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THE NOVEL APPROACH FOR AUTOMATIC FACIAL MASK RECOGNITION FOR VISITORS AND EMPLOYEE IN AN ORGANIZATION TO PROVIDE FACE MASK

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Abstract

Surveillance has become an active research topic. Video analytics enhance video surveillance systems by performing tasks of real-time event detection and post-event analysis. This can save Human resources, costs and increase the effectiveness of the surveillance system operation. One of the common requirements of Video Analytics for security is to detect the presence of a masked person automatically. In this project, we propose a technique for masked face detection using four different steps of estimating distance from the camera, eye line detection, facial part detection, and eye detection. The paper outlines the principles used in each of these steps and the use of commonly available algorithms of people detection and face detection. This unique approach for the problem has created a method simpler in complexity thereby making real-time implementation feasible. Analysis of the algorithm’s performance on test video sequences gives useful insights to further improvements in the masked face detection performance.

Keywords: Surveillance, face detection, Video Analytics, people detection.

I. INTRODUCTION

By traditional video surveillance methods, a security person will have the duty of staring at hundreds of screens. It is a challenging job for a person to monitor everything effectively even between only two screens. Due to the limitations of human eyes, eyes get tired quickly after a few minutes even if one has to stare at a single screen for a longer duration. Security being of utmost importance, the increasing demand in this area challenges academic researchers, as well as industrial practitioners to timely, provide analytics theory and system solutions to meet the overwhelming global need. The challenge is twofold, although hardware of video surveillance systems has been developing quite fast in recent years due to the application-specific digital

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signal processors, hardware-oriented issues are still demanding and unsolved especially for specific applications. On the other hand, analytics based on algorithms have been targeted as the breakthroughs for intelligent video systems and analytics. Whereas the action recognition community has focused mostly on detecting simple actions like clapping, walking, or jogging, the detection of the person wearing a mask has been comparatively less studied. Such capability may be extremely useful in some video surveillance scenarios like in malls, banks, shops where there are very high chances of robbery and other possible threats, etc. General mask detection or scarf detection algorithms deal with complex algorithms like feature-based algorithms and learning-based algorithms. Methods based on facial features exploit the information of facial features such as the mouth or skin color to decide whether there is occlusion on the face or not. Jia H. and Martinez A. M. propose support vector machines for occluded face recognition. Min. R. approach occluded face detection with Gabor wavelets, principal components analysis, and support vector machines. However, these techniques are computationally intensive.

II. PROPOSED ALGORITHM

Security being of utmost importance, video surveillance has become an active research topic. Video analytics enhance video surveillance systems by performing tasks of real-time event detection and post-event analysis. This can save human resources, costs and increase the effectiveness of the surveillance system operation. One of the common requirements of Video Analytics for security is to detect the presence of a masked person automatically. In this project, we propose a technique for masked face detection using four different steps of estimating distance from the camera, eye line detection, facial part detection, and eye detection.The project outlines the principles used in each of these steps and the use of commonly available algorithms of people detection and face detection. This unique approach for the problem has created a method simpler in complexity thereby making real-time implementation feasible. Analysis of the algorithm’s performance on test video sequences gives useful insights to further improvements in the masked face detection performance.

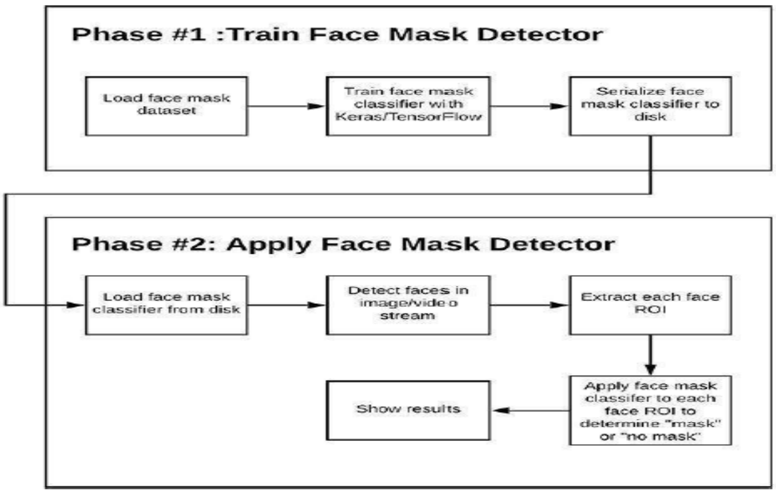

Figure 1: System architecture

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The ideal way to identify whether a person is approaching the camera or going away is to find out the distance between the person and the camera. As the person approaches the camera, the distance between person and camera will decrease, and face detection can be triggered. To find out the distance between person and camera, a pinhole camera model is used. The pinhole camera model is a simple camera model in which, light enters from the scene or distant objects, but only a single ray enters from any particular point. This particular point is then “projected” onto an imaging surface. Due to this, the image on this image plane (or projective plane) is always in focus, and the size of the image relative to the distant object is given by the camera’s focal length. For an ideal pinhole camera, the distance from the pinhole aperture to the screen is precisely the focal length.

2.1. Eye Line Detection

In this step of masked face detection, an eye line is detected in the output window of person detection. Eyes and eyebrows are regions with low gray levels compared to other parts of the face; their locations will correspond to the local valley of the horizontal projection histogram. So the eye line detection algorithm can be reduced as a valley finding procedure on the horizontal gray value projection histogram. We extract the top 30% part of the detected window which is obtained as a result of person detection and calculate its horizontal projection histogram. The valley in horizontal projection Histogram corresponds to the eye line. As the eye line is detected, we consider that person is approaching the camera and activate face detection. If an eye line is detected and the face is not detected, it indicates that it is a mask.

2.2. Facial Part Detection

Facial part detection based on masked face detection is achieved in two parts. Face detection is followed by facial part detection. Facial part detection based on masked face detection is achieved in two parts. Face detection is followed by facial part detection. Face detection as well as detection of facial parts like eyes, nose, and mouth is implemented by Viola Jones’s algorithm. Some of the advantages of the Viola-Jones algorithm are, it is robust with a very high true detection rate and very low false-positive rate, it is real-time and at least 2 frames must be processed per second. The algorithm has four stages, namely, Haar Feature Selection, Integral Image creation, Adaboost Training, and Cascading Classifiers.

III. EXPERIMENT AND RESULT

Mask detection through a picture, we specify the image path in the code, after we run the file in command prompt, it will instantly open the chosen picture in the desktop and detect if the person in the picture is wearing the mask or not. You can see the red rectangle which means the person is not wearing a mask and a green rectangle which means wearing a mask.

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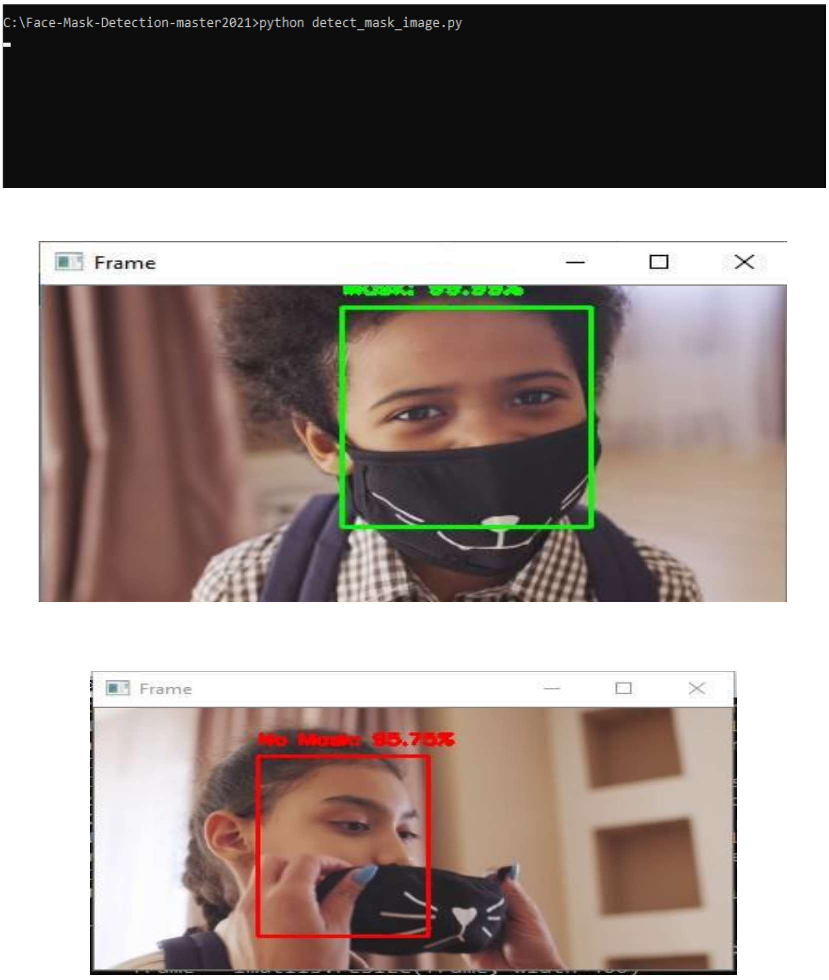

Figure 2: Output for Running the detect mask image file in the command prompt.

Figure 3: Detection of output without Mask:

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Figure 4: Detection of output with Mask:

Mask detection through a Live camera instantly opens the camera in the desktop and detects if the person is wearing the mask or not. You can see the red rectangle which means the person is not wearing a mask and a green rectangle which means wearing a mask.

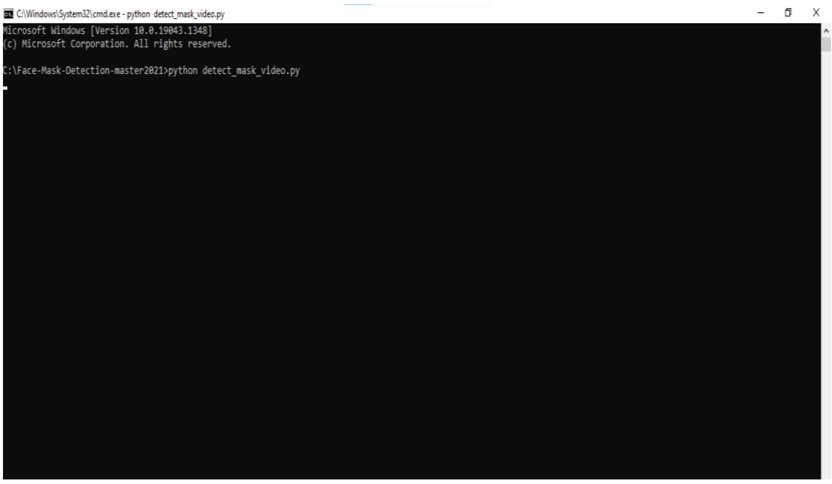

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Figure 5: Detection of masks in a moving video.

Mask detection through a video, we specify the video file in the code, after we run the file in command prompt, it will instantly open the chosen video in the desktop and detect if the person is wearing the mask or not. You can see the red rectangle which means the person is not wearing a mask and a green rectangle which means wearing a mask.

IV.CONCLUSION

In this project, we propose a technique for masked face detection using four different steps of estimating distance from the camera, eye line detection, facial part detection, and eye detection. The project outlines the principles used in each of these steps and the use of commonly available algorithms of people detection and face detection. This unique approach for the problem has created a method simpler in complexity thereby making real time implementation feasible. Analysis of the algorithm's performance on test video sequences gives useful insights to further improvements in the masked face detection performance. By the development of face mask detection we can detect if the person is wearing a face mask and allow their entry would be of great help to the society. The accuracy of the model will be achieved and the optimization of the model is a continuous process and so we are building a highly accurate solution. We can prevent peoples from Virus Transmission through this System.

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