Social Distancing Proximity Detection System

Ekurume Ogagaoghene Elohor, Aji Theresa Kalu

Faculty of Science
Department of Computer Science
Delta state university, Abraka, Nigeria.

ABSTRACT: The coronavirus disease 19 (COVID-19) is a highly transmittable pathogenic viral infection which was first discovered in Wuhan, China. The rate of transmission of the virus was very high in the late 2019 and early 2020 across the globe. Due to this rapid spread, social distancing was introduced to help reduce the spread of the virus, as the spread could only travel at aboutapproximately six feet or two meters.This paper presents a novel prospective that would encourage and enhance social distancing. This would may curb the spread of the virus and ensure the health and safety of individuals. In this paper, a novel approach is introduced to encourage social distancing. This approach makes use of Proximity detector with Arduino Uno board, LCD and LED as the hardware and C# programming language is uploaded on the board using Arduino Integrated Development Environment (IDE).
Keywords: Social Distancing, Health, Arduino, IR Proximity sensor, Distance Detector.

I. INTRODUCTION

Over the years, the human race has been threatened by various plagues, the most recent infectious disease is the pandemic of SARS-CoV-2 also known as the Coronavirus disease 2019 (COVID-19) (Bhavya. S. &Manan M 2021). According to The South Morning China Post The first discovery of the Coronavirus disease 2019 was in Wuhan, China November 17, 2019 (Milibari A.A. 2020).

Some of the symptoms of the virus are cough, fever, very high temperature and breathing difficulty. The COVID-19 VIRUS is spread when in contact with an infected person or environment, preventive measures against the spread of the virus includes constant hand wash with soap and running water for at least 20 seconds, avoiding facial contact with hands and Social distancing.

Social distancing is described as a method to reduce the closeness between people (approximately six feet or two meters) in order to reduce the risk of the virus spreading. Although social distancing is an effect method to stop the spread of the virus but people fail to comply due to ignorance (Milibari A.A. 2020). Hence, the idea behind this project is to help individuals to maintain certain distance to stop reduce the risk of infection. We have developed a device that has in-built sensor to detect distance between individuals in an enclosed space like offices, schools etc. The aim of the project is to help reduce the spread of the virus by using this system to indicate when six feet or two meters' rule between individual is not effected.

II. LITERATURE SURVEY

Professionals from different fields are working in various ways to help fight the spread of the virus including developing products to predict the spread, track the virus, combat the virus. The table below is a summary of technology solutions for COVID-19.

TECHNOLOGIES	AUTHOR (S)	COVID-19 SOLUTIONS

Machine Learning/Deep Learning	Punn, Sonbhadra, & Agarwal, 2020	Analyze epidemic situations
		Diagnostic and prognostic analysis
	Wang, Ng, et al., 2020; Wang, Zha, et al., 2020; Watson, Ives, et al., 2020	Automatically detection of COVID-19 cases
		Early triage of critically ill COVID-19 patients
	Ozturk et al., 2020	Early detection and diagnosis
	Liang et al., 2020	
	Chen et al., 2020	
Big Data Analytics	Liu.,Ting, Carin, Dzau, & Wong, 2020	Tracking movements of people, understanding epidemic trends, and control and regulate pharmaceutical supplies
	Wang, 2020	New drug and vaccine development.
HPC Infrastructures	Liu, 2020	Target exploration and drug selection
Robots	Yang et al., 2020	Deliver food and medicine; Disinfect rooms; Treat patients
3D Printing Technology	Choong et al., 2020	Produce protective masks; Make test swabs
Digital Contact Tracing Technology	Budd et al., 2020	Track movements of individuals; Alert people from visiting COVID-19 hotspots
Internet of Things	Rahman et al., 2020	Ensure patient compliance with quarantine requirements; Monitor patients remotely
Wearable devices	Bhavya& Mahajan 2021	distance is monitored with a smartphone's in-built geo-location sensor, warning the user to maintain a distance of six feet

Table 1: summary of technology solution for COVID-19

III. METHODOLOGY
SURVEY AND ANALYSIS

In the early 2021, most countries the suspended the lockdown, it was observed that in most academic and social institutions in Nigeria, social distancing are not maintained and understood by individuals. With that observation, a survey was conducted in order to give an insight to how different age groups observe Social distancing rules in social environments and where the proposed system can be implemented.
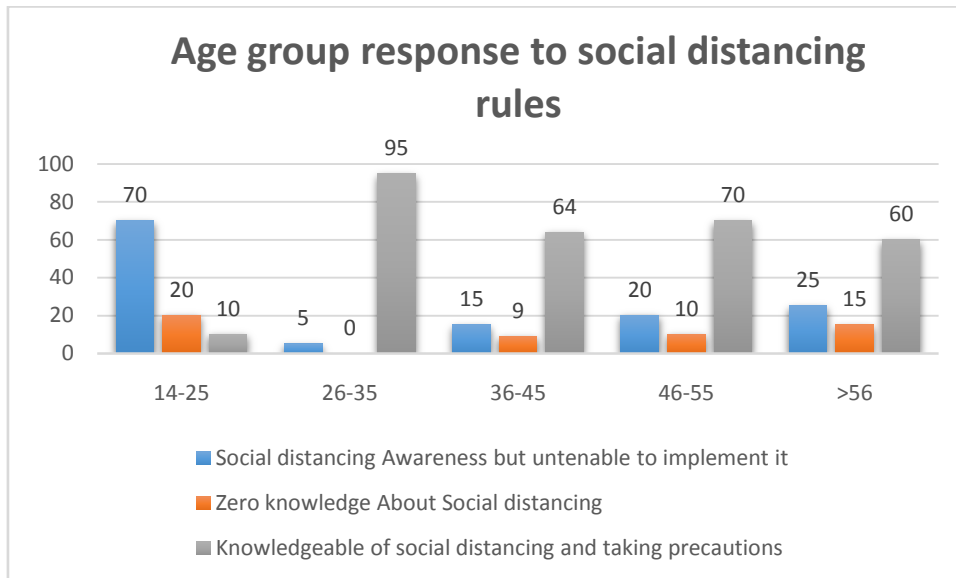

Figure 1: Age group response to social distancing rules

From Figure 2, 52% are knowledgeable about social distancing rules but unable to implement it either because they have little control of their environment (Most are in classes or with close friends that they don't feel the need to distance themselves)
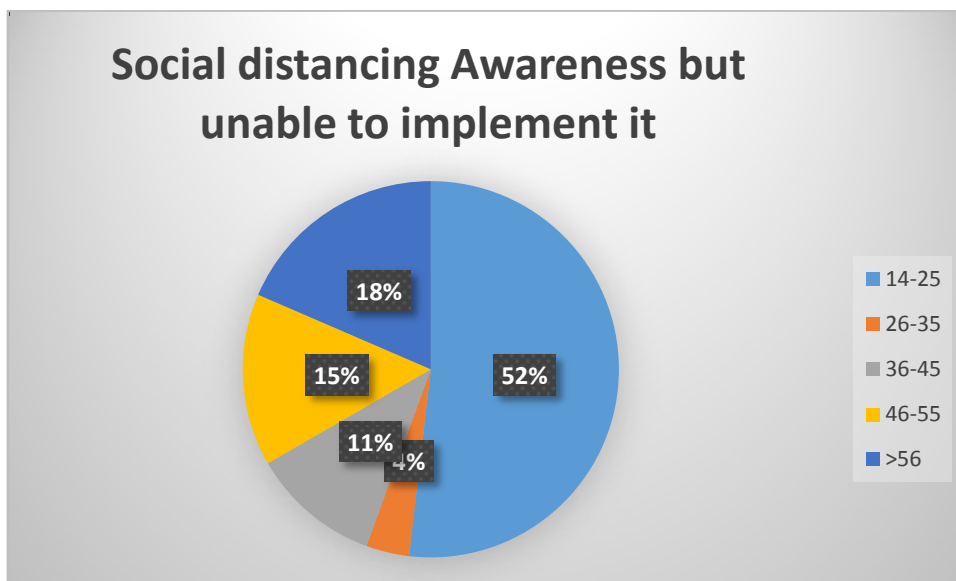

Figure 2: Social distancing awareness but unable to implement it

From Figure 3, it was observed that the age above 26 years have knowledge of the virus and how to distance themselves as well as to taking precautions to reduce the spread.
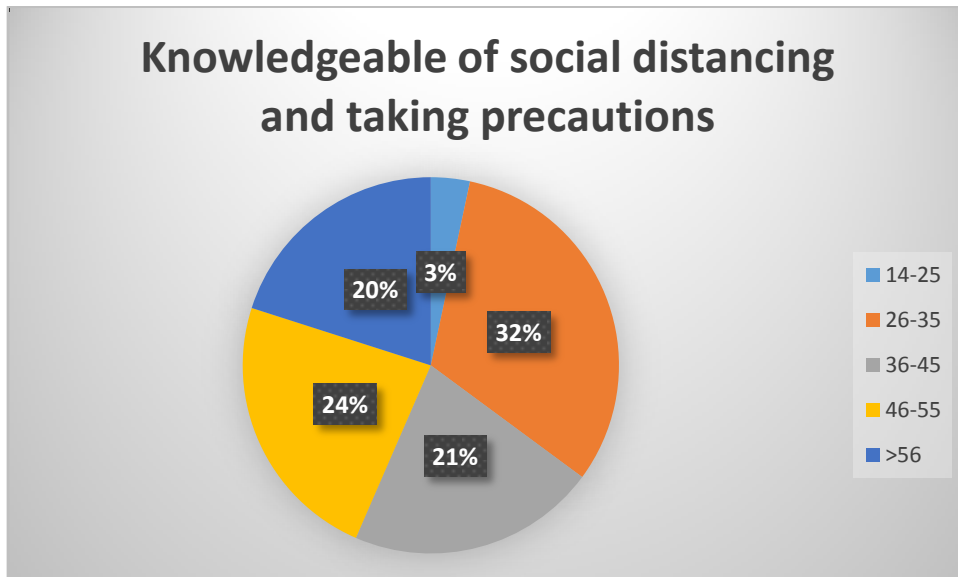
figure 3: Knowledgeable of social distancing and taking precautions
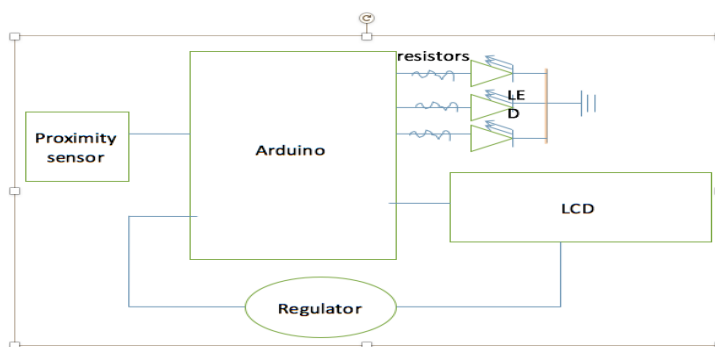
BLOCK DIAGRAM AND GENERAL OVERVIEW

figure 4: Block Diagram

HARDWARE

The microprocessor is the ARDUINO board that processes the signal that comes from the analog input pin to the digital input and output. The proximity sensor is an analog that will be read in the analog part of the ARDUINO board, the display is the output of the processed analog sensor that is read in the digital part of the AUDUINO board.From the circuit diagram, the AUDUINO board has the power pins, the analog pins and the

digital pins. The proximity detector sensor has three terminals, VCC, ground (GND), OUT. The VCC of the proximity detector is connected to the 5v of the power pin of the ARDUINO board, the GND of the proximity detector is connected to the ground of the power pin of the ARDUINO board, the OUT of the proximity detector is connected to the analog OUT of the ARDUINO board. Every connection made use of a JUMPER wire. From the digital part of the ARDUINO board, the circuit has three different colors of LED, GREEN, YELLOW, RED, the positive leg of the LEDs is connected to pin 8, 9, and 10 through a resistor, the negative leg of the LEDs is connected to the ground of the power pin of the ARDUINO board. An LCD display is used to display the status, it has sixteen terminals, and twelve terminals are made use of. The VSS is connected to the GND power pin of the ARDUINO, VDD is connected to the 5V power pin of the ARDUINO, VO is connected to middle

terminal of the regulator, RS is connected to pin 1 of the digital part of ARDUINO, RW is connected to GND of the power pin of ARDUINO, E is connected to pin 2 of the digital part of ARDUINO, D4, D5, D6, D7 are connected to pin 4, 5, 6, 7 of the digital part of the ARDUINO, A is connected to 5V power pin of ARDUINO, K is connected to the GND power pin of ARDUINO. The regulator has three terminals; the 1 and 3 terminal is connected to 5v and GND power pin of ARDUINO.The system is programmed to detect the range of the proximity sensor to be between 70 and 150.If the sensor gets a proximity value of 105 and below, it implies that there is a close presence and the RED LED turns ON.If the proximity sensor is between 105 and 120, it implies that there is presence but not close, the yellow LED turns ON.If the proximity sensor value is greater than 120, it implies that there is a little or No presence, for these, the Green LED is ON.
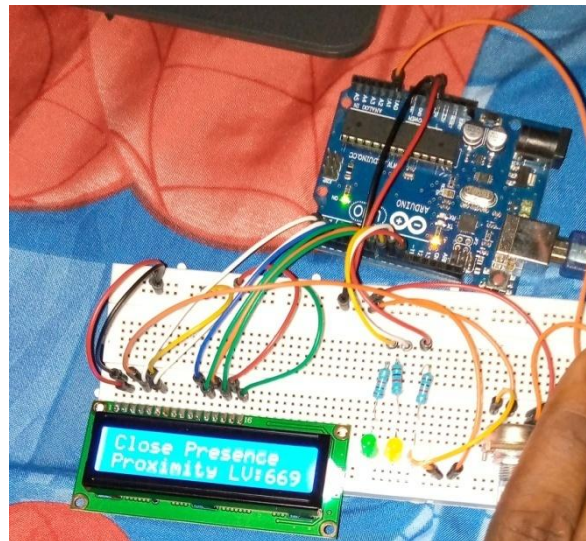

Fig 1: Circuit diagram of the prototype system

DISTANCE CALCULATION PROGRAM AND METHODOLOGY

The program below is used to find the distance between individuals:

```
#include <LiquidCrystal.h>LiquidCrystal
lcd{1,2,4,5,6,7};int proximitySensor = A0; int
proximitySensorValue = 0; int ledred=10;int
ledyellow=9;int ledgreen=8; int state=0;void
setup() {lcd.begin(16,2);
pinMode(ledred,OUTPUT);
pinMode(ledyellow,OUTPUT);
pinMode(ledgreen,OUTPUT); }void loop()
{proximitySensorValue = analogRead
(proximitySensor);
```

```
lcd.setCursor(13,1);lcd.print(proximitySensorValue
); delay(500); if(proximitySensorValue <105){
if(state!=0){ lcdDisplay("Close
Presence","Proximity LV:");
digitalWrite(ledred,HIGH);
digitalWrite(ledyellow,LOW);
digitalWrite(ledgreen,LOW); }state=0;} else
if(proximitySensorValue >=105 &&
proximitySensorValue<=120){
if(state!=1){lcdDisplay("Presence","Proximity
LV:");
digitalWrite(ledred,LOW);digitalWrite(ledyellow,
HIGH);digitalWrite(ledgreen,LOW);
}state=1;}else if(proximitySensorValue >
```

```
120){if(state!=2){lcdDisplay("No
Presence","Proximity
LV:");digitalWrite(ledred,LOW);digitalWrite(ledye
llow,LOW);digitalWrite(ledgreen,HIGH}state=2;}
}void        lcdDisplay(String        msg1,String
msg2){lcd.setCursor(0,0);
lcd.print(msg1);lcd.setCursor(0,1);lcd.print(msg2);
}
```

IV. RESULTS AND DISCUSSION
PROXIMITY DETECTION SYSTEM

This is an effective way to remind and motivate individuals to maintain and follow social distancing rules. The system alerts the individuals when they exceedthe rules of social distancing in enclosed spaces like schools, offices etc. This will help prevent the spread of the virus since the expected distance is kept between individual as well as as wearing face masks, regular washing of hand, use of hand sanitizer and disaffectionof enclosed spaces.

V. CONCLUSION

With the spread of the virus and professionals constantly developing new idea to reduce the spread of the virus. The prototype was developed to help reduce the spread by detecting violation of social distancing rules in enclosed spaces. Apart from social distancing, wearing face masks, regular washing of hand, use of hand sanitizer and disaffection enclosed spaces is necessary to reduce the spread of the virus.

REFERENCE

[1].   BhavyaSekhani, &Manan Mahajan. (2021). SOCIAL DISTANCE ENCOURAGER AND MOTIVATION SYSTEM. International Journal of Innovations in Engineering Research and Technology, 8(05), 101–106. https://doi.org/10.17605/OSF.IO/YZGR9

[2].   Budd, J., Miller, B. S., Manning, E. M., Lampos, V., Zhuang, M., Edelstein, M., et al. (2020). Digital technologies in the public-health response to COVID-19. Nature Medicine, 1–10.

[3].   Chen, C. M., Jyan, H. W., Chien, S. C., Jen, H. H., Hsu, C. Y., Lee, P. C., et al. (2020). Containing COVID-19 among 627,386 persons in contact with the diamond princess cruise ship passengers who disembarked in Taiwan: big data analytics. Journal of Medical Internet Research, 22(5), Article e19540.

[4].   Chen, R., Sharman, R., Chakravarti, N., Rao, H. R., &Upadhyaya, S. J. (2008). Emergency response information system interoperability: Development of chemical incident response data model. Journal of the Association for Information Systems, 9(3), 200–230.

[5].   Choong, Y. Y. C., Tan, H. W., Patel, D. C., Choong, W. T. N., Chen, C. H., Low, H. Y., et al. (2020). The global rise of 3D printing during the COVID-19 pandemic. Nature Reviews Materials, 1–3.

[6].   He, W., Zhang, Z. J., & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. International journal of information management, 57, 102287. https://doi.org/10.1016/j.ijinfomgt.2020.102 287

[7].   Milibari AA (2020) Current Situa on of Coronavirus Disease: (COVID-19) Review Article. Health Sci J. Sp. Iss 1: 005. **DOI:** 10.36648/1791-809X.S1.005. http://iMedpub.com

[8].   Punn, N. S., Sonbhadra, S. K., & Agarwal, S. (2020). COVID-19 epidemic analysis using machine learning and deep learning algorithms. medRxiv. http://refhub.elsevier.com/S0268-4012(20)31486-9/sbref0310

[9].   Wang, C. J., Ng, C. Y., & Brook, R. H. (2020). Response to COVID-19 in Taiwan: Big data analytics, new technology, and proactive testing. Jama. http://refhub.elsevier.com/S0268-4012(20)31486-9/sbref0395

[10]. Ozturk, T., Talo, M., Yildirim, E. A., Baloglu, U. B., Yildirim, O., & Acharya, U. R. (2020). Automated detection of COVID-19 cases using deep neural networks with X-ray images. Computers in Biology and Medicine, Article 103792. http://refhub.elsevier.com/S0268-4012(20)31486-9/sbref0265

[11]. Liang, W., Yao, J., Chen, A., Lv, Q., Zanin, M., Liu, J., et al. (2020). Early triage of critically ill COVID-19 patients using deep learning. Nature Communications, 11(1), 1–7. http://refhub.elsevier.com/S0268-4012(20)31486-9/sbref0175

[12]. Liu, J. (2020). Deployment of health IT in China's ght against the COVID-19 pandemic. Available at: https://www.itnonline.com/article/deployme nt-health-it-china%E2% 80%99s- ght-against-covid-19-pandemic.

[13]. Lin, L., & Martin, T. (2020). How

coronavirus is eroding privacy. Available at https://www. wsj.com/articles/coronavirus-paves-way-for-new-age-of-digital-surveillance-11 586963028.

[14]. Rahman, M. S., Peeri, N. C., Shrestha, N., Zaki, R., Haque, U., & Ab Hamid, S. H. (2020). Defending against the Novel Coronavirus (COVID-19) Outbreak: How Can the Internet of Things (IoT) help to save the World? Health Policy and Technology, 9(2), 136–138.

[15]. Yan, L., & Tan, Y. (2014). Feeling blue? Go online: An empirical study of social support among patients. Information Systems Research, 25(4), 690–709.