A System for Preventing Covid-19 by Automated Temperature Sensing and Social Distancing

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Abstract

Background: The need for continued access to research and learning has never been more important. The outbreak of coronavirus disease (COVID-19) has created a global health crisis that has had a deep impact on the way we perceive our world and our everyday lives. It is human tendency to find solace in the company of others. The rate of contagion threatens us and also the safety measure put in place to stop the spread also requires social distancing, which is against the human tendency.

Objective: The main aim of the product is to help maintain social distancing and screen people entering the company at the entrance. While some western, traditional or home remedies may provide comfort and alleviate symptoms of mild COVID-19, there are no medicines that have been shown to prevent or cure the disease. As for now there is only 1st phase dose specific vaccine or treatment for COVID-19, this project is surely useful when it comes to prevention from the disease.

Social Implications: As we see pandemic has affected every sector i.e. from Household, Private to Government sector. So this project's social implication are limitless "Wherever there are public places this system is worthwhile."

Methodology: The System is divided in two parts: the initial part of the product is a temperature detection device, which will be placed on the entrance door of a Company/organization and second part is social distancing device which will be hanging on every individual's neck or will be placed on every table.

Summary: This product is like a weapon in this pandemic which will help us to restrict the disease. It has the ability to screen the person at the very entrance hence keeping an infected person at bay before he even comes in contact with other people and if tries to come then social distancing device will restrict such activities. It also has a build in camera which can be used for security purposes.

***Keywords*: Social distancing, temperature detection, covid-19, corona virus, pandemic, prevention.**

1. Introduction

Coronavirus disease (COVID-19) is an infectious disease. The novel coronavirus COVID-19 originally discovered in December 2019 as a severe case of pneumonia in Wuhan province of China. Since then it has become a global pandemic, affecting each and every nations around the globe [1][2]. Following the few days after diagnosing the first case of this previously unknown pneumonia, a novel coronavirus and its contributing agents have been identified by the several independent laboratories (6-8). For the time being the causative virus has been named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the relevant infected disease has been named as coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO). The current outbreak of the coronavirus SARS-CoV-2 and the associated disease, COVID-19, is transfixing the world with over 9 billion confirmed infections by January 16. In addition to its physical threat, this outbreak also causes psychological distress, anxiety, and depression. Moreover, research on the coronavirus associated SARS pandemic in 2002/2003 points to potentially long-lasting adverse consequences, such as depression, stigmatization, diminished quality of life, and post-traumatic stress. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so it's important that you also practice respiratory etiquette (for example, by coughing into a flexed elbow).

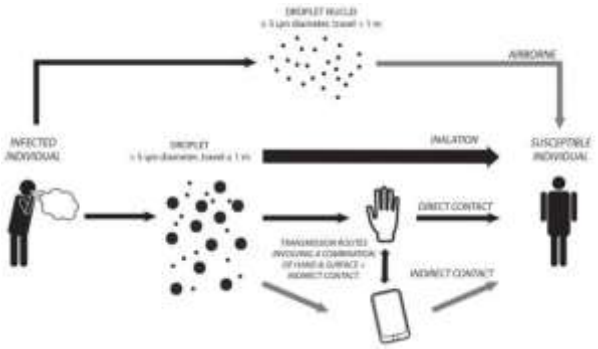

Fig 1: Transmission traits(Source: who.in)

SARS-CoV-2 can also be transmitted through direct or indirect contact with infected people or by depositing droplets containing the virus on any person (handshake, greeting, hug) or inanimate surface [3]; these droplets can contaminate the hands of other subjects by subsequently entering the body through access routes such as the oral and nasals cavity as well as other mucous membranes. The best way to prevent and slow down transmission is be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing your hands or using an alcohol-based rub frequently and avoiding social contact. While some western, traditional or home remedies may provide comfort and alleviate symptoms of mild COVID-19. WHO does not recommend selfmedication with any medicines, including antibiotics, as a prevention or cure for COVID-19. However, several countries started vaccination but results are not satisfactory. This project is surely useful when it comes to prevention from the disease.

2. Literature survey

This is the first time that this generation has faced the corona pandemic problem. A lot of research and study in the form of articles, newspapers, leaflets have been taken placed during the development and manufacturing of the product to understand the traits and lifecycle of coronavirus. World Health Organization (WHO) explained the lifecycle, spread, symptoms of coronavirus. WHO is bringing the world's scientists and global health professionals together to accelerate the research and development process, and develop new norms and standards to contain the spread of the coronavirus pandemic and help care for those affected. The solidarity of all countries will be essential to ensure equitable access to COVID-19 health products says WHO. The organization is gathering the latest international multilingual scientific findings and knowledge on COVID-19.

While COVID-19 symptoms may not be conspicuous to the affected individual or others, they will cause subtle variations to speech characteristics that can be detected by artificial intelligence (AI) algorithms.[4]

That's because infected individuals undergo changes to body parameters such as temperature, heart rate, blood pressure, and breathing rate. All of these affect the physiology of speech and are reflected in speech signal.

[5] The new Abbott ID NOW COVID-19 test runs on Abbott's ID NOW™ platform — a lightweight box (6.6 pounds and the size of a small toaster) that can stay in a variety of locations. Because of its small size, it can be used in more non-traditional places where people can have their results in a matter of minutes, bringing an alternate testing technology to combat the novel coronavirus.

[6] The self-assessment test will enable anyone to answer a few questions to check whether the person might be at risk of being affected by the COVID-19 coronavirus. This chatbot isn't made to give people medical results.

Our product is available at low cost, it is affordable to the offices as well as individuals. The product also provides accurate results. The major advantage of the product is that it will very helpful for the visually impaired people, who cannot sense someone approaching close to them. It is the ultimate way to obtain social distancing.

3. Objectives

The main aim of the product is to help maintain social distancing and screen people entering the company at the entrance. Prevention is the main goal of this product i.e. giving alerts to people whoever is not following distancing rules and screening in sense that one must not to be allowed entering premises if he/she is susceptible.

4. Methodology Material:

We searched and analysed targeted evidence based guidelines issued in various countries affected by this epidemic up to date. The recommendations for the prevention and control of other epidemics caused by other pathogens belonging to the same family of coronaviruses or others that present the same mechanisms of transmission also were searched and analysed. Different scientific papers related to pharmacological approaches, clinical assessment of various Personal Protective Equipment (PPE) of the respiratory tract and epidemiological data regarding this virus.

Design of the product: We are using hybrid model where there is transparency in business. For our product there is minimum investment and profit is more than satisfactory. As there is more than enough profit for distributors so covering market is easy enough. According to our survey there is no such existing social distancing mechanism in market so investor's see it a great opportunity to cover and make huge profit from market, not only self but the market can make profit by exporting in foreign

countries. Target groups for our product is boundless i.e., from government to private, from public places to personal safety. And one of the most important point is one who is selling will gets 60% of margin and one who is buying will get safety from covid19. The initial part of the product is a temperature detection device, which will be placed on the entrance door of a Company/organization. At the very entrance, the individual who has to enter the premises, will have to place his hand close to the device. The machine will then detect the temperature of the person. If the temperature of the person is approx. 98.6^0 F (37^0 C) , the person will be allowed to enter, while if the temperature is above 98.6^0 F (37^0 C) a loud beeping sound will alert the security person that the visitor/person entering the premises may have symptoms of covid-19 and hence will not be allowed to enter. The second part of the product is a distance maintaining device that will be hanging around the neck of each and every person in the premises. The main aim of product is to help maintain social distancing. The distance maintaining device covers the circumferal distance of 120^0 and 6 feet to detect the presence of any individual. If a person comes in close proximity of another person, the device will beep loudly, reminding ourselves to keep six feet safe distance.

Fig 2: The actual product

5. Product Design and working

The whole part is sliced out majorly in two parts. The first one being "Fully Automated Digital Thermometer" and the second one being "Distance maintaining Device", the modern device to maintain social distancing between fellow people. The product and internal circuit shown in fig 2 and fig3 respectively.

5.1 Fully Automated Digital Thermometer

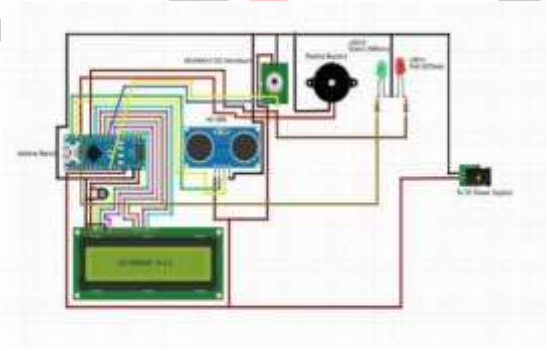

Fig 2: Circuit Design for automated thermometer

As the device boots up, the red and green led will glow for few seconds and the passive buzzer will beep couple of times. Later on, the green led will then ON continuously notifying that the device has been initialized and ready to use.

In order to capture the temperature, the person has to rest his/her palm in front the MLX90614 sensor within the distance of 2cm approximately before entering the premises. The criteria regarding the distance will be maintain by HC-SR04 ultrasonic sensor. As soon as the HC-SR04 detects that the palm is within the desired distance, it will give an interrupt to the micro-controller through digital pin D11. It will request the MLX90614 temperature sensor to capture the temperature of the person and will be displayed on 16 x 2 LCD display through digital data pin D4, D5, D6, D7.During the period, the red led will glow up notifying that the device is currently busy. Approximately, after 3 to 4 seconds the device's green led will turn on again indicating that device is ready for next scan only if the current captured temperature is normal, else the device will start to beep for about 10-15 seconds reporting that the

current person with currently captured temperature may be infected. Along with the human temperature (in Fahrenheit) the device also displays the ambient temperature aka room temperature in Celsius.

This whole process will be carried out in an infinity loop as long as the device is having a stable DC power supply.

5.2 A Modern Device to maintain social distancing

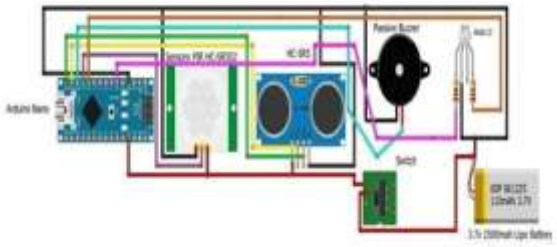

Fig 3: Circuit Design for social distance maintaining device.

When device is switched ON, the led will fade in and fade out with bright red colour three time. Along with it, the buzzer will beep for couples of times and the led will turn blue acknowledging us that the device is now ready to use.

When the employee/worker/insider will roam around the premises to conduct the daily routine or business activities, he/she may come across the other employees working in same premises. At this moment the PIR (passive infrared sensor) sensor connected will be detecting the presence of heat emitting bodies i.e. humans and will give an interrupt to micro-controller. After receiving the interrupt, the microcontroller will request the HC-SR04 ultrasonic sensor to identify the distance between two bodies.
According to the different variance within the distance between the bodies the buzzer will change its pattern of beeping and will alert the employee to maintain social distancing.

For instance, if the distance between two bodies is less than 5cm the buzzer will beep with a frequency of 4750mhz and a delay of 50 milliseconds before each beep. Similarly, if the distance between two bodies is less than 180cm the buzzer will beep with a frequency of 1000mhz and a delay of 500 milliseconds before each beep.

Note that, the device will keep running for an estimated time of 4-5 hours upon one full charge session.
The device can be charged again with proprietary Micro-USB type B.

6. Highlighting advantages and Areas in which the product can be employed.

1. This product is easy to understand and handle.
2. It is the ultimate way the achieve social distancing.
3. Using this product, the individual entering the company can be screened at the entrance.
4. The best thing about the product is that, it can be used by the people who are physically disabled (majorly blind and deaf) who cannot see someone coming close to them.
5. In a large country like India, whenever the vaccine is available it may take lots of time for vaccine to be available for each and everyone.
6. A benefit of the product is also that it is cost effective. This product is made in the minimum cost, which can be affordable to government, industrial areas as well as individuals.

7. Limitations

1. Charging (As it works on charging basis so if battery gets discharge then it may stop working).
2. Sensor Failure
3. Heating in side components.
4. Less effective in extreme cold condition.

8. Size of Market

Considering the market size of our product it has a prominent addressable market and considerable revenue opportunities (as it is an IOT based product which is mean to make human life easy and comfortable). The target groups include Banks, Industries, Government sectors, corporate offices, Hospitals, Super markets, Public places, Pilgrimage centres etc. This project benefits every sector from pandemic situation and will give indirect assistance.

According to market survey we predict that the level of acceptance as follows: -

1. Economically 80%
2. Social influence is 100%
3. Personally, it is 90% The product adaptation will be the best in existing pandemic situation and challenges where social distancing is must.

9. Future Scope

1. The first attempt is to add a camera in the social distancing device as well which will help predict whether the person in front is wearing a mask or not.
2. Another attempt is to also help detect other aliments like blood pressure using the camera of the temperature sensing device.

10. Conclusion

This product is like that weapon in this pandemic which will help us to restrict the disease. It has the ability to screen the person at the very entrance and allowing only noninfected person to enter hence keeping an infected person at bay before he even comes in contact with other people. Coro-distance will help break lifecycle chain corona virus which spreads due to contact, which will be an effective measure mainly in India where social distancing is not maintained efficiently.

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