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Mask Detection System COVID-19 Safety

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Abstract:-

The COVID - 19 pandemic is devastating mankind irrespective of caste, creed, gender, and religion. Until a vaccine is discovered, we should do our bit to constrain the expanse of the corona virus. Using a face mask can undoubtedly help in managing the spread of the virus. COVID - 19 face mask detector uses deep learning techniques to successfully test whether a person is wearing a face mask or not. The manuscript presents two classifications namely person is wearing a mask or person is not wearing a mask. The deep leaning concept can work with a live video stream. Cases in which if the mask is worn the message will be displayed that please sanitize your hands. And in the case when the mask is not worn then the message will be displayed that please wear a mask and also the system will check the number of person in a mall if the number of person are more then the system will display a message reached maximum person limit, Please wait. We will be using the Ultrasonic sensor for counting the people entering in the mall. LCD For displaying the messages, and Servo motor for opening and closing door. Mass detection using machine learning can be used in crowded places like railway stations, bus stops, markets, streets, mall entrances, schools, colleges, etc.

Introduction:-

It is believed that novel corona virus has been originated from China on the 17 th of November 2019 and spread from one country to another in no time. Deadly corona virus have previously induced respiratory infections specially Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). The symptoms of COVID - 19 are fever, tiredness, dry cough, anosmia, sore throat, headache, etc. Its arrival has stopped the world due to its severity and advers effects on humans. For a person having mild symptoms, it takes a less time for getting recovered. The recovery period for patients having critical symptoms depends on the severity. It is advisable for a person to stay quarantined or to be in self-isolation if affected by corona virus. Reverse transcription-polymerase chain reaction (RTPCR) is a standard method that is currently being implemented to detect the presence of the virus in an individual's body. Putting on a face mask can restrict the spread of the virus. In many cases, corona virus can be asymptomatic too. As it is rightly said, prevention is better than cure. One should wear a face mask while coming in contact with people. By doing this, an individual ensures his safety, another person's safety, and in this way helps to curb the spread of the disease. The World Health Organization (WHO) as well as the Centers for Disease Control and Prevention (CDC) has suggested the use of face masks for decreasing the spread of the virus. Various types of face masks are surgical face masks, N95 masks, and cloth masks. The primary purpose of a face mask is to trap the droplets that are discharged from a person's mouth while communicating, sneezing, or coughing. For a face mask to be effective, it should cover the mouth and the nose to trap the water droplets. The face mask should not be brought down to the chin. If done so, the face mask will get contaminated as it comes in association with the exposed chin. When the face mask is placed back on the face, the mouth and nose will get infected by the virus, bacteria, or germs. Hence, the face mask should be completely removed in case of eating, drinking, or doing other such activities that involve the removal of a face mask. Our Face mask detection model
aims at detecting whether a person is wearing a mask or not. This is tested using live video stream.

Problem statement:-

First, we explore the problem of Mask detection using machine learning and signal processing techniques, and then we apply the messages for wearing a mask. We propose a Mask-detection method. As the count of the patients are increasing The World Health Organization (WHO) as well as the Centers for Disease Control and Prevention (CDC) has suggested the use of face masks for decreasing the spread of the virus. Therefore we are developing a system which will detect the mask is wired or not. Before special one person was required for checking if the mask is wired or not so for avoiding that we are developing this system.

Objectives:-

-To avoid spreading of corona virus

-To maintain the count of people in the mall as per the government rules

Algorithm:

Haar cascade Algorithm:-

Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images and videos. It is then used to detect objects in other images and videos.

The algorithm has four stages:

1. Haar Feature Selection
2. Creating Integral Images
3. Adaboost Training
4. Cascading Classifiers
5. It is well known for being able to detect faces and body parts in an image, but can be trained to identify almost any object.

Let's take mask detection as an example. Initially, the algorithm needs a lot of positive videos of faces wearing mask and negative images without mask to train the classifier. Then we need to extract features from it.

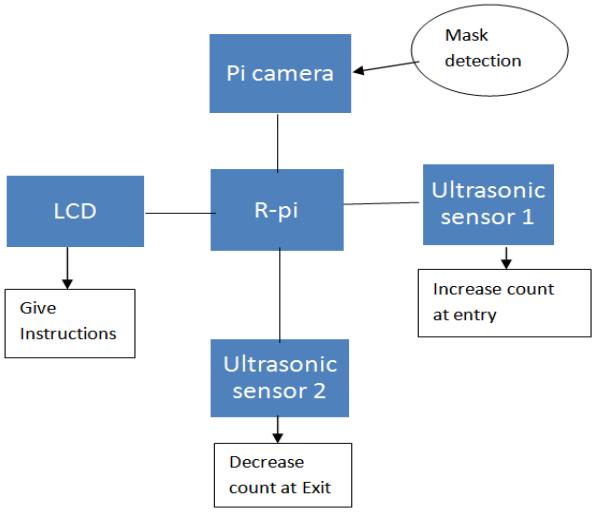
Litreture survey:-

Deep learning technique has been useful for big data analysis and has its applications in computer vision, pattern and speech recognition, etc. Liu's et al. [6] work focuses on some commonly implemented deep learning architecture and their applications. The auto encoder, the convolutional neural network, Boltzmann machine, the deep belief networks are the networks that are presented in detail. Deep learning can be used in unsupervised learning algorithms to process the unlabeled data. A CNN model for speedy face detection has been introduced by Li et al. [7] that evaluates low resolution an input image and discards non-face sections and accurately processes the regions that are at a greater resolution for precise detection. Calibration nets are used to stimulate detection. The advantage of this model is that it is fast and achieves 14 FPS in case of standard VGA images on the CPU and can be quickened to 100 FPS on GPU.A face detection system called Deep Dense Face Detector (DDFD) was proposed by Farfade etal. [8] which we considered the problem of multi-view face detection. The proposed method is least complex and it does not demand segmentation, bounding-box regression, or SVM classi_ers and can recognize faces at numerous angles. A novel data augmentation approach for mask detection from speech was proposed by Ristea etal. [5] that could be used for communication among stsurgeons, used in forensic fields or infectious diseases like corona virus. They have used multiple ResNet models and have trained Generative Adversarial Networks(GANs) with cycle consistency to build their project that could do binary classification. In their future work, they would be focusing on multiclass problems. Wangetal. [9] has made executing face mask related projects an obvious task by providing three samples of masked face datasets, which comprise of Masked Face Detection Dataset (MFDD), Real-world Masked Face Recognition Dataset (RMFRD) and Simulated Masked Face Recognition Dataset (SMFRD).Previously, andelwal et al. [3] had stated in his work about a deep learning model that binarizes an image as a mask is used or not mask. 380 images had a mask and 460 images had no mask and these images were used in the training of the MobileNetV2 model. The AUROC of the model was 97.6 %. A few limitations were observed in the model. Those remarks were it could not correctly classify partially hidden faces em with the incorporation of image super resolution using classification network (SRCNet), was made by Qin et al. [1]. It quantified mask, no mask, and incorrectly worn masks, based on 2D facial pictures. Image pre-processing, face detection and crop, image super-resolution, and face mask wearing conditions identification formed the backbone of the algorithm. The training dataset comprised of 3835 images that included 671 images without a facemask, 134 images of incorrect face mask-wearing, and 3030 image of correct facemask-wearing. SRCNet gave and accuracy of 98.70 % accuracy. A Retina face mask has been proposed by Jiang et al. [4] which is a high-accuracy and efficient face mask detector. The models used are ResNet and MobileNet. Transfer learning was used to extract robust characteristics trained on a large dataset of 7959 images. Li et al. [2] worked on developing a HGL method for head pose classiffcation with masks, using color texture analysis of pictures and line portraits. Front accuracy of 93.64 % was achieved along with a side accuracy of 87.17 %. The aforementioned
project recognizes between wearing a face mask and not wearing a face mask. Matthias et al. [10] has done
a face mask recognition project that focuses on capturing real-time images indicating whether a person has put on a face mask or not. The dataset was used for training purposes to detect the main facial features (eyes, mouth, and nose) and for applying the decision making algorithm. Putting on glasses showed no negative effect. Rigid masks gave better results whereas incorrect detections can occur due to illumination, and to objects that are noticeable out of the face.

Proposed System:-

We will be developing a system that work with a live video stream. Cases in which if the mask is worn the message will be displayed that please sanitize your hands. And in the case when the mask is not worn then the message will be displayed that please wear a mask and also the system will check the number of person in a mall if the number of person are more then the system will display a message reached maximum person limit, Please wait.

Block diagram:-



Hardware required:-

- R-pi 3B
- Pi_camera
- 8GB SD card
- LCD
- Servo motor
- Ultra sonic sensor

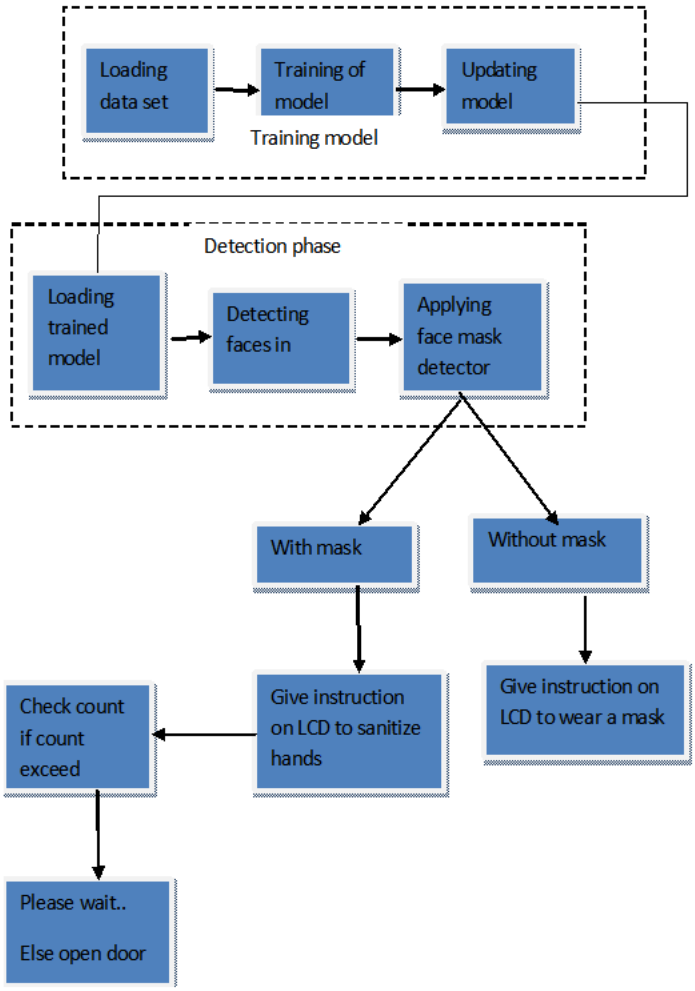
Technologies used:-

Python

Advantages:-

- Detect mask is worned or not.
- Reduce the increasing count of covid-19 patients.
- Maintain count of people allowed in mall at a time by government.

System architecture:-



Applications:-

- railway stations
- bus stops
- markets
- streets
- mall entrances
- schools and colleges

Conclusion:-

We will be developing a mask detection system. To avoid increasing rate of corona virus.

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