Face Mask Detection System

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Abstract— In the current pandemic situation world-wide, wearing a face mask is a mandatory in order to stay safe. As the country starts going through various stages of unlocking the social restrictions, face masks have become an important element of our daily lives to stay safe. Wearing face masks is a must in order to socialize or conduct business. Face Mask Detection" is an application that detects a human's facial region and identifies whether he/she is wearing a mask or not. So, this system utilizes a camera to detect if a person is wearing a mask or not. If they are found not wearing a mask, it will emit a warning buzzer so that they get alerted to wear a mask, else send a SMS to notify that person to wear a mask as he/she is in public. This project is built using python, fast2sms messaging API and face_recgonition library. The project is built in 3 modules. The first module is mainly used for training the machine to detect facial features and to recognize faces who are not wearing masks properly. The second module acts as a temporary database from which the daily report is generated at the end of the day. The final module takes the uses the recognized face's name and phone number to generate and send a SMS alert to the concerned person. The outcome of the project helps the organization to identify people without mask and give warning accordingly. The project is tested for the various ways in which the mask can be worn. All the modules are tested and the project is implemented successfully.

Keywords: Face Mask Detection System, API, Face Recognition, COVID-19

I. INTRODUCTION

In this pandemic situation the coronavirus disease (COVID-19) has seriously affected the world and there is no end to it. To limit the spread of the virus, rules to wear a face-mask mandatorily are now becoming more common in public places all over the world. In this situation many retail stores, metro stations, colleges and other public service providers require people to wear face masks when in public.

Based on the above problem statement we have to add a Face Mask Detection System that can be used at office, college and metro stations in small area premises to detect if people are maintaining safety standards at work. It monitors the people without masks and sends them a reminder to wear a mask. If the same person is not wearing the mask for particular times then it will send a message to the particular person based on which we add on the dataset.

In this method, some Face images are required to train a machine learning model to detect faces in an image. This method requires lots of data and pre-processing to build a face detector but it gives better results than a feature-based face detector. This is the basic principle of the face recognition module which we have used in the project. [1]

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II. LITERATURE SURVEY

A. N. Ozkaya, S. Sagiroglu, "Intelligent face Mask Prediction System":

Biometric based person identification systems are used to provide alternative solutions for security. Although many approaches and algorithms for biometric recognition techniques have been developed and proposed in the literature, relationships among biometric features have not been studied in the field so far. In this study, we have analysed the existence of any relationship between biometric features and we have tried to obtain a biometric feature of a person from another biometric feature of the same person. [2]

B. ADINI, Y., MOSES, Y., AND ULLMAN, S. 1997. Face recognition: The problem of compensating for changes in illumination direction. IEEE Trans. Patt. Anal. Mach. Intell. 19, 721–732:

We propose a novel hybrid illumination invariant feature selection scheme for face recognition, which is a combination of geometrical feature extraction and linear subspace projection. By local geometry feature enhancement technique, neighbourhood histogram equalization (NHE) in our experiment, some illegible edges due to weak illumination will be enhanced effectively. [3]

C. PHILLIPS, P. J., MCCABE, R. M., AND CHELLAPPA, R. 1998. Biometric image processing and recognition:

Biometric-based identification and verification systems are poised to become a key technology, with applications including controlling access to buildings and computers, reducing fraudulent transactions in electronic commerce, and discouraging illegal immigration. There are at least eight image-based biometrics that are being actively considered. In image-based biometrics, the biometric signature is acquired as an image and the image is processed using techniques from computer vision, image understanding, and pattern recognition. We consider two promising image-based biometrics, faces and fingerprints. For each, we provide a critical assessment of the state of the art, suggest future research directions, and identify technological challenges. [4]

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E. Facial Recognition System for People with and without Face Mask in Times of the COVID-19 Pandemic:

This prototype system allows for the facial recognition of people with and without a mask, and could be used as a low computational consumption proposal for personnel access control. The two models of this system are tested with images, thus achieving better precision and optimization for each model. [6]

III. EXISTING SYSTEM

The identification of masks is carried out manually by authorities, this leads to more interactions between people, which may lead to increased virus transmission if people are infected. In image-based biometrics, the biometric signature is acquired as an image and the image is processed using techniques from computer vision, image understanding, and pattern recognition. We consider two promising image-based biometrics, faces and fingerprints. For each, we provide a critical assessment of the state of the art, suggest future research directions, and identify technological challenges.

A. Disadvantages

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IV. PROPOSED SYSTEM

This plan can be utilized in schools, hospitals, banks, airports, etc. as a computer examining device. The process of determining people's faces and isolating them into two types namely the people with masks and people without masks is done with the assistance of image processing and deep learning.

In this we expect when the machine detects the face for a particular number of times it will recognize the person and store in the database the person's name, date and time. This data will be stored on that day and after it will be erased, In that we have to make one document where all data is stored in the database.

In this method, some Face images are required to train a machine learning model to detect faces in an image. This method requires lots of data and pre-processing to build a face detector but it gives better results than a feature-based face detector. This is the basic principle of the face recognition module which we have used in the project.

A. Modules

1) Main Module

Training the machine to learn faces by adding new images. Mapping the facial features to their respective names. Creating a database of phone numbers of all new images added.

2) Message Module

Unique authorization for accessing the message API from fast2sms website. Sending the message request to the website using the previously configured URL, message and phone number.

B. Advantages

The advantages for the proposed system can be listed out as follows:

1) Creates awareness about healthier practices to the public.
2) Reduce workload for public monitors, police officers, health workers, doctors etc.
3) Reduces the chance of virus transmission.

V. SYSTEM PERSPECTIVE

The block diagram gives you an outlined idea of how the 'Face Mask Detection System' works. It shows what exactly happens when the system is up and running.

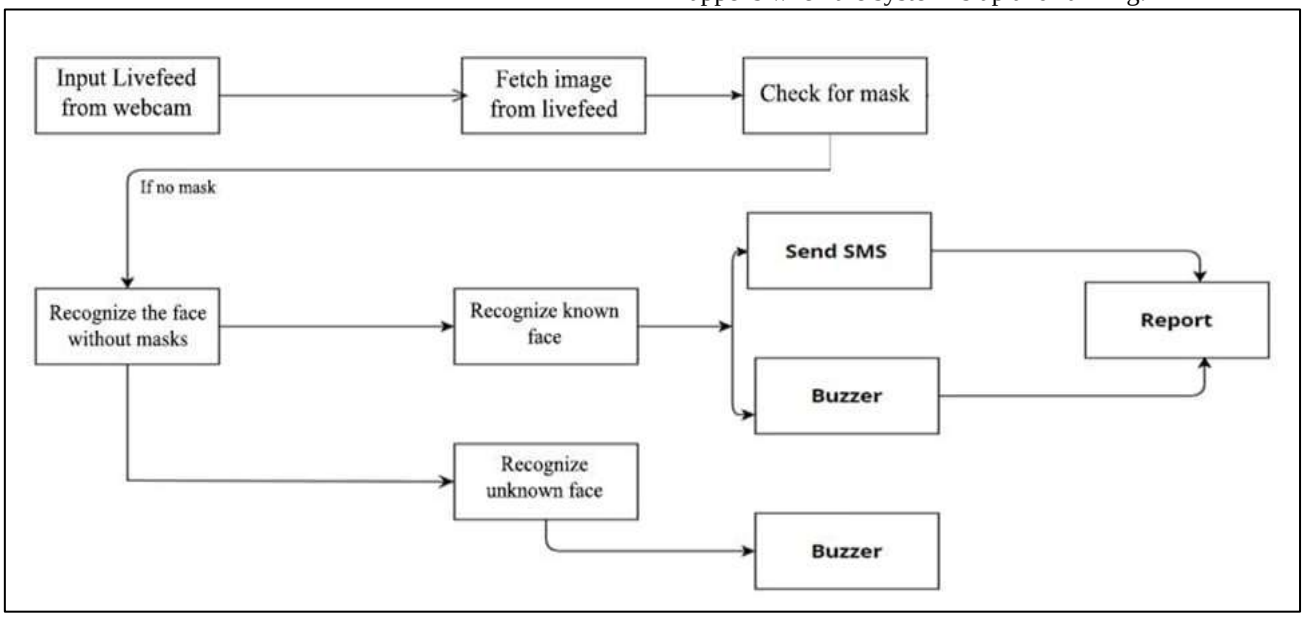

Fig. 1: Block Diagram of Face Mask Detection

VI. SYSTEM REQUIREMENTS

The purpose of the System Requirements is to outline the requirements for the project "Face Mask Detection System".

A. Hardware Requirements

- PyCharm software
- Raspberry Pi 4
- Micro SD card to install Raspbian OS
- USB Webcam
- Power Supply
- Internet connection

B. Software Requirements

- OS: GNU Linux based Distro
- IDE: PyCharm

VII. RESULT AND DISCUSSION

In this we presented a study on facial recognition and face mask detection through machine learning techniques by building a CNN model using transfer learning and fine-tuning techniques. This process gave accurate and quick results for facial recognition security systems that recognize that half of the faces are covered with face masks. The test results show a high accuracy rate in identifying individuals wearing a face mask, not wearing a face mask, and wearing a face mask but in an incorrect manner. Here we create a model to achieve more performance on accuracy. Moreover, the study presented a useful tool in fighting the spread of the COVID-19 disease by allowing all individuals to wear a face mask while performing face recognition. Facial recognition with a face mask is becoming more and more important over the past year due to the spread of the COVID-19 virus. Our future works include alarm if somebody is not wearing a face mask properly, and detection of social distancing. And store the unknown faces, record the date and time, and how many times they don't wear a mask in a particular place.

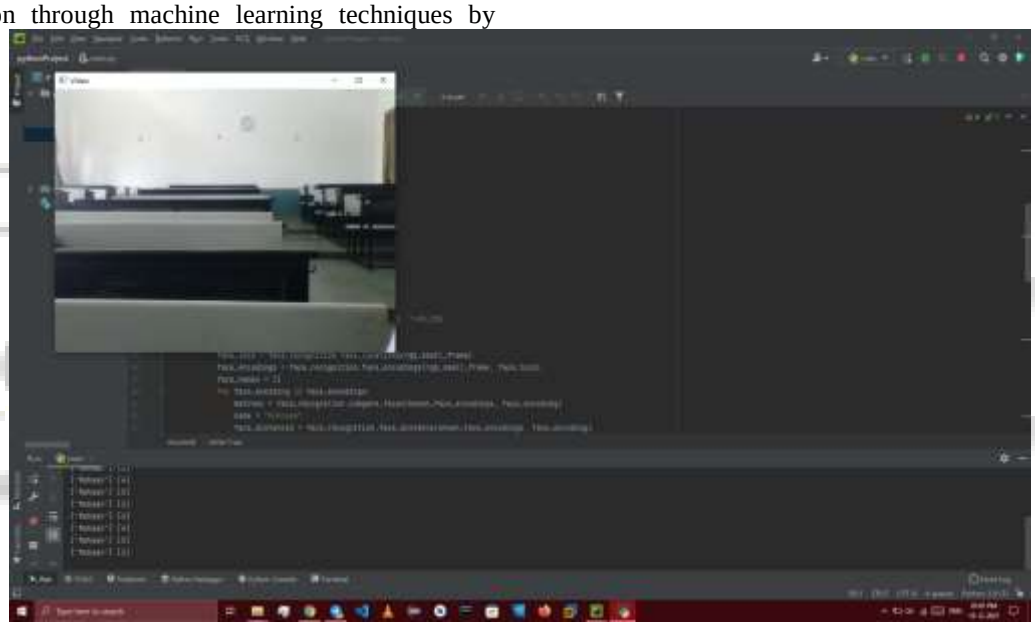

Fig. 2: The above image is of the interface which takes reading from a webcam.

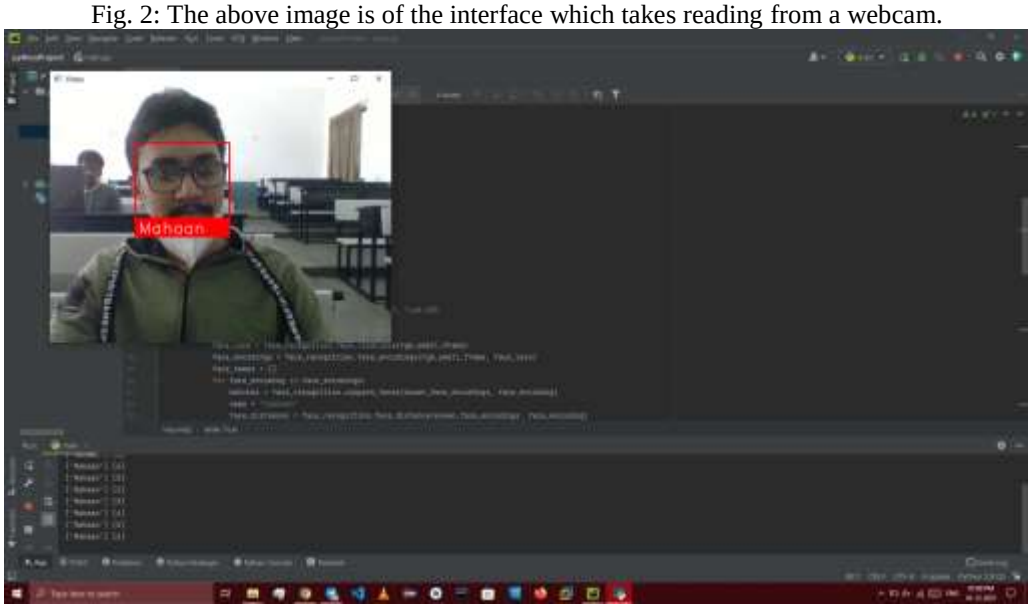

Fig. 3: Name of the recognized person who's not wearing mask properly

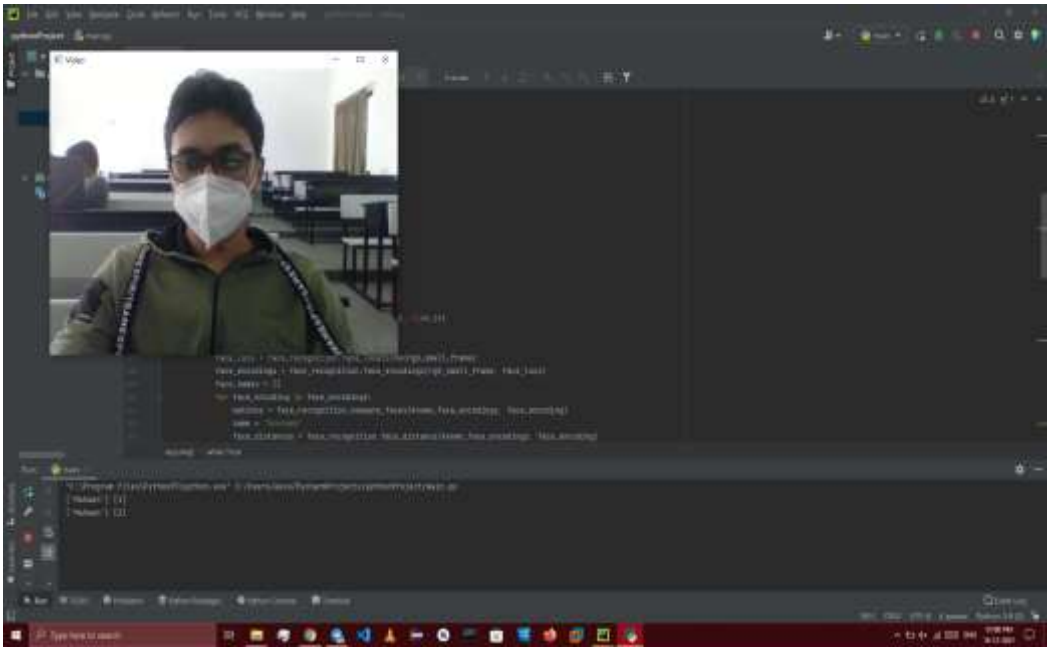

Fig. 4: Face wearing the mask in a proper way

Fig. 5: Alert reached in the form of message.

VIII. CONCLUSION

The computational models, which were implemented in this project were chosen after extensive research. The successful testing results confirm that the choices made after the research is reliable. This system was tested under very robust conditions in this experimental study and it can now be used in that real-world. The performance will be accurate. At the end of the day, we can check how many people were not following the guidelines to wear masks and on how many instances.

Based on these literature surveys we found that here they only recognize the face and add biometric software only. When the face is detected it will only give a buzzer sound by recognizing the face through the camera. First they will find the biometric option for the security purpose by adding some algorithms. For this feature we are adding some other tools or techniques like face detection along with biometric options. By analysing these literature surveys it will recognise only faces and analyse the fingerprint through the biometric, but in these features there is no storing of data by recognising a person.

ACKNOWLEDGMENT

The satisfaction and euphoria that accompany the success of any work would be incomplete unless we mention the name of the people who made it possible.

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