



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Special Issue 3, December 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

9940 572 462

6381 907 438

ijrset@gmail.com

www.ijrset.com

Advanced Sanitizer Dispenser with Mask & Temperature Detection System

Suresh.P, Manju .K. R

Department of Electronics & Communication Engineering, Al- Ameen Engineering College Shoranur, Palakkad,,
Kerala, India

Department of Computer Science Faculty Member, IETE Palakkad, Kerala, India

ABSTRACT: COVID-19 pandemic has influenced human life in various sectors. Various attempts were made to reduce the virus transferring by work from home, social distancing, and including hand hygiene. So far, most of the available hand sanitizers do not operate automatically. This Paper aims to make an automated sanitizer system with following features 1) contactless temperature sensing 2) mask detection. Contactless temperature sensing the temperature using infrared sensor or thermal camera, while mask detection is performed by leveraging computer vision techniques on camera-equipped ESP32 Module. The VL53L0X is a LIDAR based distance measuring sensor that will detect the hand presence at predefined distance and it will send the data to the control unit for controlling sanitizer dispense valve for sanitization

KEYWORDS: Infrared sensor, Time-of Flight (ToF) laser module, Micro python

I. INTRODUCTION

The existence of Covid-19 disease has a big impact on both socials and economics. WHO has declared this a pandemic disease and many cities around the world are in a lockdown situation. To prevent the cause of this virus, it can be done by keeping a distance at least 1 meter, avoid going to crowded places, avoid touching the eyes, mouth, and nose when outside, and cleaning hands with soap or alcohol-based hand rub. Providing containers for cleaning fluids in public spaces is a form of Covid-19 prevention, but the provision of containers is currently ineffective because there are parts that are often touched. This could be a point of transmission for Covid-19. Many health actions are carried out using automatic systems including air quality monitoring, hand sanitizers, hand hygiene. Hand sanitizers are an alternative for washing hands during a pandemic. It can be used when and water are not available. Hand sanitizer is also available in several forms such as liquid (spray) or gel. Hand sanitizer is usually made from materials such as alcohol, poly acrylic acid, glycerin, propylene glycol, or plant extracts. The process of killing germs starts with removing the oil on the skin, then the bacteria in the body will come to the surface. Soap or alcohol will kill bacteria after rubbing to your hand. Hand sanitizer is effective against Covid-19.

In this paper, cost-effective system aiming to help organizations respect the COVID-19 safety measures in order to reduce the disease spread is presented. We focus on most common indoor measures - people with high body temperature should stay at home, wearing mask is obligatory. For the first Scenario, the VL53L0X will sense the presence of Hand and data coming from the sensor is compared. While ESP32 module equipped with camera making use of computer vision techniques are used for mask detection scenario. So far, most of the available hand sanitizers do not operate automatically. This article aims to make an automatic hand sanitizer where it can come out automatically. By showing the hand, the VL53L0X is a LIDAR based distance measuring sensor that detects the presence of hand and will control the opening and closing of the Sanitizer valve for dispensing the sanitizer. If Mask is not detected the aware announcement will be occurred through Audio chip.

II. BACKGROUND

A. OpenCV

Python version of Open CV [11], open-source computer vision library was used for implementation of mask detection and social distance check algorithms. We decide to use it, as it was approved for usage with older Raspberry Pi devices [12]. Face and body detection algorithms rely on the existing OpenCV implementation of

Viola-Jones object detection framework based on Haar feature cascades [13]. It is a machine learning approach where cascade function is trained from a large set of positive and negative images. After that, this function is used to detect objects in new images. OpenCV comes with both trainer and detector. However, OpenCV offers pre-defined classifiers for detection of commonly used objects, such as human face, whole body, body and face parts (both front and back for some of them). Therefore, in this paper, we leverage the existing classifiers provided by OpenCV library, as they were enough to cover satisfy the needs of the implemented solution. In [12], face detector provided by OpenCV library was used for control of multimedia reproduction systems based on Raspberry Pi devices within museums and cultural heritage sites, showing acceptable performance, even in real-time use cases

III. RELATED WORK

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. In [17], a dataset for masked face recognition is introduced and its application by different algorithms in context of campus and enterprise corona virus prevention discussed. Moreover, in [18], 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, in [19], a state model-based solution for face mask detection relying on Viola-Jones algorithm in context of ATM center security was described. When it comes to temperature sensing, there are several variants of Arduino-based solutions. In [20], Arduino was used for real-time temperature visualization using MATLAB. However, the used sensor does not allow contactless temperature sensing. Moreover, in [21], a similar system incorporating the usage of smart phones 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 (smart phones and Arduino Uno) [16] and video surveillance system relying on Raspberry Pi single board computers and Edge servers [22]. Our main goal is to provide a comprehensive solution for COVID-19 safety monitoring which relies on IoT devices as much as possible in order to be affordable at the same time.

IV. SYSTEM DESIGN & IMPLEMENTATION

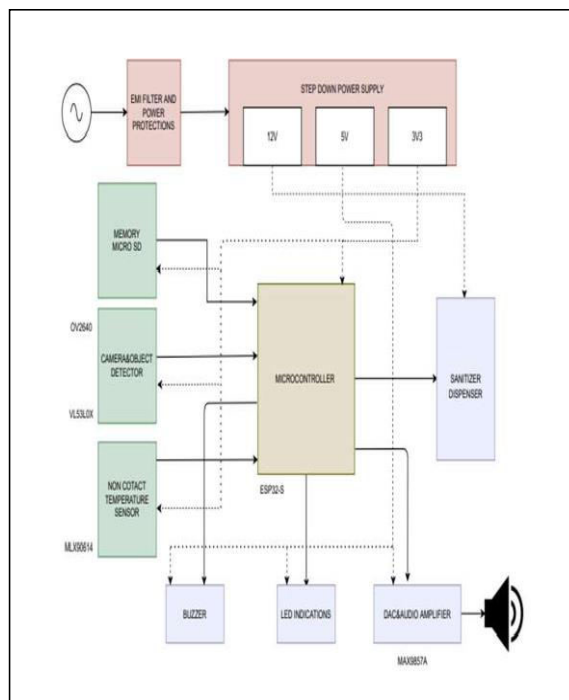


Fig.1 System design of advanced sanitize Dispenser

Figure demonstrates the design of the Automatic hand sanitizer container system consisting of block an infrared Temperature sensor and Time-of-Flight (ToF) laser-ranging module to sense the Body temperature and the motion of hand respectively, it will send data to ESP32. ESP32 send data to the relay to activate the Solenoid valve delivering the sanitizer for particular time limit. The camera module associated with ESP 32 will do the mask detection by the help of computer vision library associated with micro python, which is loaded in the SD card of the ESP 32 module.

The circuit in this research has three systems that can work simultaneously. In Figure 3, infrared (IR) temperature sensor senses heat and range sensor detect the hand motion. Along with this the camera module will do the mask detection. The corresponding data will send to the Controlling unit ,ie ESP32 so that it can activate the spray valve and the cleaner reaches the hand through a small pipe The sensors connected to the ESP 32 will start working when the device is activated. If the mask is not detected then there will be an audio announcement for awareness be done through the Audio Amplifier which is interfaced with the control unit with a speaker . The audio message to be announced can store in the mp3 file format on SD card as well

A. Mask detection algorithm

For implementation of mask detection algorithm, we rely on three OpenCV library classifiers¹¹: 1) haarcascade_frontalface_default – which is used for detection of human face from frontal side 2) haarcascade_mcs_mouth – recognizes human mouth within the provided image 3) haarcascade_mcs_nose – to detect nose. For each frame coming from camera stream, the procedure given in Listing 1 is executed.

First, the camera frame is converted to a gray scale image which is used for face detection, as it required by the OpenCV's Haar cascade classifier. Moreover, additional black and white version of camera frame is also created as a new copy. It was empirically noticed that in most cases of person wearing a white 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 images. In case that array length of detected faces is 0 in both cases, then it is assumed that there isn't any human present within the camera's view. Otherwise, if a face was detected, mouth and nose detection are further applied to the corresponding camera frame version. In case that image does not contain mouth and nose, it means that person wears mask properly and corresponding door will be opened. However, if mouth is detected and its coordinates are within the area of the detected face, then the person is warned that mask is needed in order to proceed. If nose is detected within face area, then the person is warned to put the mask properly (covering nose). The algorithm is working in both single- or multi- person mode.

In single-person it is assumed that people pass one by one near the mask detection system's camera. In case of multi- person mode, the check whether mouth and nose coordinates lie inside a face is done for each pair of face-mouth and face-nose pair, as more than one person can be allowed to pass near camera at once. In Fig. 2, a screenshot of successful mask detection on Raspberry Pi model 2B is given.

V. RESULT AND DISCUSSIONS

The flow chart shows a program that is loaded into the microcontroller. Figure 5 is a flow chart of the ESP 32 module software design. It will process the input data that has been obtained. The reading data from the sensors will be sent to the controller. The Image processing for Mask detection will done with the help of Open CV library which is in the Micro python language

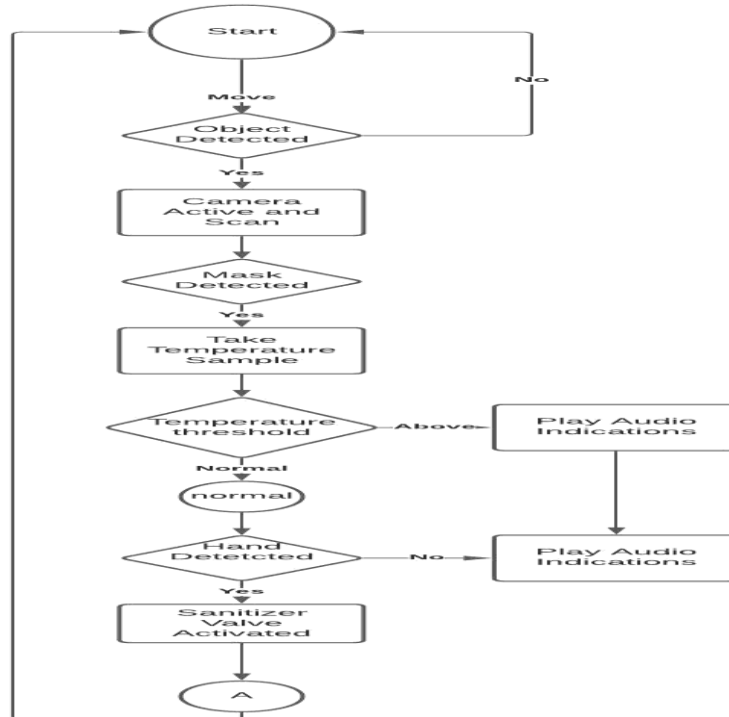


Fig. 2 Flow Chart

This Advanced hand sanitizer system uses sensors to detect temperature, Hand detection by means of MLX 90614 Non contact Temperature Sensor and VL5310X Time-of-Flight (ToF) laser-ranging module .When the hand comes under the sensor will send to ESP32 control Unit. And it will trigger the solenoid valve for the dispense of sanitizer. Same time the OV2640 module will do the object detection and face mask detection through the micro python program. Otherwise, in case of non-detection of mask will produce an audio announcement for awareness.

This Project uses ESP 32 module as a central unit with light version of python called micro python and camera module, which leads the cost effective method than the existing one.

Scenario	Device	Frame size [W x H]	Frame rate [fps/mps]	Accuracy
Mask detection	RPi 2B	640x480	0.48	84-91%
		320x240	1.71	
	RPi 3	640x480	0.76	
		320x240	2.83	
	Laptop	640x480	11.94	
		320x240	38.46	
Temperature sensing	IR	1	8	0.5°C
	Therma lcamera	8x8	2	2.5°C

Table 1. Detection parameters

VI. COVID-19 INDOOR SAFETY MONITORING ONTOLOGY

The highest-level concept in this ontology is Monitoring System. It consists of heterogeneous Devices, such as Raspberry Pi, Arduino Uno and conventional laptop. Each device is equipped with different sensors and is able to

detect different types of safety rule Violations. Several types of safety rule violations are considered: Social Distancing, No Mask and High Temperature. In case that some violation occurs, then the corresponding Action is taken as a response, such as closing Door or notifying Security Guard. For both the physical objects (Device, Door, Security Guard) and Violation events, the Room where it resides or occurs is relevant. Each Room is located on a Floor. This way, it is enabled to find the available Security Guard from the same Floor where Violation occurred and send him/her notification. Otherwise, the first guard that is available is selected. In Fig. 4, an excerpt from the described ontology is given.

VII. CONCLUSION AND FUTURE WORK

To assess whether or not people were wearing face masks, we used Open CV. The models were tested using images and real-time video streams. The model's accuracy has been achieved, and model optimization may be a continuous method during which we're fine-tuning the hyper parameters to make a highly accurate solution. Face mask detection technology which will identify whether someone is wearing a mask and permit them entry would be highly beneficial to society. The primary step in detecting Covid is to seem for signs of fever. We still go to keep an eye fixed on everyone for a mask. Every individual features a temperature monitor that detects if the temperature is too hot or too cold. If the temperature is just too hot or too cold, the buzzer will sound and therefore the machine are going to be notified otherwise the gate will open. The device would undoubtedly aid within the implementation of hand hygiene easily, as hand sanitizer is required for access to any entry point. Due to its touch less property, which removes any possibility of cross contamination, it is much safer and more recommended. This is a low-cost, easy-to-use device that everybody can use. Both of the machines are in good working order. It is often assumed that the tactic has been introduced effectively, and therefore the target has been met with none deviations. The outcomes of this project are real and therefore the product of diligence and honesty.

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 definite and desirable advantage for such systems. In 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 frame rate. Moreover, we would like to extend this solution with environment sensing mechanisms for adaptive building air conditioning and ventilation airborne protection in order to reduce the spread of corona virus indoors [4, 8, 24], especially during summer. Finally, the ultimate goal is to integrate the system presented in this paper with our framework for efficient resource planning during pandemic crisis [25] in order to enable efficient security personnel scheduling and mask allocation, together with risk assessment based on statistics about respecting the safety guidelines and air quality.

VIII. ACKNOWLEDGMENT

We express my sincere thanks to all faculty members of Electronics Department of the Institution for their valuable support and the encouragement provided me with throughout my work.

REFERENCES

1. P. Zhai et al., "The epidemiology, diagnosis and treatment of COVID-19", International Journal of Antimicrobial Agents vol. 55 issue 5, May 2020
2. P. Dawson et al., "Loss of Taste and Smell as Distinguishing Symptoms of COVID-19", Clinical Infectious Diseases June 2020, pp. 1-4, 2020.
3. L. Morawska, "How can airborne transmission of COVID-19 indoors be minimized?", Environment International vol. 142, September 2020, 105832, pp. 1-7, 2020. 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.
4. D. Oran, E. Topol, Prevalence of Asymptomatic SARS-CoV-2 Infection: A Narrative Review, Annals of Internal Medicine, June 2020, pp. 1-7, 2020.
5. T. Dbouk, D. Drikakis, "On respiratory droplets and face masks", Physics of Fluids 32, 063303, pp. 1-11, 2020.
6. 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.
7. V. Balachandar et al., "COVID-19: emerging protective measures", European Review for Medical and



National Conference on Emerging Technologies [NCET' 2021]

Organized by

Royal College of Engineering and Technology, Thrissur, Kerala, India

- Pharmacological Sciences vol. 24 (6),
8. P. Viola, M. Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features", 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, pp. 511-518, 2001.
 9. J. Davies, R. Studer and P. Warren, *Semantic Web Technologies: Trends and Research in Ontology-based Systems*, John Wiley & Sons, 2006.
 10. Venceslau et al., "IoT Semantic Interoperability: A Systematic Mapping Study", ICEIS 2019, pp. 535-544, 2019.
 11. N. Petrović, Đ. Kocić, "Data-driven Framework for Energy-Efficient Smart Cities", Serbian Journal of Electrical Engineering, Vol. 17, No. 1,
 12. Z. Wang et al., "Masked Face Recognition Dataset and Application" [preprint], pp. 1-3, 2020.
 13. T. Meenpal, A. Balakrishnan, A. Verma, "Facial Mask Detection using Semantic Segmentation", 2019 4th International Conference on Computing, Communications and Security (ICCCS), pp. 1-5, 2020.
 14. M. Kavitha, S. M. M. Roomi, K. Priya, K. B. Devi, "State model based face mask detection", International Journal of Engineering & Technology, 7 (2.22), pp. 35-38, 2018.
 15. R. Biswas, A. Roy, "Real Time Temperature Graph using MATLAB and Arduino", International Journal of Engineering Research & Technology (IJERT) vol. 9 issue 5, pp. 624-625, 2020.
 16. M. J. Pramila, P. S. Shewta, "Wireless Temperature detector System using ARDUINO and IOT", International Journal of Computer Trends and Technology (IJCTT) vol. 67 issue 11, pp. 82-83, 2019
 17. N. Petrovic, "Surveillance System Based on Semantic Video and Audio Annotation Leveraging the Computing Power within the Edge", XIV International SAUM 2018, pp. 281-284, 2018.
 18. R. V. Gomeseria, "Building Services Design to Prevent the Spread of COVID19", pp. 1-18, 2020.
 19. N. Petrovic, Dj. Kocic, "Framework for Efficient Resource Planning in Pandemic Crisis", CIIT2020,



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details