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Sanitizer Dispenser Using Face Vizard Detection

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Abstract- Face Mask Detection is being seen significant progress in the domains of Image processing and Computer vision, since the rise of the Covid-19 pandemic, many face detection models have been created using several algorithms and techniques. The proposed approach in this paper uses deep learning, Open-CV to detect face masks, many new algorithms are being invented using convolution architectures to make the algorithm as accurate as possible. This convolution architecture has made it possible to extract even the pixel details. We aim to design a binary phase classifier which detect any phase present in the frame irrespective of its alignment. We present a method to generate accurate face segmentation mask from any arbitrary size input image. It is more relevant today because it not only used on images but also in video applications like real time surveillance and face mask detection in videos. The proposed Raspberry Pi based automatic sanitizer dispenser mainly deals with solving the problem of unhygienic condition of the area. The automation system for everyone is turning very frequently in the present. Yet, common people are facing many issues in their treadmill. Providing the best solution to this issue is the main aim of our project. The enduring method involves manual cleaning done by human which is not at all easy task and it is may not even exist in all areas. Sanitation and hygiene is one of the largest problems faced by people in our country. The cleaning process is operated to be automated and simple. This facility helps the regular janitors as well as the users to work easily. On selecting Raspberry pi as a suitable interface, we aim to provide an easily compatible facility at an economically feasible rate.

Keywords:- Face Mask detection, hand-free sanitization, sanitizer tunnel, Raspberry Pi based automated sanitizer Dispenser and face mask detection.

I. INTRODUCTION

According to the UN (United Nation) Water report as per the study done by the WHO (World Health Organization), nearly billion people are living in this world without safely managed sanitation. Remedy interventions, particularly vaccination, have been the principal public health method of prohibiting and controlling seasonal influenza. Therefore it is proposed that study should be conducted on the use of face masks with the use of hand and body hygiene (Sanitization). Sanitation and hygiene are still the challenges in India. The Smart Disinfection and Sanitation Tunnel is a illustration of how it is been designed to insurance maximum protection to people passing through the tunnel in around 3 seconds of high pressure which can help the community to fight against the COVID-19.

The increasing generality of infectious diseases in recent years has posed the serious threat to the public health. The respiratory droplet or we can say the soaring route has the biggest potential to disrupt social interactions, while being amenable to prevention by the humble face-mask. The main idea of this project is to make a tunnel that can prevent the spread of COVID-19 using inner security via face mask detection system. It can disinfect a person fully from head to toe at the time period of 3 seconds.

On selecting Raspberry Pi as a suitable interface, we aim to provide an easy compatible facility at an economically feasible rate. The cleaning process is operated to be automated and simple. Hence, on adopting this methodology, we will be able to increase the standard of public and community hygiene and facilitate people to use these effectively.

II. LITERATURE REVIEW

Intelligent Face Mask Detection System, this paper is published in the year 2008 at International Joint Conference on Neural Networks (IJCNN) and we understood that it is possible to extract an unknown biometric feature from a known biometric feature which is quite interesting.[1]

Raspberry Pi based Smart Fire Management System employing Sensor based Automatic Water Sprinkler, this paper is published in the year 2017 at International Conference on Power and Embedded Drive Control (ICPEDC), and we understood the response time of the traditional sensor based water sprinkler.[2]

Facial Mask Detection using Semantic Segmentation, this paper is published in the year 2019 at 4th International Conference on Computing, Communications and Security (ICCCS) and we understood to generate accurate face masks for human objects from RGB channel images containing localized objects.[3]

A Face Emotion Recognition Method Using Convolutional Neural Network and Image Edge Computing, this paper is published in the year 2020 at IEEE and we understood the method can automatically learn pattern features and reduce the incompleteness caused by artificial design features. The proposed method directly inputs the image pixel value through training sample image data. [4]

Automated Washroom Sanitizing System, this paper is published in the year 2020 at International Conference on Intelligent Computing and Control Systems (ICICCS 2020) and we understood that how to improve the hygiene condition of the surrounding form this paper. [5]

Image Processing based Improved Face Recognition for Mobile Devices by using Scale-Invariant Feature Transform, this paper is published in the year 2020 at International Conference on Inventive Computation Technologies (ICICT) and we understood that we can acquire line test fractional face to exhibition facial pictures and overstate outward appearances.[6]

Hand Sanitizers: A Review of Ingredients Against Corona viruses Infection Control, this paper is published in the year 2020 at American Journal of Infection Control, 2020 and we understood the mechanism of action and mode delivery of sanitizer sprinkler.[7]

Weighted Feature Histogram of Multi-Scale Local Patch Using Multi-Bit Binary Descriptor for Face Recognition, this paper is published in the year 2021 at IEEE and we understood The results from extensive experiments on mainstream face datasets demonstrate that WFH and C-WFH achieve state-of-the-art recognition performance. [8]

Boosting Semi-Supervised Face Recognition with Noise Robustness, this paper is published in the year 2021 at IEEE and we understood the robustness to noisy labels and the exploitation of unlabelled data, one can not only train high- performance network for face recognition from a small amount of labeled data, but also gain extra labeled data.[9]

III. PROCEDURE

Initially, Raspberry pi 3 controller which is the heart of the system will get a supply which will further provide it to the inputs of the system. The IP Camera module of 8MP that captures the video and processes it ahead using a Python Open- CV library which will help to recognize the person as well as the presence of a mask on the person's face. We are also interfacing the PIR sensor at the entrance to detect the motion and sent a signal to the control board when the user enters. Similarly, the sanitizer pump attached to the interface also gets to a count and turns the relay switch ON, and hence pumps sanitizer through the sprinkler for sanitizing the person. The sanitizing unit is portable so it can be fixed as per the need.

This project is divided into two parts i.e, Face Mask Detection and the sanitizer sprinkler. After completion of both the parts we will merge them and will make a complete loop system.

1. Face Mask Detection and Recognition:
Masks play a important role in protecting the health of individual against respiratory disease, as is one of the few precautions are available for COVID-19 in the absence of immunization. It is feasible to create a model to detect people wearing masks, not wearing the mask, or wearing masks improperly.

We are using CNN (convolution neural network) and Haar cascade algorithm which is a machine learning-based approach where a lot of positive and negative images are used to train the classifier. Positive image, these images contain the images which we want from the classifier to identify. Negative Image, images of everything else, which do not contain the object we actually want to detect from the classifier. Using this haar cascade we are going to recognize the presence of a mask on the person's face.

In this part first we detected the faces from the camera and then by using mouth cascade we are detecting the lips counters. When the face is detected but lips not detected which means person is wearing the mask and when the face as well as lips coordinates both are detected which means lips prediction is true and the person is wearing the mask.

We are creating the rectangle on the faces and eyes using open CV rectangular function, and also displaying the user message as an alert. After displaying the user message and a person is not wearing the face mask his/her information will be saved automatically in the XL sheet. XL sheet contents all information such as the persons Identification (person’s name), status of not covered face, Time and date as well.

1.1 Training Dataset: For the dataset, we need to gather the capture images from the webcam or the PI camera, for creating the dataset in python, we have to install some packages from environment. Next, we need to have at least 100 to 3000 captures of every single person for getting higher accuracy and meet the purpose which we are doing in this project. We can store the data in the form of separate folders distinguishing each person from others by their names or any id assigned to them.

1.2 Image Capture: For Image Capture, We require a HD camera in order to get the clear results. We can capture images from the video stream or by saving each and every image manually. By doing this the frame capture from the video stream will give us the results in short time but we would not be able to capture the faces properly if we lose lights or something and if the face is not captured properly then the accuracy may vary.

1.2 Face Detection: For detecting faces, this works by using the object cascading. The detection of the faces using cascading is bought by the most popular facial recognition model Viola-Jones algorithm. Here, there are many objects present in this algorithm. These are in the form of small blocks containing in them. They are then taken from an image and are moved through each and every block of the image and also they are checked for overlapping among them. First, we will convert the RGB image to grayscale image. The faces from the video captured are to be collected in a folder. The captured faces are cropped into small images of resolution 200x200. It would be around 15 KB in size.

1.3 Face Recognition: The faces which are in the dataset are needed to be load into the program. We have to load the captured images into that. Now we have to split the information of each and every person into testing and training datasets. Let us put it in the ratio of 0.2:0.8 from the dataset. Now we have to extract the features of all the training individuals and then we have to store them in the form of bits or bytes. We need to fetch the cropped as well as gray-scaled images. Now the training datasets are extracted with the features and also are stored in a folder. The images in the dataset along with their labels are then sent into a features array to identify them individually.

The features are sent along with the person ID to classify them and store them separately. This is completely done on the training dataset. Now we need to take a photo from the camera and detect the faces, extract the features, and then compare that with the data classified. We need a predicting method to compare classified data with the data we already have. Finally, it returns the ID to which the given data matches or almost matched. To have better results we need a bigger training dataset.

2. Sanitizer Dispenser:

Nowadays, sanitization becomes the most important step while coming or going somewhere. It reduces the risk of spread of covid-19 virus. But if the person is infected then only the hand sanitization is not sufficient, so to overcome from this problem and we came to a conclusion that we have to make a system which can sanitize the whole body of the person. We selected PIR sensor, which is a passive infrared sensor. It is electronic sensors that quantify infrared light diffuse from objects in its field of view. They are most frequently used in PIR-based motion detector systems.

We are using PIR sensor for detecting the motion of the person who is entering to the dispenser tunnel. After detecting the presence of the person the PR sensor will send a signal to the Raspberry Pi and after getting notified the Raspberry Pi will turn on the relay switch. After the relay switch is turned on the pressure pump start working and sprinkler nozzle will sprinkle the sanitizer for three second on the person who is detected by the PIR sensor.

3. Block Diagram:

3.1 Raspberry pi: For this system we are using Raspberry Pi model 3B+. The Control board consists of two 5V pins, two 3V3 pins, and 9 ground pins (0V). 5V: The 5v pins directly deliver the 5v supply coming from the mains adaptor. This pin can use to power up the Raspberry Pi, and it can also use to power up other 5v devices. We require the CSI port for camera module and The GPIO pin for PIR sensor, relay and LED.

3.2 PIR Sensor: Passive infrared (PIR) sensors use a pair of piezoelectric sensors to detect heat energy in the surrounding environment. These two sensors sit beside each other, and when the signal differential between the two sensors changes the sensor will capture.

3.3 PI Camera: The Pi camera module is a portable light weight camera that supports our Raspberry Pi model 3B+. we have used 5MP camera for detecting the mask as well as recognizing a person without mask.

3.4 Relay: A relay is an electrically operated switch. We used it to on the pressure pump after detecting the motion by PIR sensor.

3.5 Pressure Pump: Pressure pump with 12V DC and 0.7A delivers its maximum operating values with a pressure and flow rate of up to 1-3L/min which is can suck sanitizer through tube from up to 2m and pump sanitizer vertically for up to 3m.

3.6 Sanitizer Sprinkler: This is output section tunnel which is use to sprinkle the sanitizer contains a 1 pole relay, pressure pump, sprinkler. The sanitizer pump attached to the interface also gets to a count and turns the relay switch ON. The sanitizing unit is portable so it can be fixed as per the need.

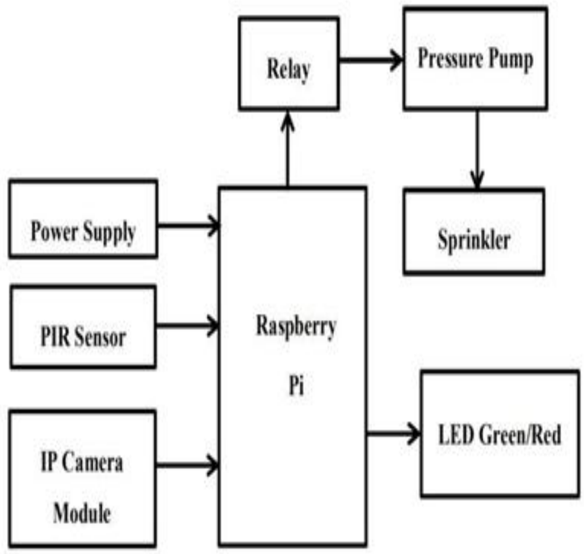

Fig 1. Block Diagram.

4. Flow chart:

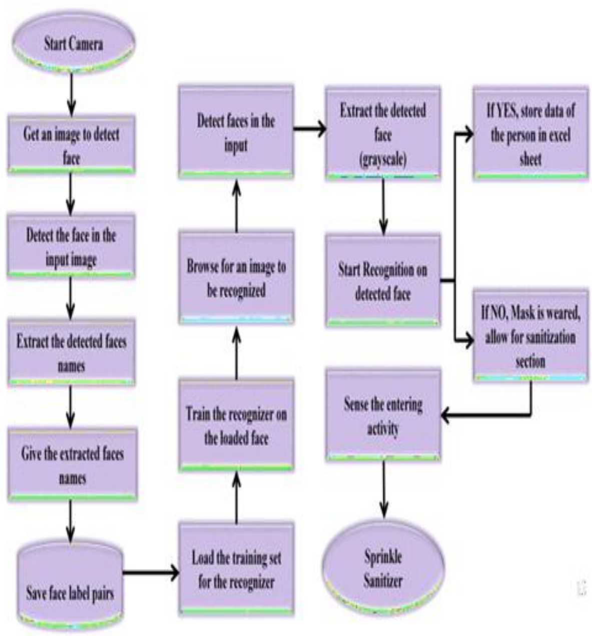

Fig 2. Flow Chart.

5. Simulated output of face mask detection and recognition:

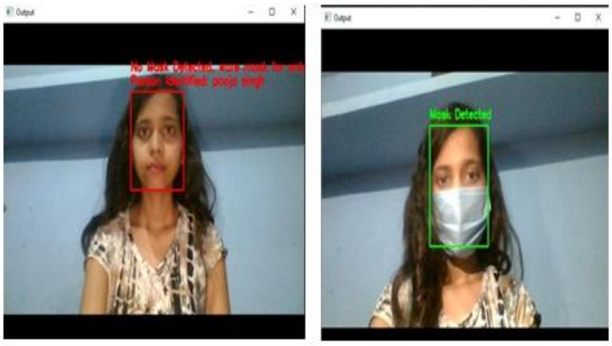

Fig 3. Face Mask of First Person.

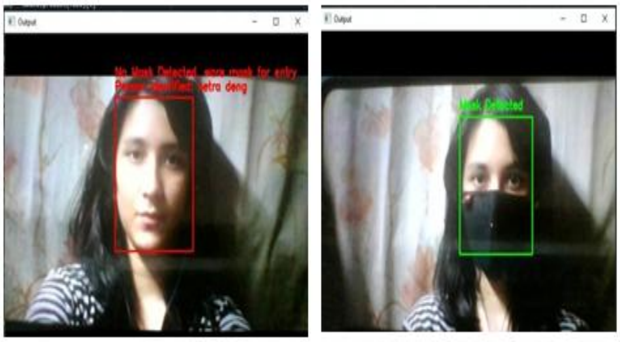

Fig 4. Face Mask of Second Person.

Table 1. Tables in excel sheet.

	A	B	C	D	E	F	G
1	Date	Time	Person Identified	Status			
2	4/5/2021	8:20:44 PM	pooja singh	No Mask Detected	wear mask for entry		
3	4/5/2021	8:24:36 PM	netra deng	No Mask Detected	wear mask for entry		
4	22/5/2021	9:45:12 AM	netra deng	No Mask Detected	wear mask for entry		
5	22/5/2021	9:53:52 AM	pooja singh	No Mask Detected	wear mask for entry		
6	29/5/2021	2:48:32 PM	netra deng	No Mask Detected	wear mask for entry		
7							
8							

6. Simulations of sanitizer dispenser system:

Fig 5. Simulation of Sanitizer Dispenser System.

IV. CONCLUSION

The purpose of this system is going to provide hygiene methods for entrance which is entirely based on face mask recognition using a sanitizer dispenser. Whole process would be feasible with the help of Raspberry Pi and Python-Open CV which will provide hands free sanitization i.e. touch less. This will also prevent the appearance of a person who will not cover face by the mask which further detects the presence of mask on the face and the system will allow the person to pass through the sanitizing section.

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