International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

COVID-19 Detection System Using Image Processing and Biomedical

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Abstract: ***In this work the design of implementation of an image processing based physical safety and health monitoring system for covid-19 pandemic. Which can support to know the physical health in the time of coronavirus using an Arduino mega 2560 microcontroller board is based on the Atmel AT mega 2560 8-bit microcontroller by using RFID EM 18 and spo2 sensor. The sensors is sense the human body's vital signs. That is it measured the pulse oxygen level in your blood, body temperature and heart beat rate based on the way the light passes through your finger and delivers the data to the device screen attach and RFID it is one of the method of automatic identification and data capture. In this system we design this disinfection chamber known as personal sanitization enclosure is capable of the disinfecting person. Then face detection in image processing and computer vision. A binary phase classifier which can detect any face present in frame irrespective of its alignments. Represent this method to generate accurate face segmentation mask from any arbitrary size input image. The purpose of this model is to provide infection control through sanitizer. And facial mask detection by detecting body temperature and pulse oxygen level with the help of spo2 sensor MAX30100.***

Keywords: Open CV, Python, Face Segmentation and Detection, Embedded C, SP02MAX3010.

1. Introduction

Since the last days of the previous year, the occurrence of novel infectious flu-alike respiratory disease COVID-19 caused by SARS-Cov-2 virus (also known as coronavirus) has affected almost every aspect of people's lives globally. It is transmitted directly (person to person) through respiratory droplets, but also indirectly via surfaces. Incubation period could be quite long and varies (between 14 and 27 days in extreme cases). Furthermore, even asymptomatic persons (almost 45% of cases) can spread the disease making the situation even worse. Therefore, the usage of face masks and sanitizers has shown positive results when it comes to disease spread reduction. However, the crucial problem is the lack of approved vaccine and medication.

Due to these facts, many protection and safety measures were taken by governments in order to reduce the disease spread, such as obligatory indoor mask wearing, social distancing, quarantine, self-isolation, limiting citizens' movement within country boarders and abroad, often together with prohibition and cancellation of huge public events and gatherings. Despite the fact that the pandemic seemed weaker at some points, most of safety regulations are still applied due to unstable situation. From workplace behavior to social relations, sport and entertainment, coronavirus disease poses many changes to our everyday routine, habits and activities.

In this project, the Arduino IDE (Arduino integrated development environment) is adopted which is written in Java language and represents a cross-platform App. It involves many features code editor such as syntax highlighting, auto¬indentation, and brace matching. The IDE additionally uploaded an Arduino board by compiled and uploaded programs using essential one-click mechanism. It also supports C and C++ languages in using special rules to order code. Further, it utilize wiring project that produces several input-output method to provide software library known by Wiring as depicted in Figure 2. In addition, Proteus software includes schematic, simulation and circuit design. It is mainly used for drawing several schematics and performing real time circuit simulation that empowers human to get access during running phase, and thus creating real-time simulation. For facedetection process, this prototype uses EmguCV cross platform. Net wrapper to the Intel OpenCV image processing library and C#.Net. The normal APIs are generated during programming by Open CV library. Ardunio UNO board is used with a computer stick driven by Intel processor. The face detection is done by using Cascade Classification algorithm which is based on Hair feature. It is presented by Paul Viola and Michael. Further, Machine learning algorithm is used with a cascade function for training both of positive and negative images. The open CV library already has the Cascade object detection that recognizes the face of the captured image. Many common features are extracted from the human Face to make a standardized size rectangle to enable image preprocessing algorithm to grayscale image as well as histogram equalization.

2. Literature Review

Armand and Tarascon (2008) expressed that Lithium-particle batteries have been the decision of battery science for fueling customer hardware because of their high vitality, high force thickness, stable electrochemical execution and the capacity to be energized [1].

Charging would turn out to be increasingly helpful if the battery is joined with at least one gadgets that gather vitality from encompassing sources, for example, light, warm, or vibrational vitality [2,3]. Of the different vitality collecting strategies, photovoltaics (PV) are frequently the most appropriate for charging high-limit batteries on account of the generally high accessible force lair-sity on the request for 100mW/cm2 outside or several μW/cm2 inside, contrasted with tens to hundreds of μW/cm2 for warm and vibrational sources.

Ostfeld et al., built up a sun based fueled pulse oximeter. The existing authors planned a wearable social insurance gadget which included adaptable lithium-particle batteries, photovoltaic vitality collecting module and heartbeat oximeter segments. The lithium-particle batteries are accused of the photovoltaic module to keep up the force gracefully for the wear-capable wellbeing checking gadget. The battery was steady all through charging and releasing at rates up to 3C under the rehashed charge and release cycling and flexing. The charging of battery from the PV module with irradiance running from 0.9 to 100 for indoor and outside enlightenment condition [4].

Honna (2012) proposed a remote Covid - 19 Patient checking framework which is utilized for constant observing of two wellbeing parameters, for example, oxygen immersion and temperature of body [5].

3. Proposed Methodology

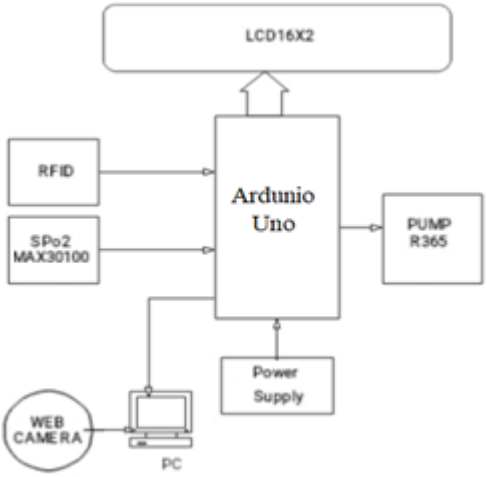

Figure 1: COVID-19 Indoor Safety Controller Based System

3.1 Working of Proposed Methodology

Our solution consists of the following subsystems:

1) Temperature measurement subsystem based on Arduino Uno
2) Computer vision subsystem for mask detection and social distancing check based on Raspberry Pi
3) Server side
4) Smartphone application for security guards.

First, all people try to enter in the building, have to pass contactless by checking temperature. For that purpose, we rely on Arduino Uno eauipped with infrared thermometer (such as MLX906 1 48) or thermal camera sensor (AMG88339 for example). Moreover, it uses ESP8266 wifi module for communication with Edge servers using MQTT protocol. In case that person has body temperature higher than normal, the door is locked and MQTT message sent to server, containing both the temperature value and location will be recorded. Server receives this message, parses it and forwards to smartphone application used by security guards, so they can arrive to make sure that person does not try to enter the building further. Otherwise, if passenger's temperature is normal, Arduino will send signal to open the door.

After that, passengers proceed to next step of checking - mask detection. For this task, computer vision subsystem based on Raspberry Pi single-board computer equipped with camera module version 110 revision 3 was used. In case that passenger does not wear mask or it does not cover nose, security guards will be informed via MQTT message, so they can provide a mask or warn that person to leave. Otherwise, if the person that is being checked wears mask, the door will be opened. Furthermore, once they enter the building, Raspberry Pi devices check whether social distancing is applied properly or not at given locations. In a similar way, MQTT message will be sent to inform the security guards when social distancing is not applied properly in some of the rooms.

On the server side, the MQTT broker and semantic triple store are deployed, while message processing, event logging, reasoning and message forwarding are done. Edge servers receive messages; perform their semantic annotation and reasoning to find the right security guard that will be notified. A simple Android mobile application used by security guards receives MQTT messages from server side and visualizes the data about rule violation and location where it occurred within the building. In Fig. 1, an overview of the proposed Controller based-based solution that aims to ensure that COVID-19 safety guidelines are applied properly indoors is given. 1-Passenger arrival 2-Temperature value 3-Door open/close signal 4-MQTT message warning that someone has higher body temperature than average 5-Wears mask/doesn't wear mask 6-Social distancing satisfied/not satisfied 7-MQTT warning message telling that person without mask tries to enter 8-MQTT warning message that passengers do not respect social distance measures 9-MQTT notification messagessent to security worker's smartphone about people breaking COVID-19 safety measures at various building rooms.

4. Results of Proposed System

The figures given below is the representation of LCD screen which shows the detail attribute of an individual person, while entering in any building or office, the person will get sanitize first and then by showing Tag or Card , the name of person will be displayed on screen. For Example, Fig 4 & 5 has the attribute Name and the names were displayed as ALEXA and PETER. After that by using SPO2, three parameter will be checked i.e. Temperature, oxygen and Heartbeat.

Figure 4: Representation of LCD screen with detail Attributes of Person

After placing the Finger on SPO2 sensor it will detect temperature, oxygen and heartbeat, if temperature exceeds above 99 then the permission to enter the building or office will be rejected. In Fig 4 and 5 the temperature is 96 and 97 respectively, which is below the threshold value and the oxygen and heartbeat are also below the threshold value, which shows that the permission has been granted to get entered.

Figure 5: Representation of LCD screen with detail Attributes of Person

5. Conclusion

An innovative real-time early detection of coronavirus and monitoring system using Novel Covid-19 detection system which integrated with thermal imaging system has been developed. Early detection of the coronavirus symptoms will be one of the suitable ways to prevent the spreading of coronavirus. As the high body temperature of people is one of the very common symptoms, a real time monitoring system of the screening process that automatically appearing the thermal image of temperature of people is needed.

So the diagnosis of the screening process will be less time consuming and less human interactions that might cause the spreading of the coronavirus faster. It can be concluded that the remote sensing procedures, which provide an assortment of ways to identify, sense, and monitoring of coronavirus, give an awesome promise and potential in order to fulfill the demands from the healthcare system. Our system has the entire precautionary attribute which are needed for the pandemic situation, which includes Hand Sanitization, temperature checker, oxygen checker, Heartbeat checker and Mask Detection. Existing System does not have potential for checking this entire attribute at one place or in one system and thus this new proposed system is more preferable and has more potential to avoid the pandemic situation to grow more.

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