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Advanced Gadgets for Covid Crisis Using IoT

S. Veena[1], K. S. Yashas[2], Y. R. Ujwal Gowda[3*], D. G. Vijay[4], H. C. Vyshak[5]
[1]*Professor, Department of Electronics and Communication Engineering, SJC Institute of Technology, Chikkaballapura, India*
[2,3,4,5]*Student, Department of Electronics and Communication Engineering, SJC Institute of Technology, Chikkaballapura, India*

***Abstract*: Coronavirus disease COVID-19 has emerged as a pandemic with serious clinical manifestations including death. A pandemic at a large-scale like COVID-19 places extraordinary demands on the world's health systems, dramatically devastate vulnerable populations, and critically threatens the global communities in an unprecedented way. While tremendous efforts are made at the frontline and are placed on detecting the virus, providing treatments, and developing vaccines, it is also critically important to examine the technologies and systems for tackling disease emergence, arresting its spread, and especially the strategy for disease prevention. Advanced gadgets for the COVID crisis using IOT aims to review enabling technologies and systems with various application scenarios for handling the COVID-19 crisis. The article will focus specifically on wearable devices suitable for monitoring the populations at risk and those in quarantine, both for evaluating the health status of caregivers and management personnel, the system consists of a Raspberry Pi Camera for automatically scanning the barcodes of an individual ID card. Automatically collected information will be maintained for further communication and diagnosis usage of an unobtrusive sensing system during quarantine for monitoring patient's health parameters with relatively mild symptoms whose clinical situation could suddenly worsen in improvised hospitals telehealth technologies for the remote monitoring and diagnosis of the COVID-19 and related diseases. Finally, further challenges and opportunities for the future direction of development are highlighted.**

***Keywords*: Raspberry Pi 4, LCD display, Push button, MLX90614, KY039, Keypad, Web camera, Twilio account.**

1. Introduction

Coronavirus disease-2019 COVID-19 has become a pandemic, affecting more than 210 countries throughout the world. COVID-19 is highly contagious, with reported average case-fatality rates ranging from 6.2% to 7.2% among the most-affected countries, and it is an acute public health issue. According to the latest data from the World Health Organization WHO, the epidemic coronavirus has infected more than 3,349,000 people and caused the deaths of more than 238,000 globally. As of 3 May 2020, the number of confirmed cases of COVID-19 is about 400 times more than the previous coronavirus-induced severe acute respiratory syndrome SARS outbreak in 2002-2003, and the number of those infected with COVID-19 is expected to grow. The COVID-19 spread not only threatens public health but also impacts many other aspects of people's daily life, in particular the global economy. Caused by the SARS coronavirus 2, COVID-19 most frequently presents with respiratory symptoms that can progress to pneumonia and, in severe cases, acute respiratory distress syndrome ARDS along with the carcinogenic or distributive shock. Though SARS-CoV-2 and SARS Covid share some common clinical manifestations, a new study shows that SARS-CoV-2 is highly efficient in person-to-person transmission and frequently causes asymptomatic infections. Clinical deterioration can occur rapidly, often during the second week of COVID-19, which can lead to intensive care unit ICU admission and high mortality. Specifically, the severity of COVID-19 varies from subclinical infection and mild illness to severe or fatal illness. According to data from China,15-20% of COVID-19 cases require hospitalization, with around 15% of cases presenting with severe symptoms and 5% requiring intensive care, including invasive mechanical ventilation for treatment. In Italy and Spain, 40-50% of COVID-19 cases were hospitalized, with 7-12% requiring admission to ICUs in severe conditions. Given its severity and fast spread, the COVID-19 pandemic has raised huge challenges for global healthcare systems in giving treatment for COVID-19. COVID-19 can rapidly overwhelm health care systems, enhancing their capacity to deliver services not only to COVID-19 patients but also to other patients infected with health problems that are not necessarily related to COVID-19. Lessons from epidemic centers such as China, Italy, and the United States show that COVID-19 can suppress the capacity of health-care systems even in countries with extensive health resources and universal care. Currently in most countries, to reduce the burden on healthcare systems, patients with COVID-19 are triaged based on the severity of the disease, i.e., critical condition patients are admitted to the hospital while patients with mild symptoms and without underlying chronic conditions may be cared at home by taking medications, and mild cases will not require intervention unless rapid deterioration occurs. In view of the current pandemic, covid testing plays a key role in fighting the pandemic. Covid testing is done in covid testing centers that provide a safe covid testing environment. No need for separate registration, the system uses the camera for an instant Aadhar card scan. Thus, we fully automate the Covid testing registration process, making it faster, safer, and error-free to help fight the pandemic in a better manner.

2. Literature Survey

Angelucci, D. Kuller, A. Aliverti, home telemedicine system

*Corresponding author: ujwalgowda686@gmail.com

for continuous respiratory monitoring. In view of the current pandemic, covid testing plays a key role in fighting the pandemic. Covid testing is done in covid testing booths that provide a safe covid testing environment. No need for separate registration, the system uses the camera for an instant Aadhar card scan. Thus, we fully automate the Covid booth testing process, making it faster, safer, and error-free to help fight the pandemic in a better manner [1].

Samuel A. Lazoff and Kim Bird in their paper Synchronized Intermittent Mandatory Ventilation, synchronized intermittent mandatory ventilation SIMV is a type of volume control mode of ventilation. With this mode, the ventilator will deliver a mandatory set number of breaths with a set volume while at the same time allowing spontaneous breaths. Spontaneous breaths are delivered when the airway pressure drops below the end-expiratory pressure (trigger). The ventilator attempts to synchronize the delivery of mandatory breaths with the spontaneous efforts of the patient. In contrast, to assist control ventilation ACV, SIMV will deliver spontaneous volumes that are 100% driven by patient effort. Pressure support PS may be added to enhance the volumes of spontaneous breaths. SIMV was initially developed in the 1970s as a method to wean patients who are dependent on mechanical ventilation. SIMV gained popularity and was the most widely used ventilatory mode for weaning, with 90.2% of hospitals preferring SIMV in a survey conducted in the 1980s [3].

P. J. Chacon, T. H. da Costa, and T. Ghomian, H. Chun Wu, A Wearable Pulse Oximeter with Wireless Communication and Motion Artifact Tailoring for Continuous Use.

Caused by the SARS coronavirus-2 SARS-CoV-2, COVID-19 most frequently presents with respiratory symptoms that can progress to pneumonia and, in severe cases, acute respiratory distress syndrome ARDS along with the carcinogenic or distributive shock. Though SARS-CoV-2 and SARS-Covid share some common clinical manifestations, a new study shows that SARS-CoV-2 is highly efficient in person-to-person transmission and frequently causes asymptomatic infections. Clinical deterioration can occur rapidly, often during the second week of illness, which can lead to intensive care unit ICU admission and high mortality. Specifically, the severity of COVID-19 varies from asymptomatic, subclinical infection and mild illness to severe or fatal illness. Cases of COVID-19 are generally categorized into five groups: asymptomatic, mild, moderate, severe, and critical. According to data from China, 15-20% of COVID-19 cases require hospitalization, with around 15% of cases presenting with severe symptoms and 5% requiring intensive care, including invasive mechanical ventilation. In Italy and Spain, 40-50% of COVID-19 cases have been hospitalized, with 7-12% requiring admission to ICUs [4].

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Mustafa A Al-Sheikh and Ibrahim A Ameen in their paper Design of Mobile Healthcare Monitoring System Using IoT Technology and Cloud Computing, this project presents an implementation of a wearable, portable, low power consumption, real-time remote bio-signals monitoring system based on the internet of thing technology. This implementation provides an improved step-in remote health monitoring field. The number of people, who require health care increase year by year and the conventional bio-signals monitoring systems requires patients' attendance in person inside hospitals. This might cause an inefficient situation to take care of the patients, especially those who have critical and unstable health conditions. Therefore, internet technology along with modern electronic devices could offer promising solutions in this field. Based on that, this project utilizes a mobile application as an IoT platform to monitor remotely the live ECG signal, heart rate, KY-039, and the body temperature of patients. The signals are measured and processed by using a microcontroller-based device Arduino. The main contribution of this paper is sending an electrocardiogram ECG signal to a specific smart mobile phone to be watched by a doctor. This assists in heart disease diagnosing before the worst case can happen. Finally, the obtained results of this project are illustrated on both smartphones and personal computers PC as well [6].

Gulraiz J. Joyia, Rao M. Liaqat, Aftab Farooq, and Saad Rehman, Internet of Medical Things IOMT Applications. Given its severity and fast spread, the COVID-19 pandemic has raised huge challenges for global healthcare systems. COVID-19 can rapidly overwhelm health care systems, impairing their capacity to deliver services not only to patients infected with this epidemic disease but also to those with health problems that are not necessarily related to COVID-19. Lessons from epidemic centers such as China, Italy, and the United States show that COVID-19 can suppress the capacity of health--care systems even in countries with extensive health resources and universal care. Currently in most countries, to reduce the burden on healthcare systems, patients with COVID-19 are triaged based on the severity of the disease, i.e., critically ill patients are admitted of ECE, to the hospital while patients with mild symptoms and without underlying chronic conditions may be cared for at home, and mild cases will not require intervention unless rapid deterioration occurs [7].

3. Modelling and Analysis

Sensors and Raspberry Pi which are used are presented in this section.

As in figure 1, Raspberry pi camera is used as a barcode scanner to fetch the details from the personal id card. The LCD display is used in displaying the heartbeat and temperature of

the patient. The SRF ID/Kit ID given will be entered through a keypad. The collected details will be stored as a database for maintaining records. This ends the registration part. After the registration process, the Raspberry pi camera will be detached for the monitoring process. In the monitoring process Heartbeat sensor (KY0039) is used to measure Pulse rate. Temperature is measured by a wireless temperature sensor named MLX90614IR sensor. The measured values are sent to the specified number with the help of the Twilio interface. In case of emergency, the Panic button will be provided to the quarantined patient for help. Once when operated the exact location of the patient quarantined will be sent via the Twilio interface.

- Keypad for entering the SRF ID/Kit ID present on the sample bottle.
- LCD for displaying the heartbeat and temperature.
- After the above process if the person tests positive the camera will be detached.
- The pulse sensor and temperature sensor are used to measure prime health parameters, in that the switch will be used as Panic Button for a patient emergency.
- Live location of the patient will be sent in the form of a link through Twilio interface with the help of GPS, which is inbuilt in the Raspberry Pi controller.

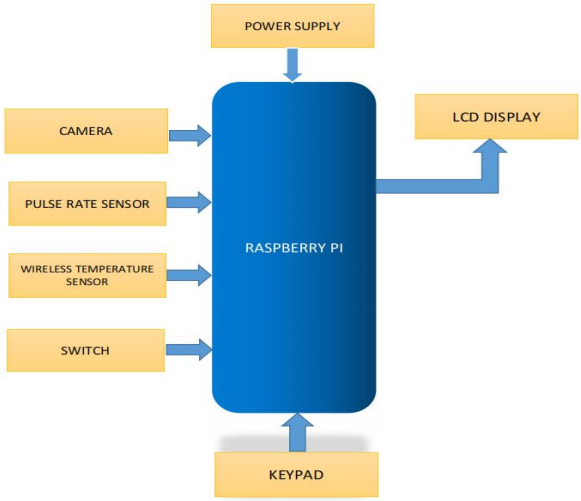

Fig. 1. Kit architecture

A. *COVID-19 patient's registration*

Registration of the person for the COVID test. Monitoring of the patient when tested positive for COVID-19.

As shown in above figure 2. The process of barcode scanning for registration purposes.

B. *Health monitoring*

During quarantine patient's primary health parameters such as pulse rate is measured from sensor KY-039 and temperature are measured using sensor MLX90614.

The panic button will be useful for patients in emergency conditions if the patient presses the panic button, then the doctor will get an alert message with a live location and then the doctor will be able to give treatment to a patient.

Fig. 2. Barcode scanning process

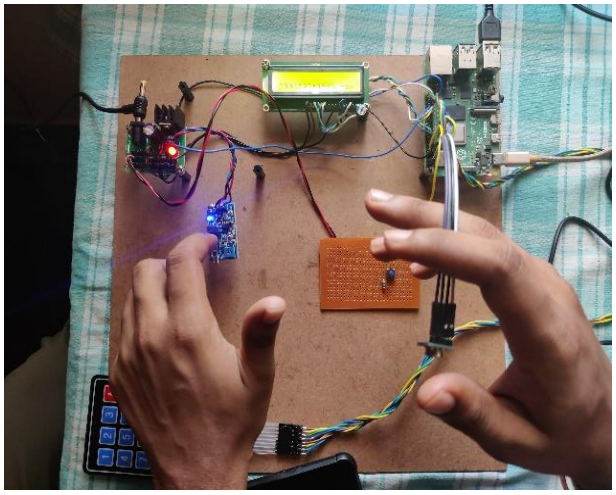

Fig. 3. Working process of sensors

Fig. 4. Sensors displaying readings

As shown in the above figures 3 and 4. The working sensors (MLX90164 and KY-039) measure the patient temperature and heartbeat and display the results.

As shown in figure 4. The alert message and the sensor reading will be sent to the specified phone number.

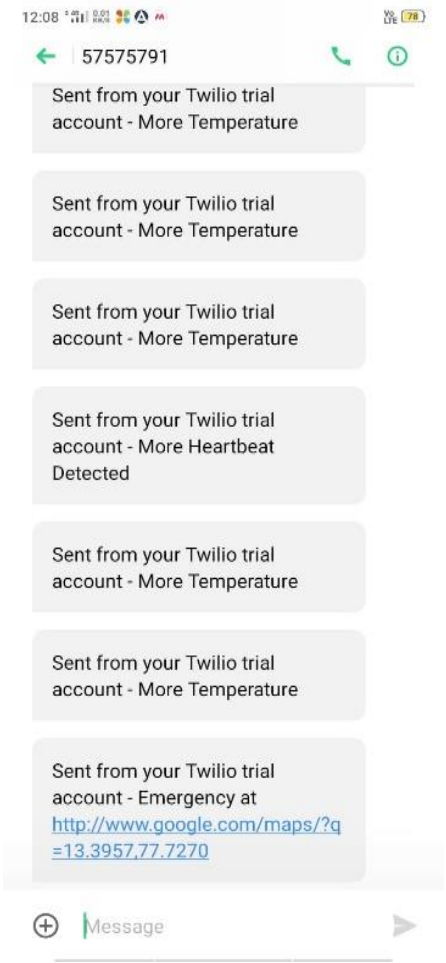

Fig. 5. Alert message from Twilio

4. Conclusion

This paper presented the implementation of advanced gadgets for COVID crisis using IoT.

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