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Alpha prototype face mask with HEPA filter and oxygen sensor

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INTRODUCTION

COVID – 19 is a coronavirus disease that appeared in 2019 and the first case detected was in Wuhan, China. COVID-19 is identical to the Severe Acute Respiratory Syndrome Coronavirus (SARS – CoV) in terms of pathogenicity, clinical spectrum, and epidemiology

IDENTIFYING INFORMATION

WHAT IS COVID19?

It’s an infectious disease that can be spread by infected people when they cough, sneeze, speak, sing or breathe

STATISTICS

Coronavirus disease cause significant impacts on the global economy and society

PREVENTION

There are standard operating procedures (SOPs) to be followed in order to prevent the spread such as wearing face mask

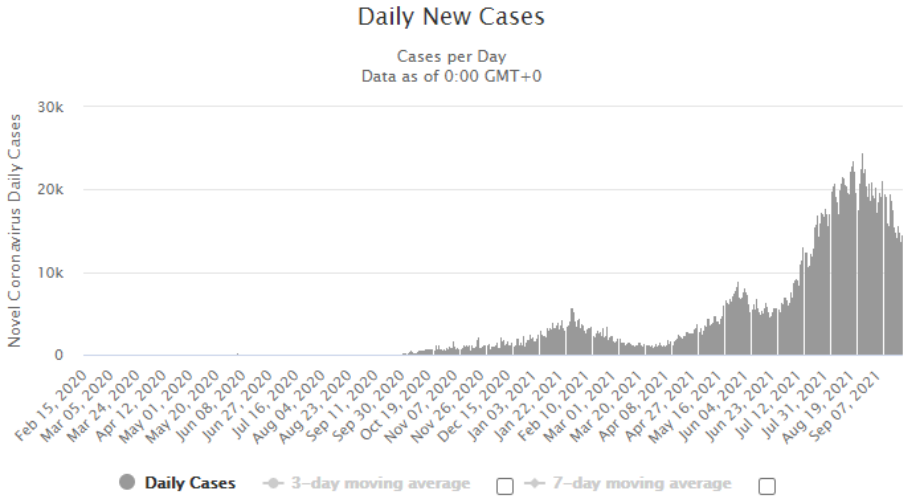
OBJECTIVES

1. To develop a prototype of face mask integrated with HEPA Filter and oxygen sensor to monitor the oxygen level.
2. To ensure there is sufficient air supplied to user when wearing the mask.
3. To prevent virus from being inhaled by human with face mask.

PROBLEM STATEMENT

- In Malaysia, the number of cases are still high although many people have already been vaccinated.
- Besides, the suppliers in Malaysia also cannot get face masks from local manufacturers because they prefer to export their face masks to foreign country.

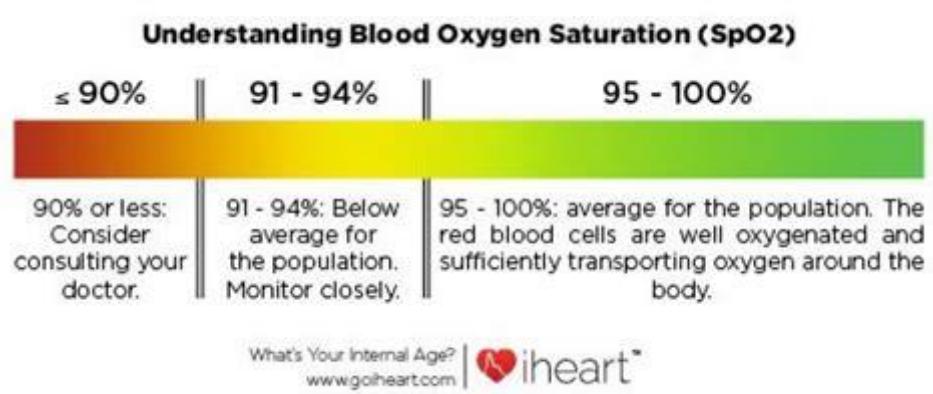
https://www.thestar.com.my/news/nation/2020/02/21/struggle-to-meet-demand-for-masks



https://www.worldometers.info/coronavirus/country/malaysia/

PROBLEM STATEMENT

- In addition, medical workers need to wear face mask 24/7, however, evaporation occurs which reduces the size of many respiratory particles in the face mask
- Self quarantine individuals also need to wear face mask and check their oxygen level (Spo2)every day.



https://yamacparasutufethiye.org/spo2-range-chart

https://generationt.asia/leaders/malaysias-youngest-hospital-ceo-on-fighting-coronavirus-on-the-front-lines

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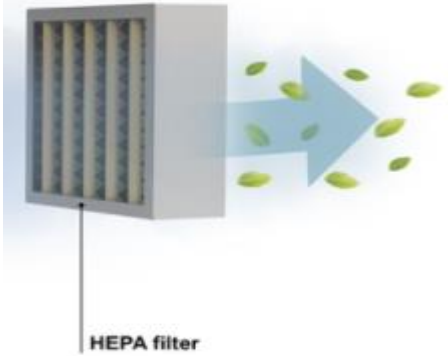
ABOUT THE METHODOLOGY

FLOW OF THE MECHANISM



Microparticles, viruses and bacteria

Oxygen monitoring system

HEPA Filter

- HEPA (**High Efficiency Particulate Air**) filters are **filters with a great capacity to filter small particles**.
- **Remove more than 99.9% of the particles from the air** stream that passes through them
- Great help for people with **asthma, allergies** or those who suffer from respiratory problems
- Air purifiers absorb air, pass the air through a series of filters (including the HEPA filter), and release clean air into the room. The filter is **composed of a mesh of randomly placed fibers**, which are **usually layers of cellulose**, **synthetic fiber** or **glass fibers**. These fibers are arranged in an accordion shape, which gives them a greater capacity to capture the particles.
- **Easily removes pathogens larger than 0.3 microns.**

Oxygen Monitoring System

- The system is built up with Arduino and oxygen sensor.
- The oxygen sensor used is MAX30100 sensor which is attached at the earlobe.
- MAX30100 sensor has two LED's, a photo detector, optimized optics, and low-noise analog signal processing to detect pulse and heart-rate signals.
- When the heart pumps blood, there is an increase in oxygenated blood as a result of having more blood. As the heart relaxes, the volume of oxygenated blood also decreases. By knowing the time between the increase and decrease of oxygenated blood, the pulse rate is determined.
- The system can be connected with Bluetooth function so that people can check their SpO2 level when they wear face mask at outside.

CONCLUSIONS

- MAX30100 sensor and HEPA filter will be used to build the Alpha prototype face mask.
- Both of this material can be used to reduce the use of face mask, help the user to get medical help immediately when SpO2 is low than 95%, and reduce the risk of infection of the virus.

Challenges

- Classification of Covid-19 or other heart diseases by using the oxygen sensor.

References

- Esmaeiliazad, T. (2021). **Special Study of Earlobe Pulse Oximeter Using MAX30100 for Detecting SpO2 and Heart Beat**. *Academic Journal of Health Sciencies: Medicina Balear, ISSN-e 2255-0560, Vol. 36, Nº. 4, 2021, Págs. 43-47*, *36*(4), 43–47. https://dialnet.unirioja.es/servlet/articulo?codigo=8085437&info=resumen&idioma=SPA
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THANKS!