

AN INTEGRATED APPROACH FOR SOCIAL DISTANCING AND FACE MASK DETECTION USING DEEP LEARNING

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Abstract — In this paper, The proposed system detect the violation of social distance and face mask for the prevention of spread of viruses like COVID-19.The proposed methodology involves taking input from a CCTV feed and detecting humans in the frame, using YOLOv5. These detected faces are then processed using Stacked ResNet-50 for classification whether the person is wearing a mask or not, meanwhile, EUCLIDEAN FORMULA is used for distance computation and has been used to detect proximities within the persons detected.

INTRODUCTION

A novel virus has caused a world pandemic and huge life losses. Declared by the World Health Organization (WHO), this coronavirus originated from Wuhan, China in late December 2019. Upon thorough research, the virus has been observed as pathogenic and transmissible by air or by coming in close contact with an infected person. To avoid the spread of this virus, many measures have been suggested, such as maintaining a social distance, that is, maintaining a proper physical distance between people and lessening close contact with each other, and wearing a face mask to avoid the droplets from transmitting through the air.

COVID-19 is one of the deadliest pandemics the world has witnessed, taking around numerous lives till now across worldwide ,also in India. To limit its spread numerous countries have issued many safety measures. Though vaccines are available now, still face mask detection and maintain social distance are the key aspects to prevent from this pandemic. With more than 769,481 deaths being reported to date² , this virus is said to cause a pandemic. The origin of this virus is most likely said to be from bats or snakes but there has been no intermediate host detected yet. The Chinese researchers and

health authorities assume that the virus may have been originated and spread by an animal species that was infected and spread to humans via being trafficked illegally in the seafood market in Wuhan. Researchers are still trying to discover the origin of this virus. The coronavirus causes respiratory and gastrointestinal infections and can be categorized into four different types which are Deltacoronavirus, Gammacoronavirus, Alphacoronavirus and the Betacoronavirus. Birds are infected by the first two types whereas mammals are infected by the latter two (Fong, Dey and Chaki, 2020).

While medical researchers are primarily working and preparing to develop a vaccine or any type of drug to help in the prevention of this virus, there are other possible social ways that may help in limiting the rapid spread of the virus within individuals. According to the researchers, this virus can spread while coming in close contact with the person who is affected. Thus, it being alike all the other infectious respiratory diseases, researchers suggest close contact be withdrawn under any and all circumstances as the possibility of the virus transmitting through airborne ways and droplets is quite likely to occur.

PROPOSED SYSTEM

Many image processing techniques, mathematical formulae were proposed to compute a distance between two objects(persons) like Manhattan distance formula. Jong Bae proposed a medium to detect the distance of two persons applying smart phone based thermal rear camera that works in poor light environment. This method was as obtained 81% accuracy. In our proposed method uses a Euclidean Distance formulae for calculating distance between object here object means persons, this method was accuracy of 93%.

The main objective of our system is that will identify whether the person in frame is wearing the face mask and also maintaining distance between two people. The system provides two bounding boxes one for face and one person. If the person is wearing mask properly then our system will put the green bounding box across the face, else the bounding box will be in red colour. Similarly, the person in frame should maintain minimum of 6 feet distance then our system will put a green bounding box across the person else bounding box will be in red colour. Status is shown in the screen, containing number of people in frame and number of people who are not maintaining distance of 6 feet, not in face mask will be displayed in status bar that bottom of the screen. Our proposed model can be integrated with

the camera (CCTV camera) also in the web camera to impede the COVID-19 transmission.

Advantages of Proposed System

This System uses YOLOv5 Algorithm to detect persons in frame and also the location of the person to detect the social distance (6 feet Safe distance). The main Advantage of the system is it gives a Gmail alert to the admin when violators are exceeded to the limit. Admin can set the limit to the COVID-19 precautions violators.

It gives voice alert to the crowd when they do not follow COVID precautions as per WHO guidelines.

LITERATURE SURVEY

Huynh, 2020. The author drew data from Google community and the cultural factors of 58 countries from Hofstede. Thus, the author came up with a conclusion that proposed effective measures to contain the virus by focusing on the role of uncertainties. On the other hand, a research paper had a different approach to test the significance of social distancing.

Aldila et al., 2020. By applying their model on the data that they had acquired, they found out that the individuals who had self-isolated or maintained social distancing reduced or delayed the time of an outbreak. Therefore, they concluded by stating that if a strict social distancing measure was carried out in all the countries, it would help in avoiding the outbreak of the virus. Some researchers in their study were determined to investigate whether the social distancing measures were effective and whether relaxing some measures was possible or not to avoid a second wave.

Wu et al., 2020, The research that they had conducted confirmed that social distancing measures that were carried out helped reduce the transmission of the virus and brought down the infection contact rate. In their study, they depicted that improving the case detection rate was necessary to reduce the reproduction of the virus and also there are many other protections measures available that should be carried out in order to improve the personal protection to recompense the strict social distancing measures.

RELATED WORK

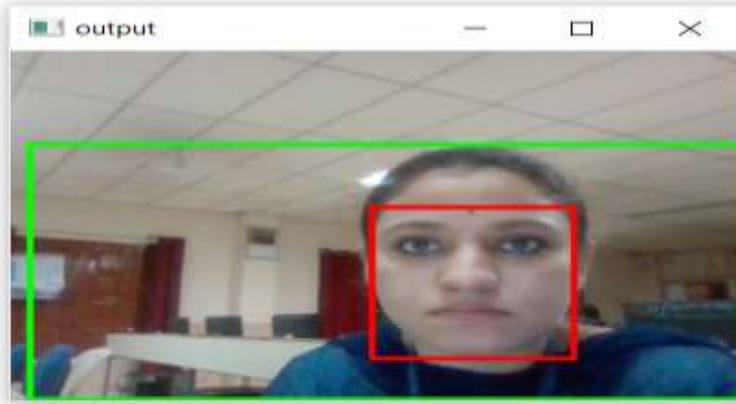


Fig: Person without face mask

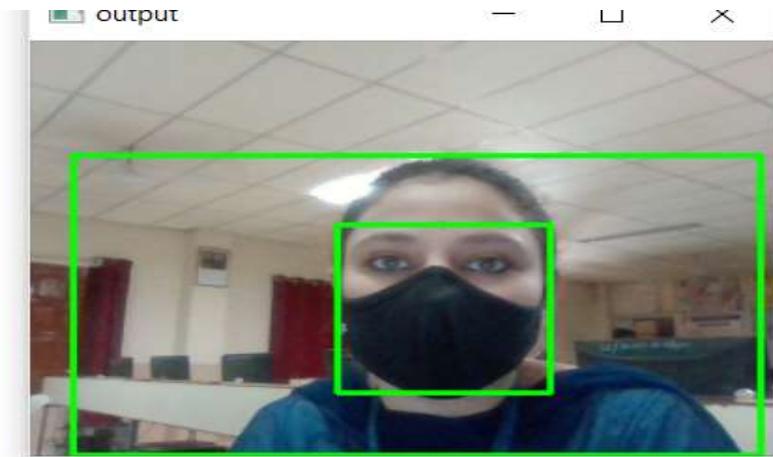


Fig: Person with face mask



Fig: Person detection and labeling safe or Unsafe

CONCLUSION

In this paper, propose about the virus, this paper can conclude two things: social distancing can reduce the spread of the coronavirus; face coverings help prevent the infectious disease to transmit via the air. Therefore, to support this study, this research proposed an AI-based real-time approach towards the detection of social distancing and face mask. Crowd density was examined by gaining the ROI of the video frames and the count of people violating and non-violating the measures was also shown. The results obtained were accurate and real-time based. The pandemic is continuing to increase and is still going on while studying this research.

Future enhancement:

In this system, the people who have close relationships or who know each other and are walking together are detected as they are violating the social distancing measure. Some argue that they should practice social distancing in public areas while some argue that they need not. Hence, this is one of the limitations in this research and can be considered for future work. This research does not make use of the bird's eye view function and hence can be considered for future work as well. Some places where the virus transmission is high, people are required to wear double face masks, and thus to detect whether a person is wearing a double face mask can be achieved in the future. If in the future there is no need for social distancing, this project can be reutilized and repurposed for other applications. Museums have a 2-3 feet distance policy between the arte fact and the individual and thus it can be used to detect this distance

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