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Covid - 19 Mask Detection Using CNN Algorithm

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ABSTRACT: The paper deals with mask detection in the age of COVID - 19, by proposing a simple and efficient method to detect people not wearing mask. The approach includes a feature extraction step followed by a supervised learning model built with support vector machines. The features are formed of color information by considering red, green and blue channels for an RGB color image. Ratio of color channels is taken into account to discriminate between mask and non mask images. The approach has been tested on a set of 1211 facial images extracted from group of people wearing or not wearing a mask, by considering a 2 - class problem, where the mask class represents the positive examples, where the non-masked faces are negative examples. Part of the image data set is used to train the support vector machines for learning discriminant features for each class, followed by a prediction for each test sample. The image set for the mask class ranges from simple and common one-colored surgical masks to com plex and challenging patterned masks. Cross-validation approach is adopted to test the approach, leading to 97.25 as recognition rate.

KEYWORDS:-—mask detection, COVID - 19, color information, support vector machines

I. INTRODUCTION

- presented that coronavirus disease 2019 (COVID-19) has globally infected over 2.7 million people and caused over 180,000 deaths. In addition, there are several similar large scale serious respiratory diseases, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), which occurred in the past few years Liuetal.
- reported that the reproductive number of COVID-19 is higher compared to the SARS. Therefore, more and more people are concerned about their health, and public health is considered as the top priority for governments .
- Fortunately, Leung et al. showed that the surgical face masks could cut the spread of coronavirus. At the moment, WHO recommends that people should wear face masks if they have respiratory symptoms, or they are taking care of the people with symptoms
- Furthermore, many public service providers require customers to use the service only if they wear masks. Therefore, face mask detection has become a crucial computer vision task to help the global society, but research related to face mask detection is limited.

II. LITERATURE SURVEY

Xinyu Wang, Chunhua Shen, Hanxi Li, Shugong Xu , ” Human Detection Aided by Deeply Learned Semantic Masks.” [1] Human detection is one of the long-standing computer vision tasks, and it has been a cornerstone for many real-world applications such as photo album organization, video surveillance, and autonomous driving. Benefiting from deep learning technologies such as convolutional neural networks, modern object detectors have been achieving much improved accuracy in generic object detection tasks. In this paper, we aim to improve deep learning based human detection. Our main idea is to exploit semantic context information for human detection by using deep learnt semantic features provided by semantic segmentation masks. Segmentation masks play as an attention mechanism and enforce the detectors to focus on the image regions where potential object candidates are likely to appear. Meanwhile, the extra segmentation mask channel can also guide the convolutional kernels to automatically learn more discriminative features which make it easier to distinguish the background and foreground. We implement our methods with two popular detection frameworks, i.e., Faster RCNN and SSD, and experimentally analyze the effective ness of the proposed methods. Evaluation results on the widely used MS-COCO dataset and the very recent Crowd Human dataset are provided. Our proposed methods outperform the baseline detectors and achieve better performance on highly occluded human detection.

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:Ioan Buciu," Color quotient based mask detection." [2] The paper deals with mask detection in the age of COVID - 19, by proposing a simple and efficient method to detect people not wearing mask. The approach includes a feature extraction step followed by a supervised learning model built with support vector machines. The features are formed of color information by considering red, green and blue channels for an RGB color image. Ratio of color channels is taken into account to discriminate between mask and non mask images. The approach has been tested on a set of 1211 facial images extracted from group of people wearing or not wearing a mask, by considering a 2 - class problem, where the mask class represents the positive examples, where the non-masked faces are negative examples. Part of the image data set is used to train the support vector machines for learning discriminant features for each class, followed by a prediction for each test sample. The image set for the mask class ranges from simple and common one-colored surgical masks to complex and challenging patterned masks. Cross validation approach is adopted to test the approach, leading to 97.25 as recognition rate.

Wenxuan Han" A Mask Detection Method for Shoppers Under the Threat of COVID 19 Coronavirus" [3] Object detection, which aims to automatically mark the coordinates of objects of interest in pictures or videos, is an extension of image classification. In recent years, it has been widely used in intelligent traffic management, intelligent monitoring systems, military object detection, and surgical instrument positioning in medical navigation surgery, etc. COVID-19, a novel coronavirus outbreak at the end of 2019, poses a serious threat to public health. Many countries require every one to wear a mask in public to prevent the spread of coronavirus. To effectively prevent the spread of the coronavirus, we present an object detection method based on single-shot detector (SSD), which focuses on accurate and real-time face masks detection in the supermarket. We make contributions in the following three aspects: 1) presenting a lightweight backbone network for feature extraction, which based on SSD and spatial separable convolution, aiming to improve the detection speed and meet the requirements of real-time detection; 2) proposing a Feature Enhancement Module (FEM) to strengthen the deep features learned from CNN models, aiming to enhance the feature representation of the small objects; 3) constructing COVID 19- Mask, a large-scale dataset to detect whether shoppers are wearing masks, by collecting images in two supermarkets. The experiment results illustrate the high detection precision and realtime performance of the proposed algorithm.

I.G. Kazantsev1 , B.O. Mukhametzhanova2*, Suvorovsky O. Yu3, "Corner Detection Based on Scalable Masks "[4] Scalable masks for the selection of angular structures in two-dimensional (2D) digital images are considered. The mask is a 2D window sliding over the image and convolved with image fragments. We propose the model of a scalable 2D mask based on expanding smaller mask along its sides and edges. In this case, the submatrices remain unchanged, and the generation of new elements consists in repeating the elements of the submatrix, preserving the structure of the corner. Numerical ex periments with test images are performed.

Si-Qi Liu , Xiangyuan Lan , and Pong C. Yuen , Senior Member, IEEE, "Multi-Channel Remote Photoplethysmography Correspondence Feature for 3D Mask Face Presentation Attack Detection" [5] With the advancement of 3D printing technologies, 3D mask presenta tion attack becomes a critical challenge in face recognition. To tackle the 3D mask presentation attack detection (PAD), remote Photoplethysmography (rPPG) is employed as an intrinsic detection cue which is independent of the mask material and appearance quality. Although the effectiveness of existing rPPG-based methods has been verified, they may not be robust enough when rPPG signals are contaminated by noise. To identify the heartbeat information from the noisy raw rPPG signals, we propose a new 3D mask PAD feature, multi-channel rPPG correspondence feature (MCCFrPPG) with the global noise-aware template learning and verification framework. To further boost the discriminability, temporal variation of the rPPG signal is considered and extracted through the multi-channel time-frequency analysis scheme. This paper also extends HKBU-MARs V2 dataset with more customized high-quality masks and increases the number of videos by two times. Comprehensive experiments were performed on existing 3D mask datasets and the extended HKBU-MARs V2+, which totally covers 3 types of masks, 12 different light set tings and 6 cameras. The results not only justify the effectiveness and robustness of the proposed MCCFrPPG on 3D mask attacks but also indicate its potential on handling the replay attack with camera motion and dim light.

Sohee Park, Geonwoo Kim," Block-based masking region relocation and detection method for image privacy masking "[6] The widespread use of CCTV and various image devices has become a primary cause of privacy invasion, because these are possible to record, share and leak privacy images without owners' consent. The image privacy masking is one of technology for privacy prevention, and its necessity has been increased owing to need of personal information protection and social safety in these days [1]. In this paper, we propose a block based masking region relocation and detection method to overcome the shortage of the meta-data typed privacy region information sharing method of

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restorable image masking service. This method is based on the histogram difference between the original image and the masked image. It analyzes the histogram feature of images, and relocates the masking region information from the coordinate system to the block system. Therefore, it set and detect the masking region without addi tional information such as meta-data and the original image. For demonstration the feasibility of our approach, we used the real-world database and the experimental results show the applicability of the real privacy masking service.

Feiyang Son," Multisize plate detection algorithm based on improved Mask RC "[7] The sorting of plates is an indispensable part of the plate processing production line. In order to achieve plate detection in complex detection scenarios, a multisize plate detection algorithm based on improved Mask RCNN is proposed. The model fusion method is used to introduce the Dense Net network structure to optimize the feature transfer path to make feature extraction more efficient. At the same time, the boundary distance constraint is added to the segmentation loss function, which makes the model more precise for the target with high stacking complexity and fuzzy boundary information. The experimental results show that the improved Mask RCNN performance is significantly improved, compared with other models, it achieves an optimization effect with an average accuracy of more than 98percent ages

III. PROPOSED SYSTEM

To detect face mask, we present a deep neural network technique. We Use the CNN algorithm for training and testing. We provide security through our application. Our work aims the develop technique that can accurately detect mask over the face in public areas.

SYSTEM ARCHITECTURE

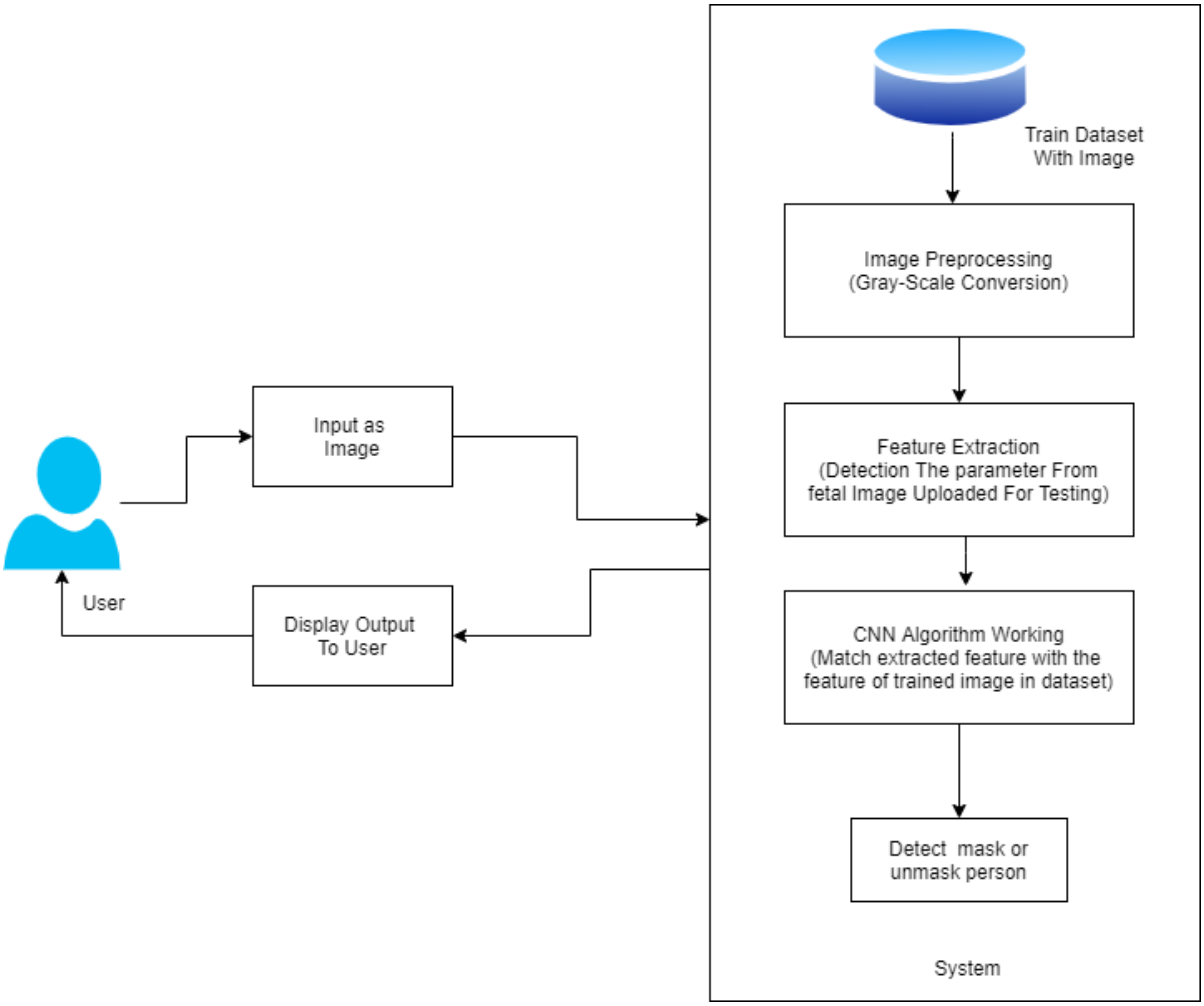

Fig. System Architecture

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IV. ALGORITHM

CNN stands for Convolutional Neural Networks, which are specialized for image and video recognition applications. Image recognition, object detection, and segmentation are among of the most common image analysis tasks that CNN is employed for.

Convolutional Neural Networks have four different sorts of layers:

1) Convolutional Layer: Each input neuron in a conventional neural network is linked to the next hidden layer. Only a small portion of the input layer neurons connect to the hidden layer neurons in CNN.

2) Pooling Layer: The pooling layer is used to minimize the feature map's dimensionality. Inside the CNN's hidden layer, there will be several activation and pooling layers.

3) Flatten: Flattening is the process of transforming data into a one-dimensional array for use in the next layer. To construct a single lengthy feature vector, we flatten the output of the convolutional layers.

4) Fully Connected Layers: Fully Connected Layers are the network's final layers. The output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer, is the input to the fully connected layer.

V. CONCLUSION

In this paper, the canny operator is used to extract edges on SAR images. The detection results are fed into a Mask RCNN based model with the original images in pairs, so as to achieve a better edge enhancement. Better detection results can be obtained after the additional inclusion of the edge detection results. This provides an idea for the application of object detection with prominent texture features, and also proves that under the condition of limited training samples, the combination of traditional methods and deep learning methods can often achieve better detection performance.

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