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A Survey on Covid Safety System

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Abstract: ***In this paper a Raspberry Pi based automated solution system focused on the real-time face monitoring of people to detect both face masks and body temperature with the help of MLX90614 sensor has been proposed. This is implemented using Python Programming with OpenCV Library, TensorFlow, Dlib Module. A security clearance system is deployed that will allow that person to enter if they are wearing a face mask and their body temperature is in check with WHO guidelines. A programmed hand sanitizer apportioning machine is mechanized, non-contact, liquor-based hand sanitizer gadget. Liquor is essentially a dissolvable, and furthermore a generally excellent sanitizer when contrasted with fluid cleanser or strong cleanser, likewise it needn't bother with water to wash off since it is unpredictable furthermore, disintegrates in a split second after application to hands. It is too demonstrated that a convergence of >70% liquor can execute Covid in hands. Here, we have used IR sensor detects the hand put close to it, the Arduino Uno is utilized as a microcontroller, which detects the distance and the outcome is the pump starts running out the hand sanitizer. Thus, the above said system will help the society by saving time and also helps in contaminating the spread of coronavirus. This can be implemented in public places such as colleges, schools, offices, shopping malls, etc. to inspect people.***

Keywords: Deep Learning, Open CV, Keras, Python, Tensor Flow, Computer Vision, Raspberry Pi, COVID-19, DLib, Arduino, Sensor, Sanitizer, Infrared sensor.

I. INTRODUCTION

According to the World Health Organization (WHO)'s official Situation Report – 205, coronavirus disease 2019 (COVID-19) has globally infected over 20 million people causing over 0.7million deaths [1]. Individuals with COVID-19 have had a wide scope of symptoms reported – going from mellow manifestations to serious illness. Respiratory problems like shortness of breath or difficulty in breathing is one of them. Elder people having lung disease can possess serious complications from COVID-19 illness as they appear to be at higher risk [2]. Some common human coronaviruses that infect public around the world are 229E, HKU1, OC43, and NL63. Before debilitating individuals, viruses like 2019-nCoV, SARS-CoV, and MERS-CoV infect animals and evolve to human coronaviruses [3]. Persons having respiratory problems can expose anyone (who is in close contact with them) to infective beads. Surroundings of a tainted individual can cause contact transmission as droplets carrying virus may withal arrive on his adjacent surfaces [4]. To curb certain respiratory viral ailments, including COVID- 19, wearing a clinical mask is very necessary. The public should be aware of whether to put on the mask for source control or aversion of COVID-19. Potential points of interest of the utilization of masks lie in reducing vulnerability of risk from a noxious individual during the "pre-symptomatic" period and stigmatization of discrete persons putting on masks to restraint the spread of virus. WHO stresses on prioritizing medical masks and respirators for health care assistants[4]. Therefore, face mask detection has become a crucial task in present global society. Face mask detection involves in detecting the location of the face and then determining whether it has a mask on it or not. The issue is proximately cognate to general object detection to detect the classes of objects. Face identification categorically deals with distinguishing a specific group of entities i.e. Face. It has numerous applications, such as autonomous driving, education, surveillance, and so on [5]. This paper presents a simplified approach to serve the above purpose using the basic Machine Learning (ML) packages such as TensorFlow, Keras, OpenCV and Scikit-Learn. The world is suffering more because of this Covid. There is an exacting assessment wherever to control the corona illness and spread to the country. The emergency clinic and the medical caretaker people are enduring to fix the influenced people and stop spreading the infection to the neighbouring people. The mask and the sanitizer is given wherever to shield people from spreading the infection and to execute the infection from the human hand. The infection is spreading from the human hand also, mouth spit. The mouth spread is controlled with the covering mask and the human hand is constrained by the hand wash sanitizer. The hand contact while taking hand sanitizer from bottle can spreads from one human to another. There ought to be a programmed hand wash sanitizer allocator, to control and keep up the spread from one human to another. As there is an effect in utilizing the hand washes disinfection by foot or by pressing the sanitizer bottle used to have a spread of the infection sickness with one human to another.

II. LITERATURE REVIEW

In [1] D. Meena and R. Sharan deployed an automated facemask and body temperature detection system powered by Raspberry Pi microcontroller. This setup had its own camera module through which it monitors facemask and it has a non-contact temperature sensor to read the body temperature and allows the person if they clear the COVID-19 protocols or it will alert the respected authorities. This system helped in identifying people on image/ video stream wearing a facemask with the help of Deep Learning and Computer Vision algorithms by using various libraries such as OpenCV, Keras, TensorFlow etc. The images were downloaded from various open source websites and were differentiated as “mask” and “no mask”. The images that were downloaded were of different sizes and different resolutions.

In [2] the model is integration between deep learning and classical machine learning techniques with opencv, tensor flow and keras. They have used deep transfer learning for feature extractions and combined it with three classical machine learning algorithms. They also introduced a comparison between them to find the most suitable algorithm that achieved the highest accuracy and consumed the least time in the process of training and detection. Combining all the elements of the architecture, it tend to get correct mask detection system. Mobile NetV2, classifier employed in this system. The system performance had the potential to detect face mask in image with multiple face over a large vary angles.

In [3] Mrs. Supriya Kurlekar, Mr. Aniket A. Omanna., Mr. Onkar A. Deshpande, Mr. Dinesh B. Patil used Caffe, a deep learning framework made with expression, speed, and modularity in mind is used for face mask detection. Face Mask Detection system was built with OpenCV, Keras/TensorFlow using Deep Learning and Computer Vision concepts. They could detect face masks in Static Images as well as in Real-time Video streams. In Deep Learning projects, we need a training data set.

In [2] S. Ge, J. Li, Q. Ye and Z. Luo detected faces with conclusions having a challenging task due to two main reasons: 1) the absence of large datasets of masked faces, and 2) the absence of facial cues from the masked regions. To address these two issues, this paper first introduces a dataset, denoted as MAFA, with 30, 811 Internet images and 35, 806 masked faces. Faces in the dataset have various orientations and occlusion degrees, while at least one part of each face is occluded by mask. Based on this dataset, further propose LLE- CNNs for masked face detection, which consist of three major modules. The Proposal module first combines two pre-trained CNNs to extract candidate facial regions from the input image and represent them with high dimensional descriptors. After that, the Embedding module is incorporated to turn such descriptors into a similarity-based descriptor by using locally linear embedding (LLE) algorithm and the dictionaries trained on a large pool of synthesized normal faces, masked faces and non-faces. In this manner, many missing facial cues could be largely recovered and the influences of noisy cues introduced by diversified masks can be greatly alleviated. Finally, the Verification module is incorporated to identify candidate facial regions and refine their positions by jointly performing the classification and regression tasks within a unified CNN. Experimental results on the MAFA dataset showed that the proposed approach remarkably outperforms 6 state-of-the-arts by at least 15.6%.

In [4] A.G. H. Dong Chen, F. Wen and J. Sun propose a new cascaded Convolutional Neural Network, dubbed the name Supervised Transformer Network, to address this challenge. The first stage is a multi-task Region Proposal Network (RPN), which simultaneously predicts candidate face regions along with associated facial landmarks. The candidate regions are then warped by mapping the detected facial landmarks to their canonical positions to better normalize the face patterns. The second stage, which is a RCNN, then verifies if the warped candidate regions are valid faces or not. They conducted end-to-end learning of the cascaded network, including optimizing the canonical positions of the facial landmarks. This supervised learning of the transformations automatically selects the best scale to differentiate face/non-face patterns. By combining feature maps from both stages of the network, we achieve state-of-the-art detection accuracies on several public benchmarks. For real-time performance, they ran the cascaded network only on regions of interests produced from a boosting cascade face detector. Their detector ran at 30 FPS on a single CPU core for a VGA-resolution image.

In [5] Dr Y. B. Gurav, Tejas Giri, Nupur Karve, Ifrah Ansari, Atish Oswal indicated that the proposed system was intended for Contactless Automatic Hand Wash Dispenser for Sanitation. Indeed, even human gets the restricted sanitizer fluid for disinfection virus from hand, to wash the hands and to shield themselves from the corona disease and misuse or wastage of sanitizer won’t happen. Programmed hand sanitizers are valued less when contrasted with some other hand cleaning dispensers. The general expense required is additionally least henceforth may be simple for everybody to purchase and utilize using Arduino, Sensor, Sanitizer, Infrared sensor .

The [5] paper says about the infusion brought about by drug safe microorganisms which causes demise rate and furthermore entanglements, the multi drugs safe pseudomonas aeruginosa MDRP which are exceptionally regular around the world. A few anti-infection agents have expanding multidrug microorganism's disconnection rate, even close to home insurance hardware (PPE) can't be often separation pace of MSRA. They utilized hand sanitizers with 60 to 70 percent ethanol or isopropanol for lessening critical number of microbes. Subsequently they accentuation about the liquor- based hand sanitizer since the liquor-based hand sanitizer had negative relationship with MRSA disconnection rate which, implies that hand cleanliness is vital in clinic. The course says about development of the typical Covid (SARS-CoV-2) which has cause surprising test to wellbeing of individuals of this world.

In [6] Jessica Hillburn indicated about the clinic got a handle on diseases, which is around 2 million Patients each year and furthermore says that it is eighth driving reason for passing's every year in USA. It additionally says that handwashing is significant and furthermore powerful with appropriate hand washing steps, yet washing with cleanser and water is tedious for top hours in clinics. This paper likewise showed the adequacy of the liquor based hand sanitizers, which decreased disease rates by walloping 30percent. They utilized hand sanitizers with 60 to 70 percent ethanol or isopropanol for diminishing huge number of microorganisms. The patients were likewise given about 4.25 ounce holders of hand sanitizer close by their beds. For multi month time of utilizing hand sanitizers showed a consequence of 36.1percent disease decrease.

In [7] Satoru Mitsuboshi, Masami Tsugita taught about the disease brought about by drug safe miniature organic entities which causes expansion in death rate and furthermore complexities, the multidrug safe microbes incorporate Methicillin Resistant Staphylococcus aureus (MRSA), Extended Spectrum Beta-lactamase (ESBL) delivering microorganisms, Multidrug Resistant Pseudomonas aeruginosa (MDRP), which are extremely basic around the world. A few anti-microbials have expanding multidrug micro-organisms disengagement rate, even close to home security equipment (PPE) can't be compelling in segregation pace of MSRA. Consequently, they underscore about the utilization of liquor based hand sanitizers since the liquor based hand sanitizers had negative relationship with MRSA segregation rate, which implies that hand cleanliness is vital in emergency clinics.

In [8] Golin, A. P., Choi, D., Ghahary, the proposed about development of the novel Coronavirus (SARS-CoV-2), which has made unforeseen difficulties wellbeing of individuals of this world, the paper additionally targets diminishing the transmission pace of the infection. The paper clarifies about the infection design and how could it be not the same as that of the bacterial construction, which implies that infection has single abandoned or twofold abandoned RNA or DNA typified in 'capsid' and infection can duplicate just in presence of a host and portrayed as 'living elements'. Microorganisms likewise have practically a similar construction including DNA or RNA alongside 'Cell Membrane' and can repeat without a host. The paper likewise gives a total examination between hand sanitizers and cleanser, froth versus gel, and it says that high grouping of ethanol can decrease the measure of infection molecule adequacy of liquor-based hand sanitizer.

In [9] M.M. Shrihari proposed a brief idea about the automatic hand wash sanitizer. The motor pumps the sanitizer liquid or solution to the human while detecting the IR Sensor. The IR Sensor is the photodiode used for sensing the human hand detection and it is used to control the motor pump from the liquid. The motor is connected to an RC timer delay setup and the pipe connected to a reducer are used to control the flowing liquid of the sanitizer. It had three modes of Control LED's in the system, White LED is used for the user to understand that the setup is in working mode and battery is in use. Red LED was used for the user to understand that Battery is in charging mode. Green LED was used for the user to understand that battery was in full charged mode. It had an On/ Off switch to control the whole setup from the battery supply. The consumer was convenient to use the setup and the user also saves costs and power.

In [10] Dulal Chakraborty deployed in his paper about eigenface based face recognition has been described. The eigenface approach for face recognition process is fast and simple which works well under constrained environment. It is one of the best practical solutions for the problem of face recognition. Eigenfaces method is a principal component analysis approach, where the eigenvectors of the covariance matrix of a small set of characteristic pictures are sought. These eigenvectors are called eigenfaces due to their resemblance of face images. Recognition is performed by obtaining feature vectors from the eigenvectors space. Many applications which require face recognition do not require perfect identification but just low error rate. So instead of searching large database of faces, it is better to give small set of likely matches. By using Eigenface approach, this small set of likely matches for given images can be easily obtained. For given set of images, due to high dimensionality of images, the space spanned is very large. But in reality, all these images are closely related and actually span a lower dimensional space.

By using eigenface approach, we try to reduce this dimensionality. The lower the dimensionality of this image space, the easier it would be for face recognition. Any new image can be expressed as linear combination of these eigenfaces. This makes it easier to match any two images and thus face recognition. One of the limitation for eigenface approach is in the treatment of face images with varied facial expressions and with glasses. Also as images may have different illumination conditions. This can be removed by RMS (root mean square) contrast stretching and histogram equalization.

In [11] the purpose of this paper was mainly to implement the face mask detection and recognition of faces without mask. The implementation was done by using Raspberry Pi with camera for capturing images and python programming using OpenCV library image processing was performed. Keras and TensorFlow were used for implementing Machine Learning algorithm.

In [12] this research aims to design and develop a low-cost, rapid, scalable, and effective virus spread control and screening system to minimize the chances and risk of spread of COVID-19. They proposed an IoT-based Smart Screening and Disinfection Walkthrough Gate (SSDWG) for all public places entrance. The SSDWG is designed to do rapid screening, including temperature measuring using a contact-free sensor and storing the record of the suspected individual for further control and monitoring. Their proposed IoT- system also implemented real-time deep learning models for face mask detection and classification. This module classified individuals who wear the face mask properly, improperly, and without a face mask using VGG-16, MobileNetV2, Inception v3, ResNet- 50, and CNN using a transfer learning approach and achieved the highest accuracy of 99.81% while using VGG-16 and the second highest accuracy of 99.6% using MobileNetV2 in the mask detection and classification module. They also implemented classification to classify the types of face masks worn by the individuals, either N-95 or surgical masks. They also compared the results of proposed system with state-of-the- art methods, and highly suggested that their system could be used to prevent the spread of local transmission and reduce the chances of human carriers of COVID-19.

Author	Face Mask Detection Technologies Used
D. Meena and R. Sharan [1]	OpenCV, Keras, TensorFlow, Deep Learning, DLIB
S. Ge, J. Li, Q. Ye and Z. Luo [2]	Locally linear embedding (LLE)- CNN algorithm
Mrs. Supriya Kurlekar, Mr. Aniket A. Omanna., Mr. Onkar A. Deshpande, Mr. Dinesh B. Patil [3]	Caffe a deep learning framework, OpenCV, Keras/TensorFlow.
A.G. H. Dong Chen, F. Wen and J. Sun [4]	Cascaded CNN, RPN, RCNN.
Dulal Chakraborty[10]	Eigen Vectors.
Kalangi B Subramanyam, S N S Kanth, D J Kumar [11]	OpenCV, Keras, TensorFlow, Deep Learning, MobileNetV2.
Weiyan hou [12]	VGG-16, MobileNetV2, Inception v3, ResNet-50, CNN
Z.Wang, G.Wang, B.Huang, Z.Xiong, Q.Hong, H.Wu [13]	OpenCV, Keras, TensorFlow, Deep Learning, MobileNetV2.
Y. Q. Wang[14]	Viola-Jones face detection algorithm
Jignesh Chowdary, Narinder Singh Punn, Sanjay Kumar Sonbhadra, Sonali Agarwal.[15]	Transfer learning SMFD dataset Mask detection InceptionV3 Image augmentation

Table 1. Face Mask Detection Techniques Comparison

III. DISCUSSION

Body temperature measuring is adequate for preventing an outbreak of COVID-19. Fever, dry cough, sore throat, headache, muscle or body aches, congestion or runny nose, nausea or vomiting, and diarrhea are the most significant common symptoms of COVID-19. To measure individuals' temperature manually consumes a considerable amount of human resources, time, and administrative resources introduced a prototype system that consists of a contact-free temperature sensor. Their proposed system has the features of contact-free temperature measurement and attendance, which are taken at the entrances of school campuses in Hong Kong. Their experiments showed that the system could measure body temperature with adequate accuracy for screening purposes. A pandemic-like flu requires rapid temperature measuring. authors designed a low-cost, scalable device used for measuring temperature to control the spread of the flu pandemic. [9]Their proposed temperature measuring module is developed by a medical-grade version of the Melexis MLX90614 series of smart infrared temperature sensors. We also used the Melexis MLX90614 contact-free temperature measure sensor in our proposed model. We also compared the comparative features of our model with previous work that was done by different authors.

IV. CONCLUSIONS

In this paper, we reviewed different face mask detection techniques and various methods for touchless sanitization. We classified these detection techniques based on different types of deep learning models like CNN, SVM, KNN, etc. Different types of technologies were discussed in this paper. Limitations and future direction of face mask detection techniques were also discussed. We believe that this survey work will help researchers to understand the deep learning techniques, current trends, challenges, and future scope of Covid Safety System.

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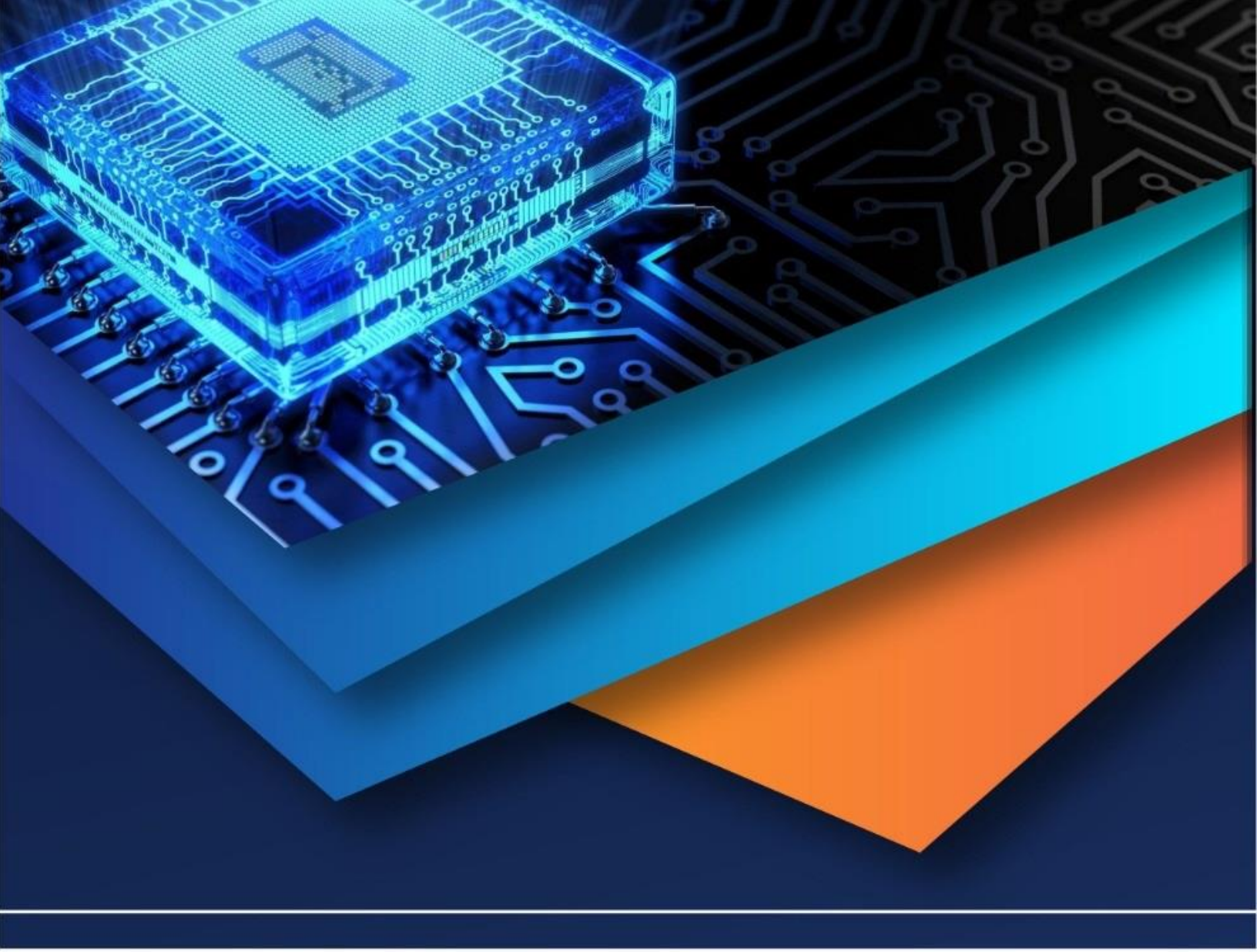

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