IJMRT: Volume (4), Issue 6, 2022

ISSN (Print) : 2663-2381
ISSN(Online) : 2663-4007

International Journal of Multidisciplinary Research Transactions

(A Peer Reviewed Journal)

www.ijmrt.in

Smart Entry System using IoT and AI

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DoI: https://doi.org/10.5281/zenodo.6632645

Abstract

The novel Coronavirus had brought a new normal life in which the social distance and wearing of face masks plays a vital role in controlling the spread of virus. But most of the people are not wearing face masks in public places which increase the spread of viruses. This may result in a serious problem of increased spreading. Hence to avoid such situations we have to scrutinize and make people aware of wearing face masks. Humans cannot be involved for this process, due to the chance of getting affected by corona. Hence here comes the need for artificial intelligence (AI), which is the main theme of our project. Our project involves the identification of persons wearing face masks and not wearing face masks in public places by means of using image processing and AI techniques and sending alert messages to authority persons.

The object detection algorithms are used for identification of persons with and without wearing face masks which also gives the count of persons wearing mask and not wearing face mask and Internet of Things (IOT) is utilized for sending alert messages. This theme consists of social distancing noticing and face mask detection for the events of disease like novel coronavirus can be solved by maintaining social distancing as well as wearing/putting on its face mask. This used to develop a Mask Detection using OpenCV, Keras/TensorFlow and also Deep Learning. This System can easily integrated/implemented to various embedded devices with limited computational capacity that uses

MobileNetV2 architecture. System will detect face masks in photos/images and in real-time videos. The alert messages are sent to the authority persons through mobile notification and Email. Based on the count of persons wearing and not wearing face masks the status is obtained.

Keywords: Temperature, Facemask, Detection, Covid 19, pandemic, safety.

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1.Introduction

The novel coronavirus covid-19 had brought a new normal life. India is struggling to get out of this virus attack and the government implemented a lockdown for the long way. Lockdown placed a pressure on the global economy. So the government gave relaxations in lockdown. Declared by the WHO that a potential speech by maintaining distance and wearing a mask asks is necessary. The biggest support that the government needs after relaxation is social distancing and the wearing of masks by the peoplele. But many people are getting out without a face mask this may increase the spread ofcovid-19. Economic Times India has stated that " Survey Shows that 90percent Indians are aware, but only 44 percent wearing a mask ". This survey clearly points that people are aware but they are not wearing the mask due to some discomfort in wearing and carelessness.This may result in the easy spreading of covid-19 in public places.The world health organisation has clearly stated that until vaccines are found the wearing of masks and social distancing are key tools to reduce spread of virus.So it is important to make people wear masks in public places. In densely populated regions it is difficult to find the persons not wearing the face mask and warn them.Hence we are using processingg-ing techniques for identification of persons wearing and not wearing facemasks. In real time images are collected from the camera and it is processed in ardino nano embedded development kit. The real time images from the camera are compared with the trained dataset and detection of wearing or not wearing a mask is done. The trained dataset is made by using a machine learning technique which is the deciding factor of the result. The algorithm created by means of using a trained

dataset will find the persons with and without wearing face masks.The Internet of Things (IOTs) can be used for connecting objects like smartphones, Internet TVs, laptops, computers, sensors and actuators to the Internet where the devices are linked together to enable new forms of communication between things and people, and between things themselves. Intimation messages are sent to authority persons busings IoT using IOT.

2. Literature Survey

2.1 TITLE: A COMPREHENSIVE REVIEW OF THE COVID-19 PANDEMIC AND THE ROLE OF IOT, DRONES, AI, BLOCKCHAIN, AND 5G IN MANAGING ITS IMPACT

AUTHOR: VINAY CHAMOLA

The COVID-19, an acronym for ‘‘Coronavirus Disease2019’’, is a respiratory illness caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a contagious virus belonging to a family of single-stranded, positive-sense RNA viruses known as coronaviridae. Much like the influenza virus, SARS-CoV-2 attacks the respiratory system and causes ailments such as cough, fever, fatigue, and breathlessness. The unprecedented outbreak of the 2019 novel coronavirus, termed as COVID-19 by the World Health Organization (WHO), has placed numerous governments around the world in a precarious position. The impact of the COVID-19 outbreak, earlier witnessed by the citizens of China alone, has now become a matter of grave concern for virtually every country in the world. The scarcity of resources to endure the COVID-19 outbreak combined with the fear of overburdened healthcare systems has forced a majority of these countries into a state of partial or complete lockdown. The number of laboratory-confirmed coronavirus cases has been increasing at an alarming rate throughout the world, with reportedly more than 3 million confirmed cases as of 30 April 2020.

2.2 TITLE: ARTIFICIAL INTELLIGENCE (AI) AND BIG DATA FOR CORONAVIRUS (COVID-19) PANDEMIC: A SURVEY ON THE STATE-OF-THE-ARTS

AUTHOR: QUOC-VIET PHAM, DINH C. NGUYEN

Coronavirus disease-19 (COVID-19), caused by a novel coronavirus, has changed the world significantly, not only healthcare system, but also economics, education, transportation, politics, etc. Infected COVID-19 people normally experience respiratory illness and can recover with effective and appropriate treatment methods. What makes COVID-19 much more dangerous and easily spread than other Coronavirus families is that the COVID-19 coronavirus has become highly efficient in human-to-human transmissions. As the leaders in the war against the novel coronavirus, the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) have released a set of public advices and technical guidelines. The cooperation between and efforts from national governments and large corporations are expected to significantly reduce risks from the spread of COVID-19 outbreak. For example, as a search engine giant, Google launched a COVID-19 portal (www.google.com/covid19), where we can find useful information, such as coronavirus map, latest statistics, and most common questions on COVID-19. Another example is that IBM, Amazon, Google, and Microsoft with White House developed a supercomputing system for researches relevant to the coronavirus. To better understand and alleviate the COVID-19 pandemic, many papers and preprints have been published online in the last few months. Our main purpose is to show the effectiveness of AI and big data to fight against the COVID-19 pandemic and review state-of-the-art solutions using these technologies. Moreover, two representative examples of the AI and big data-based solutions are presented for a better understanding. Besides, we highlight challenges and issues associated with existing AI and big data-based approaches, which motivate us to produce a set of recommendations for the research communities, governments, and societies.

2.3 TITLE: ARTIFICIAL INTELLIGENCE AND COVID-19: DEEP LEARNING APPROACHES FOR DIAGNOSIS AND TREATMENT

AUTHOR: MOHAMMAD (BEHDAD) JAMSHIDI

Humans' contribution at this stage is important because their knowledge and potentials are not available to an ML solution that unlike humans is able to deal with huge data sets far beyond the extent that humans could handle or observe in a simultaneous manner. Moreover, Deep Learning (DL) methods could be employed in cases where enormous or complex data processing challenge ML or traditional means of data processing. However, DL is mainly different from ML because it presents data in the system in a different manner. Whereas DL networks work by layers of Artificial Neural Networks (ANN), ML algorithms are usually dependent on structured data. Unlike supervised learning which is the task of learning a function mapping an input to an output on the basis of example input-output pairs, unsupervised learning is marked by minimum human supervision and could be described as a sort of machine learning in search of undetected patterns in a data set where no prior labels exist. In conventional medicine, alternatively called as allopathic medicine, biomedicine, mainstream medicine, orthodox medicine and Western medicine, medical doctors and other professional health care providers such as nurses, therapists, and pharmacists use drugs, surgery or radiation to treat illnesses and eliminate symptoms. Another complication that COVID-19 causes in the elderly is heart failure, which requires heart failure specialists stay on guard and design a structured approach to these type of patients and include them in developing algorithms for the care of these patients in early stages until the time when definite universal COVID-19 examinations or clinical trials of antivirals are in place, and deeper understanding of final stages of the disease is realized. Excessive use of fluid and drugs, such as NSAIDs that may change the balance of salt and water in elderly patients, should be avoided.

3. METHODOLOGY

3.1 DEEP LEARNING

Deep learning (also known as deep structured learning) is part of a broader family of machine learning methods based on artificial neural networks with representation learning. Learning can be supervised, semi-supervised or unsupervised. Deep-learning architectures such as deep neural networks, deep belief networks, recurrent neural networks and convolutional neural networks have been applied to fields including computer vision, machine vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics, drug design, medical image analysis, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance. Artificial neural networks (ANNs) were inspired by information processing and distributed communication nodes in biological systems. ANNs have various differences from biological brains. Specifically, neural networks tend to be static and symbolic, while the biological brain of most living organisms is dynamic (plastic) and analogue**.**

3.2 ARTIFICIAL INTELLIGENCE

AI (artificial intelligence) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision. AI can be categorized in any number of ways, but here are two examples. The first classifies AI systems as either weak AI or strong AI. Weak AI, also known as narrow AI, is an AI system that is designed and trained for a particular task. Virtual personal assistants, such as Apple's Siri, are a form of weak AI. Strong AI, also known as artificial

general intelligence, is an AI system with generalized human cognitive abilities so that when presented with an unfamiliar task, it has enough intelligence to find a solution. The Turing Test, developed by mathematician Alan Turing in 1950, is a method used to determine if a computer can actually think like a human, although the method is controversial.

3.3 Dataset Collection

To train our deep learning architecture, we collected images. The architecture of the learning technique highly depends on CNN. Data from source is collected for training and testing the model. Dataset contains images of faces only. It consists of about 1,315 images in which 658 images containing people with face masks and 657 images containing people without face masks. For training purposes, 80% images of each class are used and the rest of the images are utilized for testing purposes.

3.4 IMAGE PROCESSING

The acquisition of images (producing the input image in the first place) is referred to as imaging. Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans).

4.Block Diagram of the proposed model:

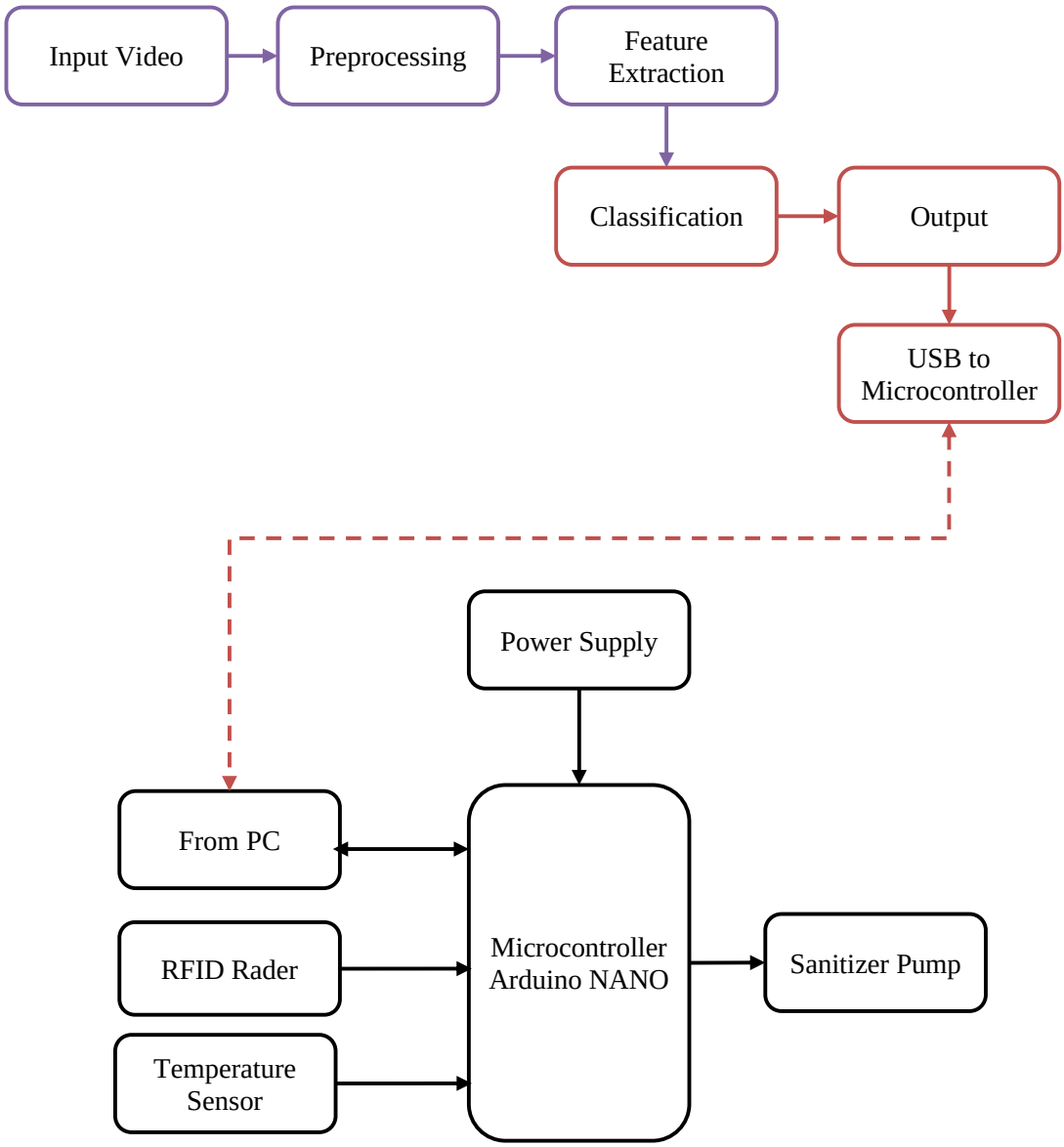

Figure.1 Block Diagram of the proposed model

5. The Proposed Smart Entry Check System

Our framework utilizes RFID tags which allow the organizations to monitor the employee's attendance, mask status, and temperature status, and the data are uploaded to the firebase portal.

5.1 FACE MASK DETECTION

Face mask detection is of two steps, one is Face Detection another is Face Mask Classifier. If any person hasn't wearing a mask then an alert get triggered in the monitoring screen. In this section it is described about the approach's taken to build the models.

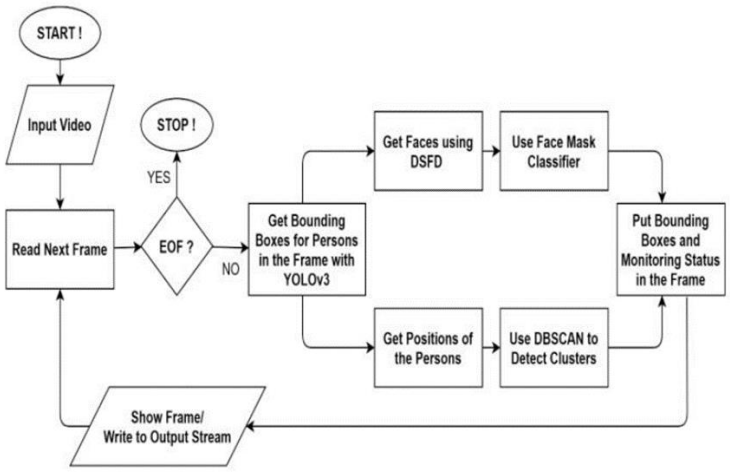

Figure.2 face mask detection flow

5.2 Authentication and Alert Notification

The proposed model is designed to be deployed in any closed area such as malls, hotels, schools, hospitals and companies, where RFID is used to detect and track any COVID cases. For efficient and accurate tracking, it is assumed that people are wearing an RFID tag when entering any closed area, which will be connected to an RFID reader.

- If the data show a suspected infected person, the action will be taken immediately through the base station to request isolation of the target person and start tracking people who were in contact with him, if any;
- If any COVID-19 cases are reported, all the people who were in contact should be tracked and isolated until it is confirmed that they are safe. The following probabilities are considered to help detect those to be tracked:

- Check the probability that the person is not wearing a mask.
- Check the probability that the distance is less than the defined safety distance.

6. Conclusion and Future Scope

A reliable, efficient, accurate, and secured data transmission system was proposed for COVID-19 cases' prediction and tracking using analytical and deep learning techniques. First, the proposed tracking system was described and explained based on different conditions. In this project we have used recent techniques in the field of computer vision and also in the deep learning. The proposed system will correctly detect the presence of face mask and person is in the safe the distance. The system is accurate, since we have used the MobileNetV2 architecture for detecting face mask and for distance computing we used Euclidean distance formula. The main contributions of the proposed work is to efficiently and cost effectively trace and track the persons who have been in proximity to the suspected cases to further take the necessary measures such as undergoing quarantine and treatments.

This method was developed with an efficient way for the people who are not wearing face mask and not maintaining social distance and notified to officials by email. As a future enhancement, we can predict/detect time at which it gets crowded and heat map can be plotted in an accurate way.

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