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Developing an Integrated Image Processing Enhanced Mask Detection Model for Effective Monitoring of the Covid-19 Coronavirus Outbreak

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ABSTRACT:

We see many people wearing masks every day, and just by looking at them, we can tell what kind of mask they are wearing and whether or not they are wearing it correctly. However, what if we need to talk about a large number quickly? This system will be designed to determine whether a person is concealing themselves behind a mask by analysing the face of the individual; If that's the case, then are they properly utilizing it, and lastly, what kind of mask is it? Additionally, we will be able to process this data in a single instance for thousands of individuals.

INTRODUCTION

The current COVID-19 outbreak has infected more than thirteen million thirty-nine thousand eight hundred fifty-three people and resulted in more than 571,659 deaths in more than 200 countries around the world, with a mortality rate of approximately37 per cent versus less than 1 per cent for influenza.

Person-to-person transmission of a novel coronavirus has occurred, but an asymptomatic carrier can also transmit the novel coronavirus that causes 2019's illness (COVID-19) without symptoms. Currently, neither a vaccine nor an antiviral medication that is clinically approved is effective against COVID-19. The virus has rapidly spread globally, posing significant health, economic, environmental, and social issues for the entire human population. The World Health Organization (WHO) currently recommends that people wear face masks to reduce the risk of virus transmission and keep a social distance of at least 2 meters between themselves to prevent disease transmission. In addition, several providers of public services require customers to wear masks and maintain safe social distancing before using their services. Consequently, image detection tasks like identifying face masks and maintaining socially acceptable distances have grown crucial to the advancement of global civilization. By monitoring in real-time whether people are using safe social distancing and wearing face masks in public places, this study outlines a strategy for preventing the virus from spreading.

The global Covid19 pandemic is spreading rapidly. Numerous essential tools are required in the fight against the Coronavirus. One of these requirements is a face mask. At first, everyone didn't have to wear face masks, but scientists and doctors said that everyone should as the day went on. We will now employ the Viola-Jones method to determine whether someone is wearing a face mask.

Viola-Jones' strategy utilizes picture handling to decide if an individual is wearing a cover. To determine whether or not a person is wearing a mask, the application can be used with any new or existing IP camera. In this project, we will investigate several essential face mask detection characteristics, not just in Covid19 scenarios but also in everyday ones. The goal of face detection is to check to see if the image or video has any faces. We can tell where each face is if there are many of them by looking inside a bounding box. Face detection can be accomplished using either image-based or feature-based approaches.

Melanoma typically affects people between the ages of 20 and 40. Regular visits to the doctor are essential to check for and find these kinds of diseases. However, there are times like the current

pandemic of coronavirus diseases (COVID), which is affecting the entire world. Getting in touch with a doctor might take a lot of work. Because of this, the proposed work would also be very helpful to people who could not get in touch with a doctor directly because it uses an online telemedicine approach.

PROPOSED METHODOLOGY

The system is intended to determine whether a person is wearing a mask by detecting their face; If that's the case, then are they properly utilizing it, and lastly, what kind of mask is it? Image processing can be improved by reading the Haar features of a human face on a grayscale contrast using the Viola-Jones Algorithm.

In object recognition, digital image features known as Haar-like features are utilized. Due to their intrusive resemblance to "HAAR Wavelets," they were utilized in the first real-time face detector.

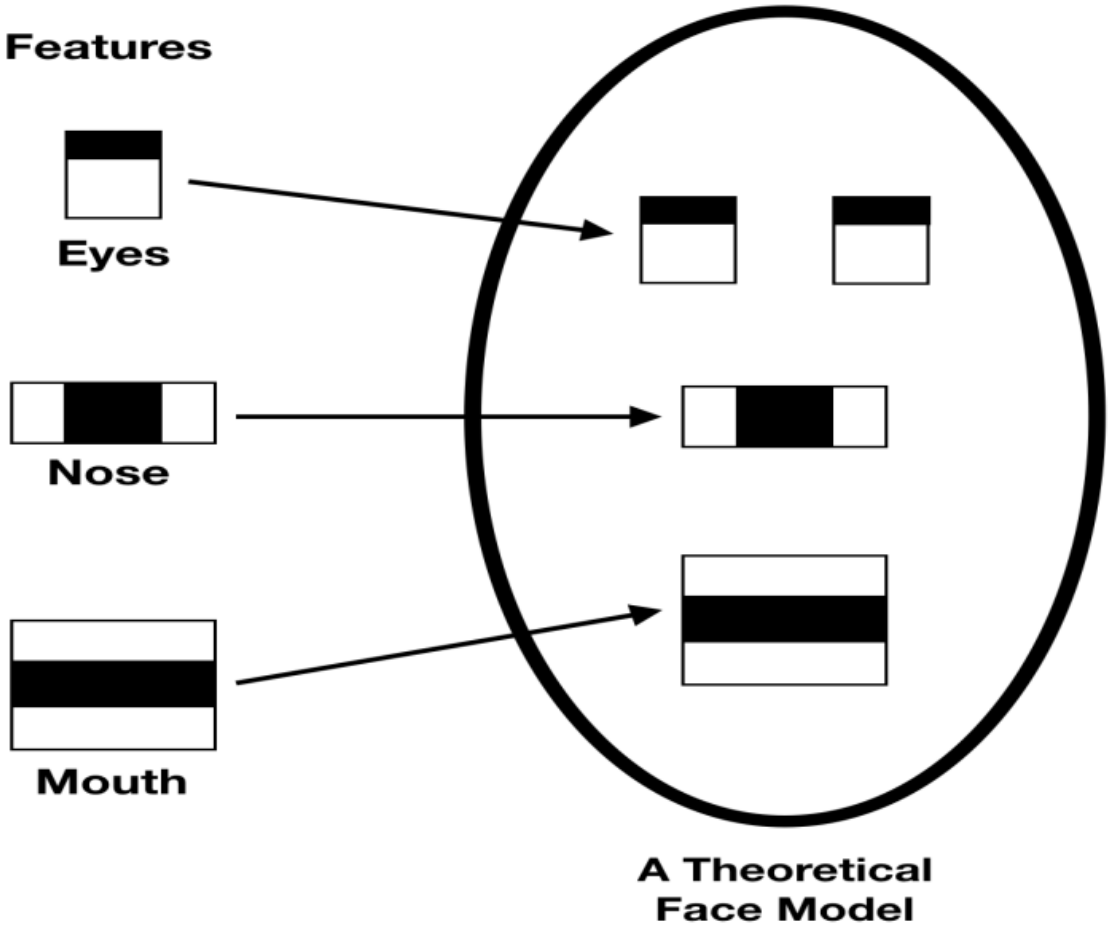


Fig. 1 Distributive pattern of HAAR details on a theoretical face model

A. Viola-Jones Algorithm In 2001, Paul Viola and Michael Jones proposed the Viola-Jones object detection framework as object detection framework. The face detection problem was the driving force behind it, even though it can be trained to recognize a variety of object classes.

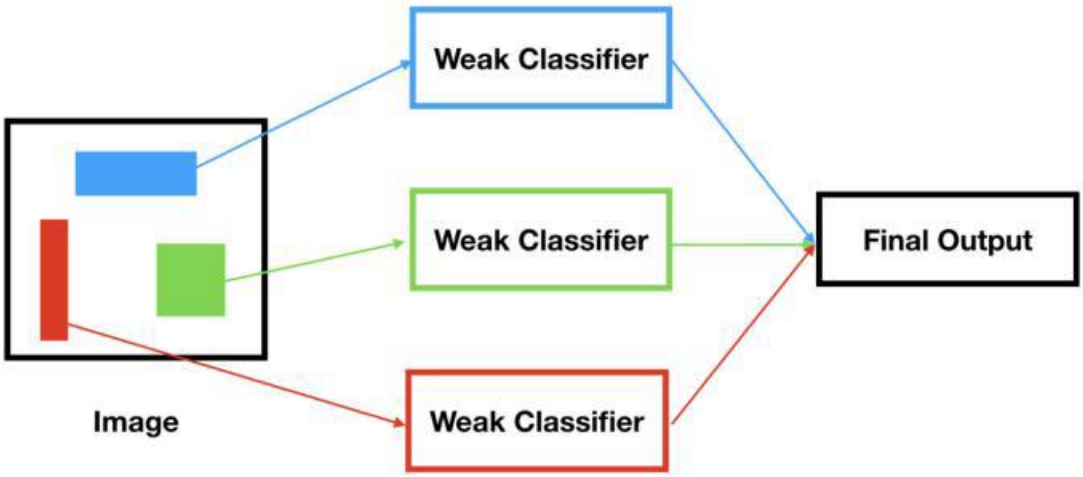
However, the number of features must be adequately compensated for by the speed at which they can be evaluated. For instance, there are a total of M=162,336 possible features in a standard 24x24 pixel sub-window, and testing an image with all of them would be prohibitively expensive. AdaBoost, a variant of the learning algorithm, is used in the object detection framework to select the best features and train classifiers that use them. A linear combination of weighted simple "weak" classifiers is used to create this algorithm's "strong" classification.

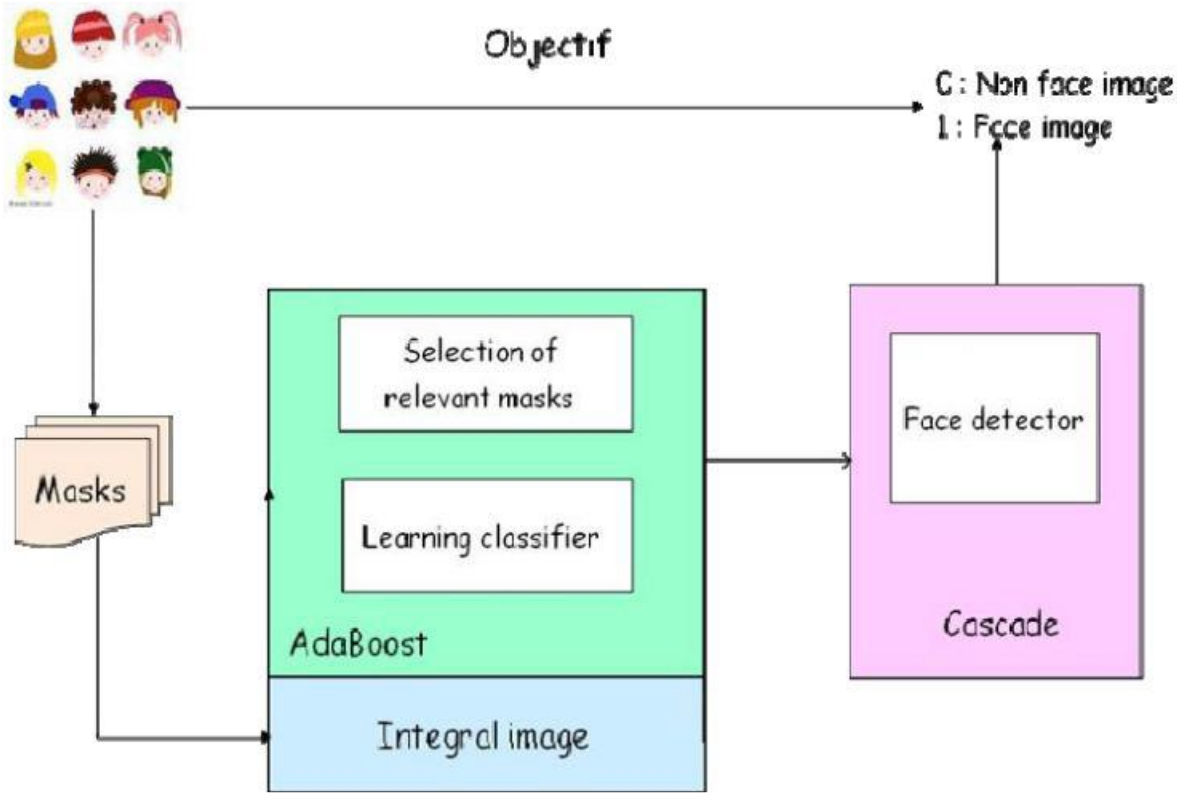
$$h(\mathbf{x}) = \operatorname{sgn}\left(\sum_{j=1}^{M} \alpha_j h_j(\mathbf{x})\right)$$

Each weak classifier is a threshold function based on the feature f_j.

$$h_j(\mathbf{x}) = \begin{cases} -s_j & \text{if } f_j < \theta_j \\ s_j & \text{otherwise} \end{cases}$$

The threshold value θ_j and the polarity $s_j \in \pm 1$ are determined in the training, as well as the coefficients α_j.





B. Applications

1) Checking: This system can be used to watch people wearing masks in public places, which is one of its main applications.

2) Quantitative: The provision of the collected data for statistical purposes is the second significant application of this system. to use the statistics to conduct research and figure out how many people wear masks in public areas.

3) Business: The industry can rely on the system to keep an eye on things and enforce rules so that workers always wear masks.

EXECUTION

The language utilized in this framework will be Python, as it is an undeniable level, intuitive, universally useful programming language that is generally utilized. Web development, applications based on machine learning, and all other cutting-edge software technologies use it.

Its language features and object-oriented approach are made to help programmers write code that is easy to understand and follows logic for both small and large projects. Python's concise and simple syntax emphasizes readability, resulting in lower software maintenance costs.

OpenCV, a large open-source library for computer vision, machine learning, and image processing, will be used in this system. Real-time operations, which are essential in today's systems, rely heavily on it. It might recognize things, faces, and, surprisingly, human penmanship in photographs and films. Utilizing modules like NumPy, Python can process the OpenCV array structure for analysis. We utilize vector space and execute numerical procedures on these highlights to distinguish visual examples and their different elements. TensorFlow, Keras, Numpy, MatPlotLib, and Scipy are some of the other important libraries used, and the instructions will be written in Jupyter Notebook. It is an open-source project that lets you use computational data to make beautiful, high-quality books and documents.

The system accurately determines whether or not a mask is on a person's face. The image processing method achieves 99.34 per cent, which is a respectable level of accuracy.

B. Advantages The system contributes to the following:

1) Cost Proficient

2) High Location Rate

3) Expanded Exactness

4) Less Handling of Tim

CONCLUSION

The proposed framework is a methodology that utilizations picture location procedures to assist with keeping a solid climate and guarantee individual insurance via consequently observing public spots to forestall the spread of the Coronavirus infection, as well as helping the police by lessening their actual reconnaissance work in control zones and public regions where ongoing observation is required.

Consequently, in the current circumstances, this proposed system will effectively and automatically track public locations when the lockout is lifted. We've gone over the following distinguishing proof of facial coverings that help human well-being exhaustively.

This solution was put into action and tested in real-time with success.

The proposed system would save time and reduce the spread of the coronavirus while also improving public safety because real-time actions can significantly reduce violations. This technique can be used in airports, shopping malls, metro stations, temples, and other locations.

The framework shows out to be approx.99.34 % Reliable.

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