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COVID-19 Indoor Safety Monitoring

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ABSTRACT: We introduce an affordable IoT-based solution aiming to increase COVID-19 indoor safety, covering several relevant aspects as contactless temperature sensing, mask detection, social distancing check, Pulse rate heart beats. Contactless temperature sensing subsystems rely on Arduino Uno using infrared sensor or thermal camera, while mask detection and social distancing checks are performed by leveraging computer vision techniques on camera equipped Raspberry Pi. This booth will detect the face with the help of Face Recognition Technology, pycam and mark the attendance and in the next part with help of body temperature sensor it measures the temperature of user and with help of pulse oximeter it measure the oxygen level and heart rate of the user and by using Senrom-1437 blood pressure sensor it measure the blood pressure of the user which is essential in this situation. After marking attendance it will submit all the health data into the ThingSpeak server. If any Covid patient found it will alert the user as well as the person who is watching the dataset

KEYWORDS: : NodeMcu, computer vision, coronavirus, COVID-19, Raspberry Pi, ontology, Internet of things (IoT).

I. INTRODUCTION

Coronavirus disease, also known as COVID-19, is an infectious disease which spreads between Humans. The incubation period of coronavirus is on average 5 - 6 days, but it could also be up to 14 days. During this incubation period, before the person begins experiencing symptoms, the person could be contagious. The virus would spread to the people with whom the infected person is interacting, and this is dangerous. Since the last days of the previous year, the occurrence of novel infectious flu-like respiratory disease COVID-19 caused by SARS-Cov-2 virus (also known as coronavirus) has affected almost every aspect of people's lives globally. First, it was discovered in China, but spread quickly to other continents in just a few weeks. According to [1], until July 11th, 2020, the total number of identified cases was 12,653,451, while taking 563,517 lives worldwide. Common symptoms of coronavirus disease include fever, tiredness, sore throat, nasal congestion, loss of taste and smell. In most cases, 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 vaccines and medication.

In this cost-effective IoT-based system aiming to help organizations respect the COVID-19 safety rules and guidelines in order to reduce the disease spread is presented. We focus on the most common indoor measures - people with high body temperature should stay at home, wearing a mask is obligatory and the distance between persons should be at least 1.5-2 meters. So I decided to use the components I had at home. I would recommend you to use those two sensors instead of the DS18B20 temperature sensor module and heartbeat sensor module. For the first scenario, Arduino Uno, a microcontroller board with contactless temperature sensor, is used, while we rely on a Raspberry Pi Single-board computer equipped with a camera making use of computer vision techniques for the other two scenarios.

II. RELATED WORK

The only way that the world can deal with this coronavirus is to slow down its spread, (i.e. "flatten the curve") by using measures such as social distancing, hand washing and face masks. However, technology could also help slow its spread, through early identification (or prediction) and monitoring of new cases. Such technologies include big data, as well as cloud and fog capabilities, the use of data gathered through remote monitoring, such as mHealth, teleHealth, and real-time Independent and convenient, healthy living is the aim of any human being no matter their age, gender,

location or health status. However, there are limitations due to age, illness, medication, hospitalization, epidemic, pandemic and other circumstances. Health monitoring systems have evolved to assist convenient healthy living, more accessible communication between healthcare givers and patients for close monitoring, measurement of vital health parameters, routine consultation and overall healthy living. Moreover, with the recent advances in information and communication technologies (ICT) through the adoption of Internet of Things (IoT) technology, smart health monitoring and support systems now have a higher edge of development and acceptability for enhanced healthy living. The study conducted by Zikali revealed that with the rapid increase in the population of older or senior citizens, patients who require health monitoring have also increased exponentially. The same study predicts that by the year 2045 the number of senior citizens who are considered the most vulnerable in society will exceed the number of children and young adults as a recent population census shows an increase in older people. However, a shortage of home health helpers, nursing assistants and home healthcare givers is looming worldwide, which makes care for the elderly expensive. Therefore, a health monitoring system can play a vital role in lessening physical contact, hospitalization, consultation time, queuing list and overall health cost for a patient while also reducing workload, burden and stress on medical staff. Advancements in information and communication technologies for connectivity anywhere and anytime make a valuable contribution to the development of the modern healthcare system utilized in telemedicine solutions and other portable medical platforms.

III.METHODOLOGY

There are several existing works that contain some of the elements relevant to the work presented in this paper. However, to the best of our knowledge, there is no such solution covering all these aspects together to achieve this goal while allowing execution on low-cost IoT devices at the same time. , a dataset for masked face recognition is introduced and its application by different algorithms in context of campus and enterprise coronavirus prevention discussed. Moreover, in a high-accuracy method for facial mask detection using semantic segmentation based on fully convolutional networks, gradient descent and binomial cross entropy was presented. However, performance-wise, it is too heavy for low-power IoT devices, such as Raspberry Pi. On the other side, a state model-based solution for face mask detection relying on Viola-Jones algorithm in the context of ATM center security was described. When it comes to temperature sensing, there are several variants of Arduino-based solutions. Arduino was used for real-time temperature visualization using MATLAB. However, the used sensor does not allow contactless temperature sensing. Moreover, a similar system incorporating the usage of smartphones for remote temperature monitoring using Arduino Uno was presented. The system architecture presented in this paper is inspired by our previous work on remote smart grid monitoring anomaly, power consumption monitoring and relay protection using IoT devices (smartphones and Arduino Uno) and video surveillance systems relying on Raspberry Pi single board computers and Edge servers.

A. OpenCV : Python version of OpenCV open-source computer vision library was used for implementation of mask detection and social distance check algorithms. We decided to use it, as it was approved for usage with older Raspberry Pi devices. Face and body detection algorithms rely on the existing OpenCV implementation of Viola-Jones object detection framework based on Haar feature cascades. It is a machine learning approach where cascade function is trained from a large set of positive and negative images.

B. MQTT : MQTT (Message Queuing Telemetry Transport)³ was used for machine-to-machine communication between the involved devices - Raspberry Pi, Arduino, Edge servers and smartphones. It is a lightweight, publish-subscribe messaging protocol on top of TCP/IP. MQTT is designed for use cases where small code footprint is desired or network bandwidth is limited, which is suitable for IoT solutions leveraging low-power computing devices presented in this paper.

C. Heartbeat Sensor : The heartbeat sensor which I have used in this project is quite tricky to work with. You should not place your finger on it too lightly or too hard because your blood flow would be interrupted and the measurements will be less accurate and the precision of the results will be affected. The heartbeat sensor module used in this project uses the reflective method. The IR LED in the heartbeat sensor module emits Infrared waves, and the photodiode measures the amount of light reflected. The intensity of the light reflected depends on the blood flow in your finger. This is how a heartbeat sensor works. Read this tutorial to learn how to use the DS18B20 temperature sensor module (you do not have to read this if you are using the non-contact sensor module).

D. Mask Detection Algorithm
For implementation of mask detection algorithm, we rely on three OpenCV library classifier
haarcascade_frontalface_default – which is used for detection of human face from frontal side
haarcascade_mcs_mouth

– recognizes human mouth within the provided image haarcascade_mcs_nose – to detect nose. For each frame coming from the camera stream, the procedure given in First, the camera frame is converted to a grayscale image which is used for face detection, as required by the OpenCV's Haar cascade classifier. Moreover, an additional black and white version of the camera frame is also created as a new copy. It was empirically noticed that in most cases of a person wearing a white mask, OpenCV classifier cannot identify the face correctly if gray scale images are used, but performs better with black and white images instead. After that, face detection is performed against both images. In case that array length of detected faces is 0 in bcases, then it is assumed that there isn't any human present within mask, OpenCV classifier cannot identify the face correctly if gray scale image is used, but performs better with black and white images instead. After that, face detection is performed against both image.

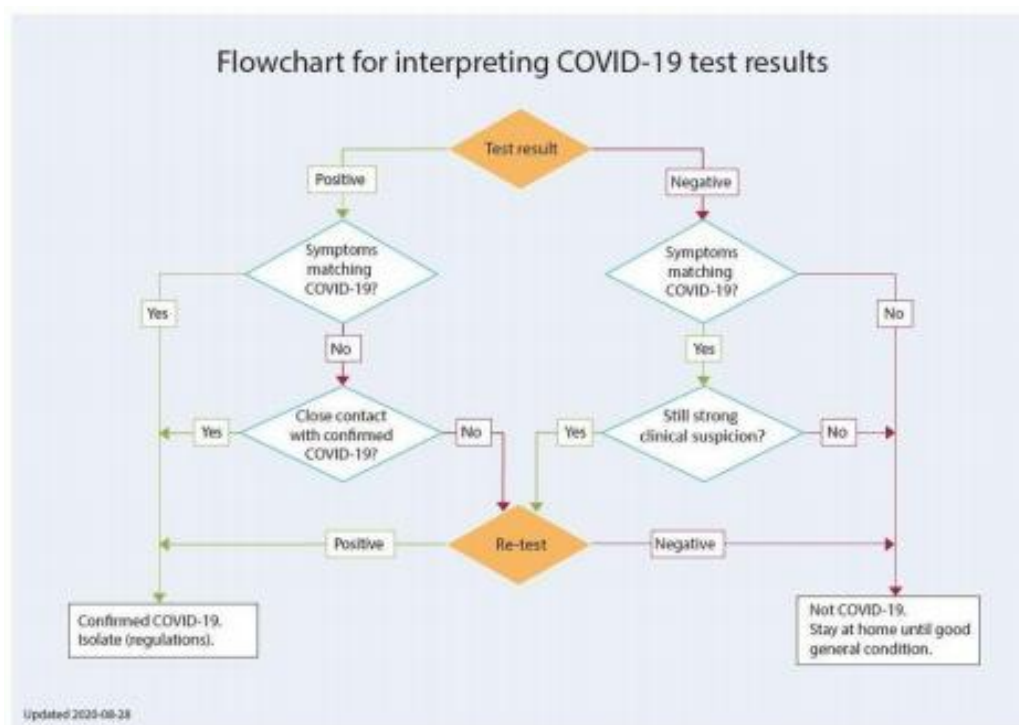
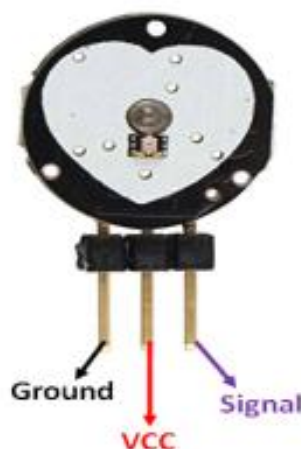


Fig 1. System Process Flow Diagram



Fig 3. Face Mask Detection

**Fig 2. Heartbeat sensor**

IV. EXPERIMENTAL RESULTS

For evaluation, the following, the following devices were used: a laptop equipped with Intel i7 7700-HQ quad-core CPU running at 2.80 GHz with 16GB of DDR4 RAM and 1TB HDD acting as Edge server, Raspberry Pi 2B (RPi 2B), Raspberry Pi 3 (RPi 3) and Arduino Uno Rev. 3 with both IR sensor and thermal camera. In Table I, the results of performance evaluation for various scenarios, devices and settings are given. The first column denotes the name of the scenario (mask detection, distance check, contactless temperature measurement). The second column shows the hardware configuration used in the experiment. Moreover, the third column is the frame size expressed as the number of horizontals multiplied by vertical pixels. Furthermore, the next column shows performance results achieved for a given configuration expressed as number of processed frames (fps) or measurements per second (mps). Finally, the last column represents the accuracy achieved for the observed scenario. It is expressed as the average percentage of successfully detected cases for mask detection and social distancing, while in case of temperature measurement it is the average measurement error for corresponding sensor. Comparing the mask detection and social distancing check performance, we see that the second is faster as it only uses one classifier (full body), while mask detection uses three of them (face, nose and mouth). In all social distance check experiments, the performance for two persons was evaluated, while it is expected to reduce as the number of people within the camera view increases. The performance of the distance check varies together with the distance

V. CONCLUSION

As a conclusion, a According to the achieved results, the proposed solution is usable for its purpose under certain performance limitations (such as number of processed frames or measurements per second). Moreover, it relies on both open hardware and free software, being a definite and desirable advantage for such systems. In the future, it is planned to experiment with various deep learning and computer vision frameworks for object detection on Raspberry Pi in order to achieve higher framerate.

REFERENCES

- [1] Coronavirus Update (Live) [online]. Available on: <https://www.worldometers.info/coronavirus/>, last accessed: 11/07/2020.
- [2] [2] P. Zhai et al., "The epidemiology, diagnosis and treatment of COVID19", International Journal of Antimicrobial Agents vol. 55 issue 5, May 2020, 105955, pp. 1-13, 2020.



- [3] [3] P. Dawson et al., “Loss of Taste and Smell as Distinguishing Symptoms COVID-19”, Clinical Infectious Diseases June 2020, pp. 1-4, 2020. <https://doi.org/10.1093/cid/ciaa799>
- [4] [4] L. Morawska, “How can airborne transmission of COVID-19 indoors be minimised?”, Environment International vol. 142, September 2020, 105832, pp. 1-7, 2020.
- [5] [5] T. Galbadage, B. Peterson, R. Gunasekera, “Does COVID-19 Spread Through Droplets Alone?”, Frontiers in Public Health, vol. 8, April 2020, pp. 1-4, 2020. <https://doi.org/10.3389/fpubh.2020.00163>
- [6] Coronavirus Incubation Period [online]. Available on: <https://www.worldometers.info/coronavirus/coronavirusincubationperiod/>, last accessed: 11/07/2020.
- [7] D. Oran, E. Topol, Prevalence of Asymptomatic SARS-CoV-2 Infection: A Narrative Review, Annals of Internal Medicine, June 2020, pp. 1-7, 2020.
- [8] T. Dbouk, D. Drikakis, “On respiratory droplets and face masks”, Physics of Fluids 32, 063303, pp. 1-11, 2020.
- [9] Y. Song et al., “COVID-19 Treatment: Close to a Cure? – A Rapid Review of Pharmacotherapies for the Novel Coronavirus” [preprint], pp. 1-25, 2020



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