REAL-TIME COMPACT FACE-SHIELD WITH INTERNET OF BIOMEDICAL-THINGS

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Abstract. Presently we are seeing the age of digitalization and people are getting exposed to advanced informative resource with the advancement of Internet of Biomedical-Things. Laudable electronic devices with biomedical instrumentation have several real-time applications in current pandemic situation. Currently coronavirus-19 is posing a serious threat to human race, compelling it to fear the unforeseen circumstances. A very marked rise in the number of infected cases all over the world has crippled us with fear. Several researches have been conducted and numerous working devices have been made to protect people from COVID-19. In this work a compact real-time face shield has been developed using basic electronic sensor with Internet-of-Things application. This device prototype has three major functions. First, shield is equipped with an external wiper with alcohol based sanitizing liquid that sanitizes the shield glass after a particular time interval which can be operated manually by user also. Second, IR sensor is used to detect the distance between user and other people to enforce social distancing. Third, a temperature measuring system has been installed to alert users regarding abnormal body temperature of people approaching the user. The suggested cost effective, compact real-time face shield will efficiently protect individuals against COVID 19.

Keywords: Compact Face-Shield, Internet of Biomedical-Things, IR sensor, Sanitizing wiper, Temperature sensor, COVID 19, Pandemic.

1. Introduction

Currently coronavirus disseminated a lot and duress the presence of mankind. Thus, with the help of modern blessings of digitalization and Internet of Biomedical-Things, cataclysm needs to be truncated. In addition, sporadic hospital reports of positive or askance infected and non-infected patient of COVID-19 are kept separated [1]. Since there are many asymptomatic COVID-19 positive patients, it becomes difficult to handle the negative ones. The attainability of screening test of COVID-19 is finite. There is a high rate of finding of false-negative results [2].

Around the globe, approximately 28 million confirmed COVID-19 cases, leading to 900 thousands deaths in 216 countries [3]. The World Health Organization avowed the COVID-19 epidemic a pandemic on 11th march, 2020 [4]. According to Chinese data, older age persons have high risk with COVID-19 then the younger age persons [5]. Although the widely held testified COVID-19 circumstances in China were insignificant 81%, roughly 80% of deaths happened among adults aged ≥ 60 years [6-9]. 226 COVID-19 environments were testified in the United States at February 12.
Here, a compact real-time face shield had been developed using basic electronics sensors with Internet-of-Things application. This device prototype has a shield that occur an external wiser with alcohol-based sanitizing liquid and an ultraviolet sanitize system of the shield glass in a particular time interval which can be operated manually by user also. Sonar modules used to detect the distance between user and other person and temperature measurement system had installed to admonish users with warm body. The suggested economic compact real-time face shield will follow for facilitating to protect world from coronavirus.

2. Circuit Design
After arduous efforts we came up with circuit architecture which is efficacious, and intends being a budget efficient gadget. The constituents of the gadget are primarily Node MCU serving as microcontroller, thermal camera and DHT modules as sensors and Sonars as a distance measuring component. DHT modules, thermal cameras and Sonars serve the purpose of keeping a temperature and distance check respectively. The modules are integrated with Node MCU which is stringent to analyse modules myriad data’s and admonish user via third party integrated apps if any inimical situation holds true.

![Figure.1. Graphic Circuit Design](image)

The sanitizing modules is made detachable and have integrated UV lights and triggers, operating on lithium cells of 3.7 volts and is further made rechargeable using step up voltage converter modules.

![Figure.2. Block diagram of basic function working flux towards circuit section](image)

3. Prototype Design and Discussion
Circuitry responsible for notifying users regarding inimical maladroit situations are integrated with face shields as external module. Connection protocols such as IEEE 802.11 will be held responsible for carrying out sensory data flow from microcontroller to user’s mobile dashboard and the third-party app will admonish users if any potential covid-19 symptoms duress propitious conditions.
Further the sanitizing module is made as a detachable module providing users with a choice of using or discarding it. All the circuitry and modules are integrated with utmost care, keeping in mind user flexibility and easy troubleshooting, and is well tested in real life scenario which guarantees to serve its solemn purpose. Coming up to the materials used, 3D printing technology blessed our work and certainly bolstered our user-friendly design implementations.

Table 1. Working Algorithm

| Steps    | Description                                                                 |
|----------|-----------------------------------------------------------------------------|
| Step 1   | Initialisation and calibration of default sensory values                     |
| Step 2   | Read sensory data from sensors and Sonar                                     |
| Step 3   | If sensory data reaches threshold, requests user warning                    |
| Step 4   | If sonar data reaches threshold distance, request user warning              |
| Step 5   | False, loop over sensory input process                                       |

Figure 3. Face shield with compact circuit system and installed 3rd party application (open space)

Figure 4. Algorithmic flowchart of the system prototype
4. Conclusions
Handling myriad COVID-19 cases is challenging as well as pain driven. Cataclysm brought by covid-19 can be truncated if we became conscious and act responsibly, but as per media reports in densely populated country like India; people have sporadic misconceptions which further admonish the need of an emerging technology which can efficaciously flatten the contamination curve. Our module aims supporting our frontline Covid-19 (SARS-CoV-2) warriors and edifies people with sporadic notion. With basic defence equipment our gadget will be an add-on serving the purpose of an extra layer security, keeping inimical situation check and being stringent with the motto of following new normal and social distancing policies.

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