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FACE MASK DTECTION USING PYTHON

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Abstract- **With the passage of time, technology evolves and improves. It causes many people to rely on technology and becoming digitalized. Everything has some good and bad sides. This is also true with the technology advancement. But assuming that everyone uses technology in a positive way is not a clever approach; some people use it to commit crimes such as robberies and fraud. So, in some circumstances, when a robber is apprehended using a CCTV camera. The positive way modification to the CCTV camera technology is the addition of a facial recognition system. To recognise faces machine learning techniques can be utilized. The facial recognition requires certain data. As per the requirement of Covid protocol too, one must wear a mask to protect himself. As a result, this can also be used to determine whether someone has covered their face with a mask, handkerchief, or other cloth. By using the good data size, the system can be utilized in various dimensions and can help in identifying the person or state of mask used or not. This can further be utilized for challan etc.**

I. INTRODUCTION

Computers are vital in our life because they provide an electronic medium for information processing, storage, and transfer [1]. Computer vision is a branch of artificial intelligence that assists systems in extracting contextual information from digital photos, videos, and other media and taking actions based on that data. Computer vision's basic purpose is to detect objects correctly [5]. Facial recognition and face recognition are two of the most significant things, the proposed system can accomplish. Because of its application in surveillance, visual recognition is a particularly popular issue these days [2]. Face recognition can be done in a variety of ways. Face mask detection algorithm comprises of four phases such as data collection Data collection is one of four steps in the face mask detection process. The creation of data was done employing a webcam in the data gathering section. In the second phase, Haar Cascades data (HCD) is utilised to detect faces using features such as pixel differences and so on [6]. The third phase involves pre-processing data for training and testing [2], and the last phase involves showing the results of the processing by using a rectangle to pick an image part. The processing is done on a set amount of data.

II. LITERATURE REVIEW-

Today most of the organization uses face recognition and image processing for authorization. But the foremost aim of this project is to identify people who are not wearing face mask in Covid time. The authors have worked in the direction of face mask detection by applying various techniques. The author provides a way for detecting face masks on humans using TensorFlow and OpenCV [4]. A bounding box drawn on the person's face indicates whether the person is wearing a mask. When a person's face is saved in the database, the name of the person who is not wearing a face mask is recognized. A notification email is sent to that person to notify them and asking them to take precautions [7].

The author used a PCA (Principal Component Analysis) approach to identify the face hidden behind the mask. This is important in the security sector. It is one of the unique works focused on detecting the human face hidden under the mask. They found that the use of face masks reduced the accuracy of face recognition by 70%. [8]. In [9], the author has developed a way to detect how a person wears a face mask. The mask detection can be categorized into three categories: wearing face mask, not wearing face mask in right way, and not wearing face mask. This method achieved a recognition accuracy of98% or higher.

It is usually observed that, person wearing white coloured mask is usually not recognized correctly by Open CV [4]. Now to overcome this drawback we have to convert the image into black and white image using 'threshold' function.. From the above context we can conclude that there not so many resources available online and a lot of research and development is required in the same domain. Therefore, for further research in face recognition and image processing many new technologies are proposed regularly to increase the efficiency and accuracy.

Methodology-The comprises of four phases as discussed below-

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1. Data collection-

Data is collected from different sources for training and testing the model. The collection of the data performed using the webcam with the help of open CV [9]. The data was stored in the form of arrays. Array contains the colour code configuration of every pixel of the picture. The set of one pixel configuration contains special RGB code arranged in order $[B_i,G_i,R_i]$ where I [0:N].

2. Image Processing-

Some are classical face recognition algorithms, artificial neural networks, Gabor wavelets, face descriptor based methods, 3D-based Face Recognition, Video Based Recognition [3]. Several steps and methods are performed to achieve the image processing. The image detection process detects the object with the help of colour processing and then Sent in the image pre-processing block and the resize of image take place. After that it will read only lighter and dark colours and background in RGB adjustment. The next step in colour processing is the elimination of unrelated colours. Unrelated colours are eliminated by comparing the current pixel RGB value with the default values of the image. The four step points are –

1. Prepare a colour image
2. RGB adjustment of the image
3. Detect image pixels and remove irrelevant object colour.
4. Remove colour unrelated to black.

The image left after colour processing is the clear object. The object detection process is used to detect objects. The image is required to be converted to a greyscale medium filter to eliminate small pixels. By removing pixels inside the medium filter which is smaller, the edge of the object is clarified. After the previous step it changes to binary image and undergoes another object elimination which is going to eliminate objects less than 200 pixel in group of objects. After CHT the selected object is used to find a pattern within the image. It transforms some feature in the image into parameter space. The votes received are stored in the form of array and the highest number of the array shows the object.

3. Haar Cascade Data-

Haar cascade data use an algorithm which works upon the light reflection on face [6]. For example the tip of nose is always brighter as compared to other part of nose. Similarly for the region above eyes we see there is much brighter region than the region below the eyes. These feature detections help us to find the edges and lines present in the image, it also helps us to find if there are some sudden changes in the image. For e.g., a spot of light in a dark image. Our objective is to come acrossthe entire image pixels in the dark area of the haar feature. Similarly calculate the aggregate of the pixels in the bright area of haar feature. Now we have to calculate the difference of these two. Now to conclude that weather there is some line or edge we have to observe the difference obtained if the difference is closer to 1 it confirms the presence of edge. Now in the above example as we can see that the difference obtained is not close to 1(difference = 0.2). So it concludes that there is no edge detected. As shown in the Figure 1 below.

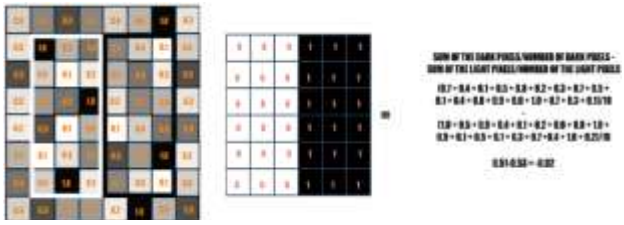

Figure 1: ColorCode Difference Identification in Pixels

Below in figure 2 is shown a single example of haar feature detection which detects the vertical edge. But for the better image processing and accurate results one has to detect all the edges so for edge detection or feature detection the traversal of whole image takes place to find different edges. Traversal of haar feature starts from upper left to the lower right of the image and searches for the specific feature. This is just an explanation for better understanding. Actually, the haar feature traverses over pixel to pixel in the image and searches for all possible features of different sizes.

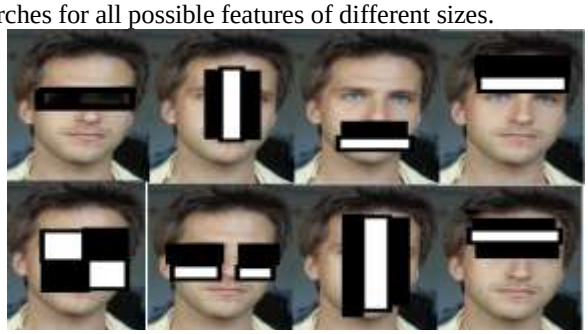

Figure 2: Haar Feature Regocinition

In the above example we saw the two rectangle feature demonstration. It is used to detect the edges in the image (horizontal and vertical). The second one, three rectangle features are used to find that if there is some dark area surrounded by lighter region or vice-versa. The third set of four rectangular features serves to change the pixel intensity across the diagonal.

4. Face Mask Detection-

The subset of all 6000 features run on the images again to get the presence of facial experience. Authors have set the standard size to 24x24 within which the features are to be

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detected [3]. There are some stages for feature detection in Attention Cascade as shown in Figure 3.

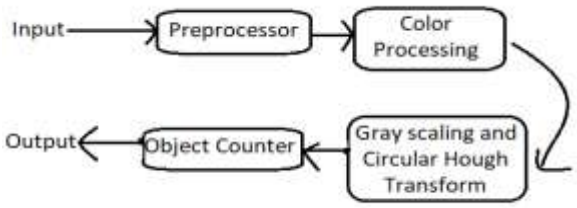

Figure 3: Recognition Block Diagram

Features are detecting starting from simpler features to the complex ones firstly small features are determined followed by complex ones. If at the initial stage the features are not detected then the process itself comes of the processes and goes to the next window. This saves a lot of processing time by skipping the irrelevant windows and not processing the mat most stages. The second stage processing will only be start if the features in the image were identified in the previous stage. The process continues in the same manner, i.e. if the stage is successful, then it moves to other stages but if it doesn't passes the stage, the process discards. This all is done on both the dataset for with and without mask dataset and on the base of difference the result is shown as there is the colour difference between the skin and face. As shown in Figure 4, the system has detected no mask state on face.

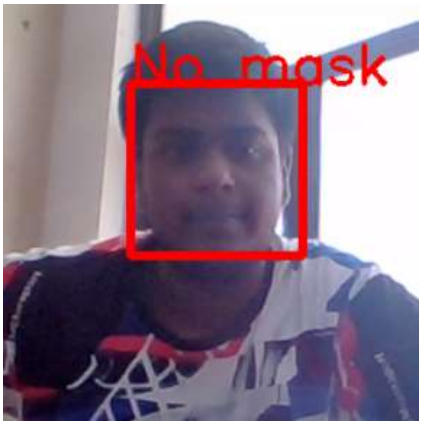

Figure 4: Face Detection

III. RESULTS

By using the above algorithm and process a project has been developed which perform real-time face mask detection using open CV[4]. The system achieved an accuracy of 98% approx. It can detect multiple faces at a time and gives output as green box on face representing the mask and red representing the face without mask as shown in figure 5. It collects the data from the webcam for detection of face mask. Below shown in figure 5 is the final result of our project and the user interface.

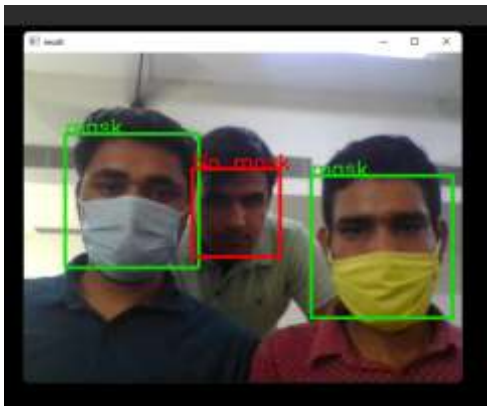

Figure 5: Result of Face Mask Detection

The model uses the predefined data and gives output as shown below in the figure 6 in terms of three parameters:
1. Shape of image (dimensions)
2. Size of image
3. Accuracy of result

Figure 6 represents these are the parameters in respective lines

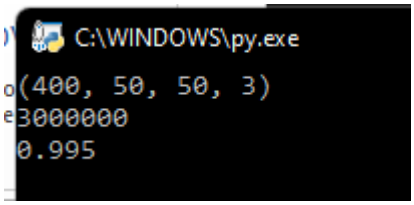

Figure 6: Output Parameters

IV. CONCLUSION & FUTURE SCOPE-

Digital image processing has received a great attention in past few decades. The image processing provides various real life applications. There are many techniques that are used to build intelligence systems and many are in progress. By applying image processing and OpenCv technology, the system have achieved 98% accuracy. Facial recognition is used to identify a face using the AI technology. It uses feature mapping algorithm and detects the face on the base of features. Facial Recognition differentiates the face from the background environment. These features are recognized as nodes by facial reorganization. A human face consists of 80 nodal points. After this calculation the details are stored in form of numerical data called as the face print.

Facial recognition has a very bright future. It is very much predictable that a very high revenue market is there in future in this domain. Security and surveillances is the most demanding zone for this technology. It's also been used in some corporate schools and university for

attendance and security purposes. It is estimated that the in future shopkeepers and sellers may use it to make the authentication against the debit/credit card billing. This can also replace the password system in future. This can also be used in government purposes such as recognition / verification in airport and may even replace humans in future. The proposed model has some drawbacks too. The first of all the data set does not update itself which can be overrode by applying deep learning into the project. Secondly the present project works for only the frontal face but to extend it to sideways and frontal both we have to consider deep learning in our project.

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