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AUTOMATION SOCIETY SECURITY TASK-ASST.

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Abstract— The COVID-19 pandemic has brought many changes in our day-to-day lifestyle. One of the major changes is wearing a Facemask and requirement of normal body temperature. Thermometer and Facemask detector are required for checking the temperature and to detect whether the person is wearing a mask or not. Using normal thermometers will be quite risky as the necessary distance cannot be maintained. IR thermometer will be helpful in this case as IR thermometer follows non-contact method by which there is no risk of passing the infection from one person to another. IR based thermometer will use Mlx90614 contactless sensor which will be used to check the temperature. As it is a contactless thermometer, it can be fixed on wall or any entry point. Alert or a beep sound will be produced if temperature reaches a certain critical point. Facemask Detectors are necessary in crowded places like malls, hospitals etc. as it would be difficult for a human being to monitor a large crowd at the same time. Facemask detector can detect the facial area of a large crowd within minutes and the person monitoring the system will get to know who is not wearing a mask by just sitting and monitoring from security camera. In Facemask detection, TensorFlow technology will be used to detect the mask as this technology uses dynamic face recognition and give complete analysis of face structure.

Keywords — COVID-19, contactless, TensorFlow, Facemask, IR Thermometer, Coronavirus, OpenCV, Machine Learning.

I. INTRODUCTION

Many precautionary measures have been taken to fight against coronavirus. Among them sanitizing hands, maintaining social distancing, wearing a mask, refraining from touching eyes, nose and mouth are the major one and wearing a mask is the simplest one [1]. Normal body temperature is also a very important factor because a high body temperature is one among the few symptoms of coronavirus. Now the question arises that how to measure the temperature without coming in contact. IR contactless thermometer is the answer to this question. IR Thermometer is a Thermometer which is used to determine the object's temperature within certain range by knowing the amount of infrared energy emitted by object and its emissivity. IR Thermometer consists of a lens which focuses the radiation on the detector. Detector then converts radiant power to electrical signals that are displayed in units of Temperature [2]. This permits the measurement of Temperature from a specific distance without contact with the object. IR Thermometer will be used to detect the unusual body temperature of any unknown person like delivery agents, visitors, housekeeping staff etc. without coming in contact with them. Facemask is necessary because persons having respiratory problems can expose anyone (who is in close contact with them). Surroundings of a tainted individual can cause contact emission as droplets carrying virus may arrive on adjacent surfaces [4]. Facemask detector is a simple model which will detect whether the person is wearing a mask or not. In this process initially 1400 images (700 images of people wearing a mask and 700 not wearing mask) needs to be uploaded. Images will contain different sizes and shapes of mask. Facial area will be scanned by the Detector and it will be compared with the images uploaded. If it does not match with the uploaded images then a beep or alert sound will be produced which will alert the

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authorities and further actions can be taken. Facemask detection model is build using the Deep Learning technique called as Convolutional Neural Networks (CNN). CNN Model is build using TensorFlow framework and OpenCV library which is highly used for real-time applications [15]. Recently, the growth of COVID-19 can be reduced by detecting the Face mask in smart city network.

This paper aims at designing a IR thermometer and Facemask detector to keep a check on the unusual body temperature and to monitor whether everyone is wearing Facemask or not. Page 1 contains Introduction and literature survey, Page 2 contains Proposed System and Methodology which are used, Page 3 contains Conclusion to the project and references.

II. LITERATURE SURVEY

IR Thermometer

Face detection algorithm allows the system to track the face position. Hence, robust and non-contacting temperature measurement can be properly done even if the person is not standing still. The system is calibrated to measure the temperature of anyone who is within the range of 1 meter and gives an alert sound when the temperature is beyond the desired temperature. Therefore, this system can reliably estimate body temperature and can be used even at a certain distance.

Facemask Detector

Face recognition has recently received significant attention especially during the past several years. Detection algorithm makes it easy to scan the facial area and detect the mask. Facemask detection involves in detection the location of face and then determining whether there is mask or not.
Person's face should be perpendicular to the security cameras. Hence this process is much useful to detect the facemask than the normal one in which a person has to monitor each and everyone which is quite impossible.

Fig. 1. Face mask Detector [16]

III. PROPOSED SYSTEM

The standardisation of the infrared measuring instrument is incredibly necessary to confirm its performance. Because the emissivity of canal is very close to unity, the temperature of the black body is usually served at the standard temperature for calibration [11]. The infrared Thermometer comes factory calibrated with a digital output giving full access to the measured temperature in complete temperature range with a resolution of 0.02 °C. The sensors have an accuracy ±0.2 °C within the relevant medical temperature range

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A. TensorFlow

TensorFlow is a multipurpose machine learning framework. It can be used anywhere from training huge models across clusters in the cloud to running models locally in an embedded system [14]. It the fastest and simplest way to do image recognition on laptops or computers without any GPU because it is just an API and CPU is good enough for this. TensorFlow provides the opportunity to adapt a pre-trained model to new classes of data with several advantages.

B. OpenCV

Open CV is Associate in Nursing open supply laptop vision and machine learning code library [6]. The advantage of being a multi-platform framework, it supports each Windows and UNIX and last mac OS X. Open CV was designed to supply a typical infrastructure for laptop vision applications to accelerate the employment of machine perception within the industrial product [15]. Being a BSD- accredited product. Open CV makes it straight forward for businesses to utilize and modify the code. It supports C++, Python, Java, SDK, etc.

C. Machine Learning

Machine learning is associate in Nursing applications of computing (AI) that has system the flexibility to mechanically learn and improve expertise while not being expressly programmed [18]. Machine learning focuses on development of laptop programs that may access knowledge and use it for themselves.

IV. METHODOLOGY

Objects are usually recognized by their unique features. There are many features in human face which can be recognized. Locating of face is done by extracting structural features like eyes, nose, mouth, etc. which then uses them to detect a face. Mask and without mask images need to be trained with appropriate algorithm. Once models are trained, move to the loading mask detector, perform face detection and classify each face. Once image has been uploaded, classification happens automatically. It is then possible to apply some interpretability methods for neural networks understanding. Grad CAM visualizes how parts of input image affect CNN output by looking into activation maps.

A. IR Thermometer

Infrared Thermometer measures temperature by detecting the infrared energy emitted by all materials which are at temperature above absolute zero. The Infrared (IR) energy is focused on the detector using lens, which converts the energy to an electrical signal that can be displayed in units of temperature after being compensated for ambient temperature variation. Temperature measurement from a distance without contact with the object to be measured is achieved by this configuration. As such, the infrared measuring system is helpful for activity temperature underneath circumstances wherever thermocouples or different probe sort sensors can't be used or don't manufacture correct information for a range of reasons. Some typical circumstances are where the object to be measured is moving, where the object is surrounded by an EM field, where the object is contained in a vacuum or other controlled atmosphere, or in applications where a fast response is required.

B. Facemask Detector

In order to use facial recognition to construct a data set of facial masks, an image of a person who does not wear a facial mask is required. Face detection is applied to calculate the location of the bounding box

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in image. Once the face is tracked in the image, face region of interest (ROI) can be extracted and facial landmarks can be applied which will localize eyes, mouth and face [12].

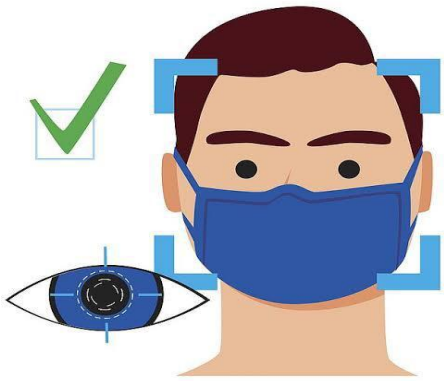

Fig. 2. Face Scanning [17]

V. CONCLUSION

The current study used OpenCV and CNN to detect whether people wear face mask or not. The models were tested with images and real time video streams. Even though the accuracy of the model is around 60%, the optimization of the model is a continuous process and we are building a highly accurate solution by turning the parameters. MobileNetV2 was used to build the mobile version of the same. This specific model could be used as a use case for edge analytics. Infrared thermometers are efficient to measure human temperature in the range of temperatures used in clinical practice. As these devices are easy to use and inexpensive, they could be largely used in critical care, anaesthesiology, or emergency medicine.

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