

AUTOMATIC HAND SANITIZER AND CONTACTLESS TEMPERATURE SCREEING ALONG WITH MASK DETECTION

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Abstract - A Automatic hand sanitizer Dispensing machine is automated, non-contact, alcohol-based dispenser, which finds its use in hospitals, work places, offices, schools and much more. Since the Coronavirus outbreak, thermal screening using infrared thermometers are used at public places to check the body temperature to identify the indicated infected among crowd. Face mask detection is a identification system that uses personal characteristics of a person to identify the person's identity. Human face recognition procedure basically consists of two phases, namely face detection, where this process takes place very rapidly in humans, except under conditions where the object is located at a short distance away, the next is the introduction, which recognize a face as individuals. Stage is then replicated and developed as a model for facial image recognition is one of the much-studied technologies and developed by experts

1. INTRODUCTION

The **COVID-19 pandemic in India** is part of the worldwide Pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first cases of COVID-19 in India were reported in the towns of Thrissur, Alappuzha and Kasaragod, all in the state of Kerala, among three Indian medical students who had returned from Wuhan. COVID-19 spreads mostly by droplet infection when people cough or if we touch someone who is ill and then to our face (i.e., rubbing eyes or nose). Ongoing pandemic shows that it is much more contagious and spreads fast.

Fast pandemic will be terrible and will cost many lives. It occurs due to a rapid rate of infection because there are no counter measures to slow it down. This is because, if the number of infected people get too large, healthcare systems will be unable to handle it. We will lack resources such as medical staff or equipment like a ventilator.

- To avoid the above situation, we need to do what we can to turn this into a slow pandemic. A pandemic can be slowed down only by the right responses, mainly in the early phase.

In this pandemic, we need to engineer our behaviour as a vaccine. That is, "Not getting infected" and "Not infecting others". The best thing we can do is to wash our hands with soap or a hand sanitizer. The next best thing is social distancing.

- In this project, we will build an **Auto Hand Sanitizer Dispenser with contactless Temperature screening along with Mask Detection**.
- In this system we also detect whether a person is wearing a mask or not using Machine Learning.
- We are also making Contactless Temperature Monitoring System using a contactless temperature sensor with Arduino along with an LCD which will display the current body temperature. The sensors will scan body temperature and these sensors are "contactless," meaning this sensor is completely automated and no one will have to touch anything to be scanned.
- An ultrasonic sensor is used to check the presence of hands below the outlet of the sanitizer machine. Automatic hand dispenser is a convenient, inexpensive, and efficient way to stop the germ transmission.
- To avoid getting infected or spreading it, it is essential to wear a face mask while going out from home especially to public places such as markets or hospitals.
- With the help of this project, we will help the society and reduce the spreading this virus. One of the important advantages is that it will reduce the human contact.

2. LITERATURE REVIEW

Various papers describing to detecting the covid and methods suggesting the implementation ways as illustrated and discussed here.

[1] Author MAMATA S, paper - Kalas real time face detection and tracking using OpenCV, the flow to identify the person in the webcam wearing the face mask or not. The process is two-fold.

1. To identify the faces in the webcam.
2. Classify the faces based on the mask.
3. Identify the Face in the Webcam: To identify the faces a pre- trained model provided by the OpenCV framework was used.
4. OpenCV provides 2 models for this face detector:
5. Floating-point 16 version of the original Caffe implementation.
6. 8-bit quantized version using Tensor flow.

[2] Author Cowling BJ, Chan K-H, Fang VJ, Cheng CKY Paper - Facemasks and Hand Hygiene to Prevent Influenza Transmission in Households.

We conducted a cluster randomized controlled trial during the pandemic season 2009/10 and the ensuing influenza season 2010/11. We included households with an influenza positive index case in the absence of further respiratory illness within the preceding 14 days. Main outcome measure was laboratory confirmed influenza infection in a household contact. We used daily questionnaires to examine adherence and tolerability of the interventions. The designed system due to its compact and portable nature can be installed anywhere such as: domestic house hold, industries, school, colleges etc

[3] Author D Bitar vs., A Goubar, J C Desenclos , paper- Effectiveness and potential use of non-contact infrared thermometers and screenings.

They used the following key words: fever; screening; non-contact, infrared thermometers; thermal imagers or scanners or thermal screening. Among the abstracts identified through these key words, we selected the publications which provided the sensitivity and specificity values of NCIT used in a fever screening objective, whatever the cause of the fever. The system can benefit universities, government offices

[4] Author - Juhui Lee, Jin-Young Lee, Sung-Min Cho, Ki-Cheol Yoon , paper- Design of Automatic Hand Sanitizer System Compatible with Various Containers

The automatic hand sanitizer system design will be presented

in two stages, the instrument structure and control parts. This work focused on using the elasticity of pumps and improving people's access to devices.

Safer for the people multiplexes, shopping malls, railway stations, bus stands, public transport etc.

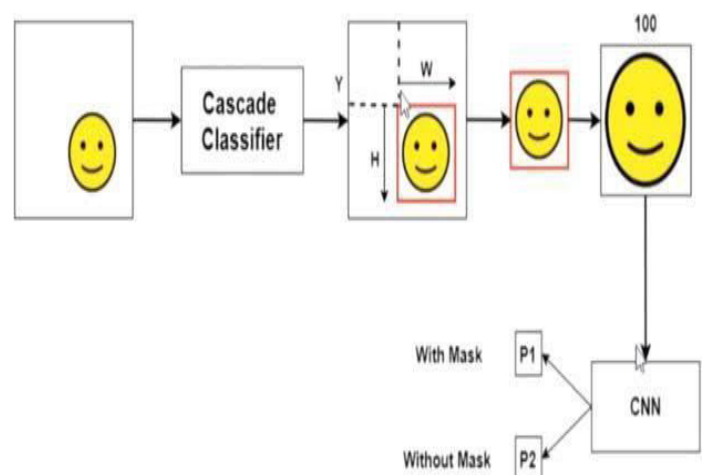
From above literature survey found that the methods are used by different researchers for preventing from covid-19 are following:

Most of the projects specialize in face construction identity recognition when wearing mask. During this project, the focus is on recognizing the people that wearing mask, or not help in decreasing the transmission and spreading of covid-19. The scientist has proven that wearing a mask help in minimizing the spreading rate of Covid-19, and also, we are making automatic hand sanitizers which are more effective in this covid period, along with temperature monitoring of human body.

3. METHODOLOGY

The step-by-step procedure as shown below:

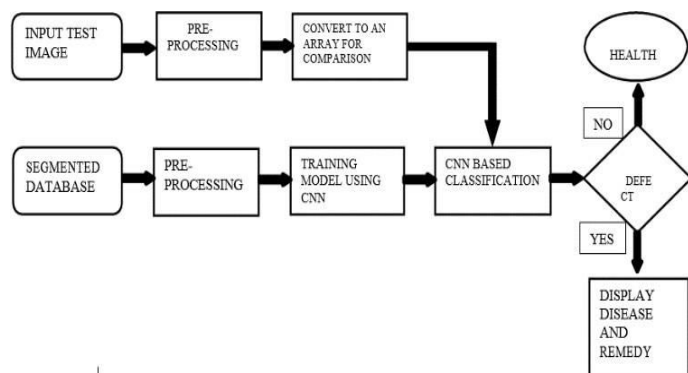
1. For mask detection - when camera will start it will take the face frame and measure the height, width, Row and column of the face and then we pass the frame into load model where we trained the model, in that face frame will compare with the CNN model and detect whether the person is wearing a mask or not.



2. FOR TEMPERATURE DETECTION- In temperature detection we are using MLX90614 sensor for detecting body temperature, it works based on Stefan-Boltzmann law which states that all objects emit IR energy and the intensity of this energy will be directly proportional to the temperature of that object. Sensor measures how much IR energy is emitted by a targeted object and the computational unit converts it into temperature value using a 17-bit in-built ADC and outputs the data through the I2C protocol. mlx90614 has certain range so here we are using ultrasonic sensor to detect the distance between hand and mlx senso, so that we get accurate output, this temperature will be pass to Arduino and Arduino will display it on the lcd screen.

3. FOR AUTOMATIC HAND SANTIZIER - For hand sanitizing we are using IR sensor to detect hand below the sanitizer box, once the hand is detected it passes the signal to Arduino and Arduino Will start running the motor which is attach to output pin of Arduino and sanitizer will be pumped out on our hand.In this project basically we are using An ultrasonic sensor which is used to check the presence of hands below the outlet of the sanitizer machine. It will continuously calculate the distance between the sanitizer outlet and itself and tells the Arduino uno to turn on the pump whenever the distance is less than 15cm to push the sanitizer out.

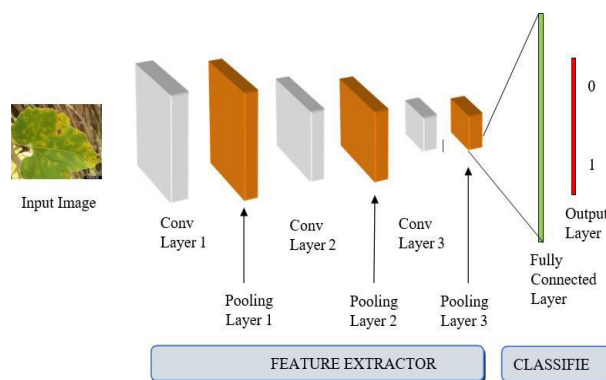
4. BLOCK DIAGRAM OF SYSTEM



1. Camara will start and it takes image and detect whether a person is Wearing a mask or not.
2. If person is not wearing a mask, then buzzer will on.
3. If person is wearing a mask, then person will go for temperature detection.
4. If temperature is high then 98 F, then buzzer will on.
5. If temperature is below then 98 F, then person will go for the hand sanitizing.

6. CONVOLUTION NEURAL NETORK (CNN)

It is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. CNNs are used for image classification and recognition because of its high accuracy. It follows a hierarchical model which works on building a network, like a funnel, and finally gives out a fully-connected layer where all the neurons are connected to each other and the output is processed.



CNN is a widely-used image recognition model that has been shown to attain greater than 78.1% accuracy on the Image Net dataset. The model is the conclusion of many ideas developed by many researchers over the years. An 256x256x3 input representing a visual field of 256 pixels and 3 color (RGB) channels. Five convolution layers, with a few interspersed max-pooling operations. Successive stacks of “CNN Models”. A SoftMax output layer at the end at an intermediate output layer just after the mixed layer. Steps involved in CNN are Convolution layer in CNN is performed on an input image using a filter. Relu (Rectified Linear Unit) which simply converts all of the negative values to 0 and keeps the positive values the same. Poolinglayer is used to reduce the spatial size of the Convolved Feature. They are of two types such as Max Pooling and Average Pooling. Fully Connected layers in a neural networks is a layer where all the inputs from one layer are

connected to every activation unit of the next layer. These networks are commonly trained under a log loss (or cross-entropy) system, giving a non-linear variant of multinomial logistic regression.

CNN LAYER:

Conv2D: It is the layer to convolve the image into multiple images activation is the activation function.

MaxPooling2D: It is used to max pool the value from the given size matrix and same is used forth next 2 layers.

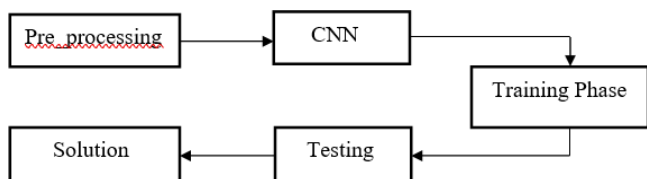
Dropout: It is used to avoid over fitting on the dataset and dense is the output layer contains only one neuron which decide to which category image belongs.

Fully Connected: It has neurons that are fully connected to the neurons in previous layer. This FC layer is often kept as the final layer of a CNN with “SOFTMAX” as its activation function for multi-class classification problems. The FC layer is responsible to predict the final class or label of the input image. Thus, it has an output dimension of $[1 \times 1 \times N]$ where N denotes the number of classes or labels considered for classification.

Epochs: It tells us the number of times model will be trained in forward and backward pass.

7. MASK DETECTION

Once the model is trained with the available dataset, it is then tested. Input the Image (filename.jpg) for the prediction. Predict function is called on the loaded pickle module to classify the image as healthy or not.



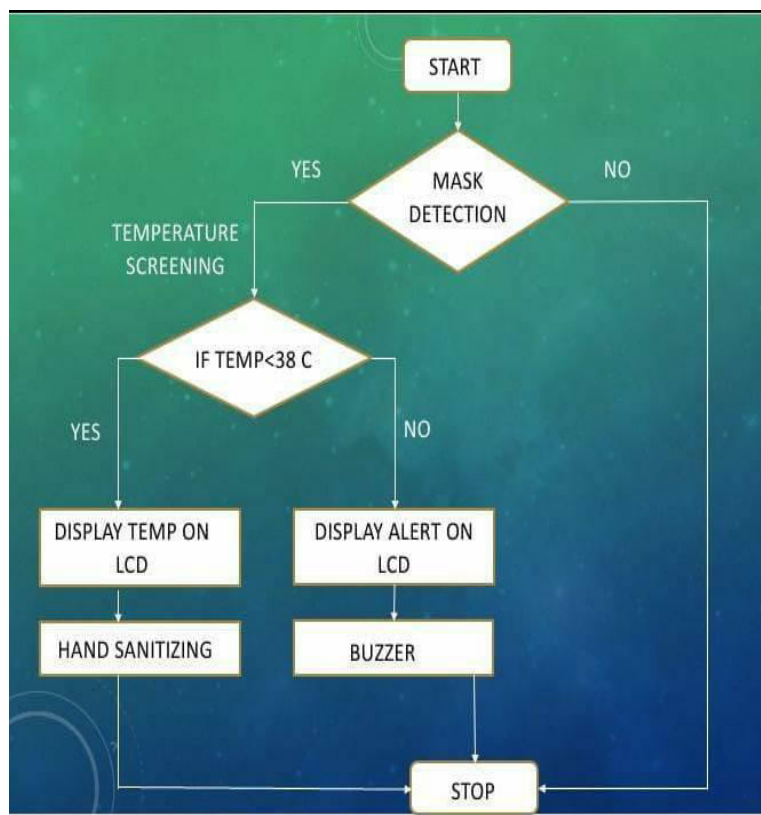
8. The final stage is the detection of the mask and with the help of model we detect whether a person is wearing a mask or not . For the mask detection, we are implementing the deep learning algorithm.

FLOWCHART AND ALGORITHMS

1. Mask Detection.

2. Temperature Screening.

3. Hand Sanitizing.



9. CONCLUSIONS

Corona Virus (Covid19) is wreaking havoc in the world. Almost every country is suffering from the Corona Virus. Many cities are under lockdown situation, people can't step out of their homes, and thousands have lost their lives. As we know hand sanitizers are more effective than soaps, and also easy to use and also, we know that non-contact dispensing is again important to prevent pathogen spreading and finally, hand hygiene is most important and must be part of our daily life. Using a medical mask is one of the prevention measures to limit spread of Covid and certain respiratory diseases.

Detecting fever which is the symptom of Covid requires measuring body temperature. So, in this project, we have developed an Automatic hand Sanitizer using ESP32, Contactless temperature screening using IR Sensor (MLX90614) & a deep learning model for face mask detection using Python, Keras, and OpenCV. We have trained the model using Keras with network architecture.

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