worn it or not. Images can also be inputted the system where classification can be possible as mask or non-mask as shown in figures.

Table 1.1: Accuracy with distance

Sr.No.	Distance in Meter(m)	Accuracy in Percentage (%)	
		Masked	Non-Masked
1.	0.1m to 1.0m	90% to 100%	100%
2.	1.1m to 3.0m	85% to 90%	75% to 90%
3.	3.1m to 6.0m	65% to 75%	70% to 80%
4.	6.1m to 10.0m	50% to 60%	70% to 80%

Table indicates accuracy in percentage depends upon distance of camera and person's position from the camera. For short distance we have achieved 100% accuracy to identify people with non-mask.

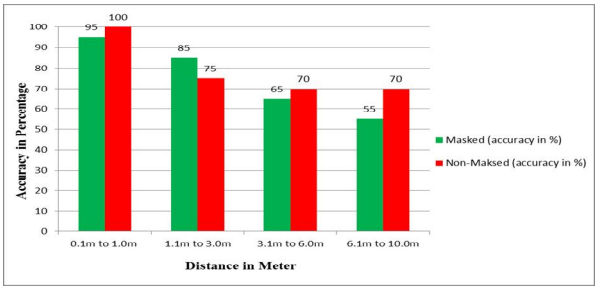

Fig 6.Accuracy graph for detection of masked or non-masked

V. CONCLUSION

You must be aware of the fact that how important it is to wear a face mask in the current scenario and what are the consequences if we don't. So, why not build mask detector exploitation Raspberry Pi that detects whether or not an individual is sporting a mask or not? It can be used in public places or even outside your house to keep an eye on visitors. With the increasing number of COVID cases all over the world, a system to replace humans to check masks on the faces of people is greatly needed. This system satisfies that need. This system can be employed in public places like railway stations, airports, and malls. It will be of great help in companies and huge establishments where there will be a lot of workers. This system will be of great help there because it is easy to obtain and store the data of the employees working in that Company and will very easily find the people who are not wearing the mask and a mail will be sent to that respective person to take Precautions not wearing a mask.

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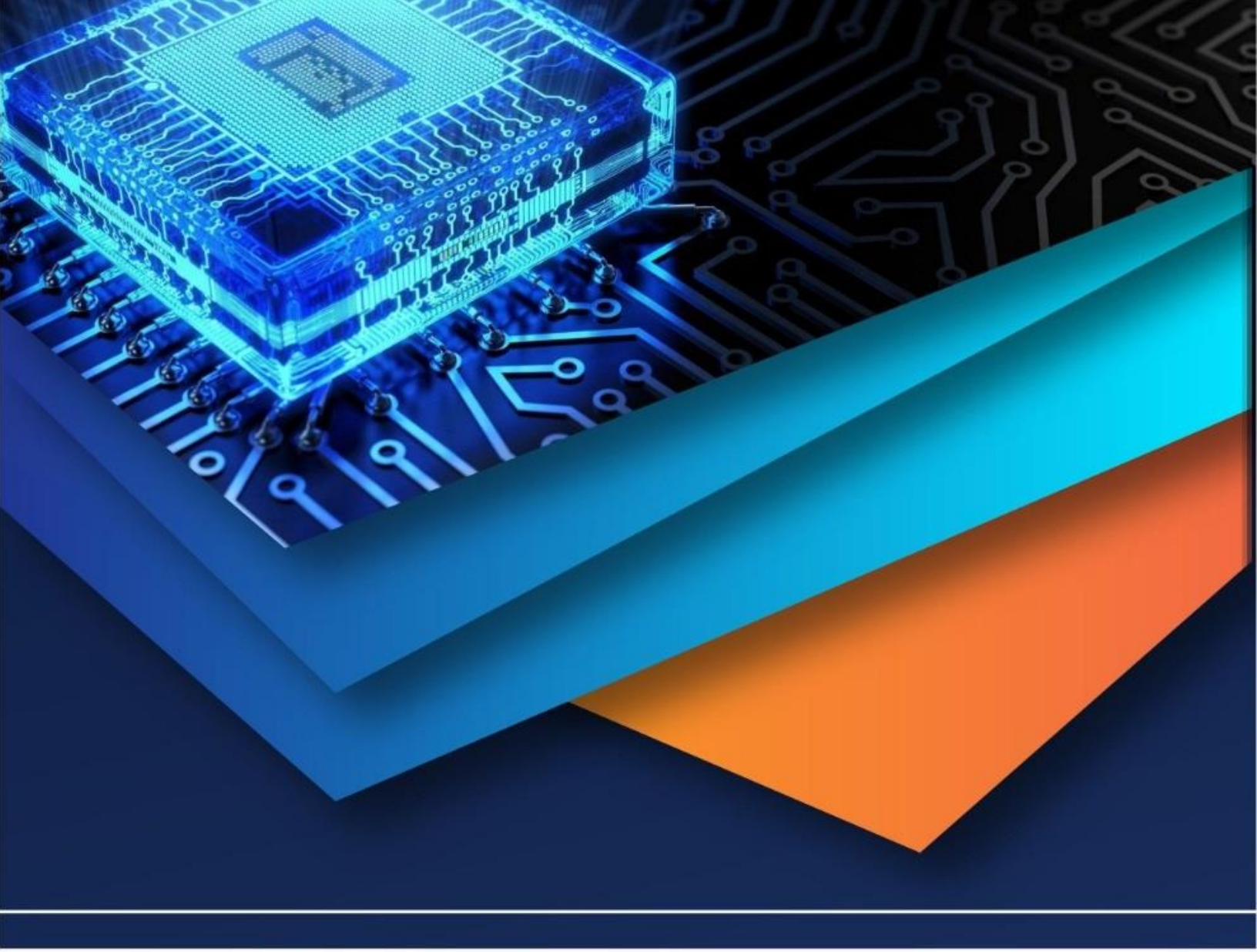

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