

An Innovative Mask Design to Combat Lack of Social Distancing

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Abstract

The purpose of this paper is to develop a creative facial mask with digital features to combat several problems that have arisen and were observed and identified by us during the Coronavirus Disease 19 (COVID-19) pandemic. The quick spread of the COVID-19 pandemic in a short amount of time has revealed several shortcomings in the regular usage of masks alone due to societal factors such as lack of information and physical factors such as crowding. By surveying individuals in affected groups, we discovered critical problems that we aimed to solve by developing an improved mask with innovative features. The mask we designed incorporates a QR code directing to a website countering disinformation and an android based location and distance detection system measuring distances between two or more different masks to alert users to maintain social distancing.

Pre-Development Survey

The initial step before designing the mask was to conduct a survey to discover lurking problems affecting the general population during the COVID-19 pandemic. We sent out a survey consisting of ten questions to 100 randomly selected individuals and subsequently interviewed them to identify concerns from the pandemic. We were able to draw several concerns from the interview responses. We decided to implement a mask design that, without losing the functionality of preventing the spread of the Coronavirus, would include features combating the below two concerns:

- 1) Misinformation, i.e. people receive contradictory information from multiple sources regarding the severity of the pandemic and hence don't know what to do to protect themselves;
- 2) Lack of social distancing, due to not being aware of one's surroundings and difficulties implementing distancing in social situations.

Methodology

We found that the most effective way to combat misinformation without reducing the functionality of the mask was to add a QR code to the front of the mask. In this convenient location, users would be able to scan the QR code, which directs them to a website we designed with informative materials from reliable sources directly addressing key misinformation points about the pandemic. These materials include educational videos and listings of official guidelines from organizations such as the Center of Disease Control and Prevention (CDC). This method is effective in providing an ubiquitous solution to the first concern we identified because surveyed individuals were curious to scan the QR code when they saw it on a mask.

The second concern we identified requires an algorithmic solution. By placing a location sensor and a small low volume speaker on the left side of each mask where it is unnoticeable to the user, we are able to track the location of each mask using a Java-based application developed using Android Studio. We can then identify the distance between masks and alert the user through the speaker if other individuals with similar masks are within a radius of 2 meters.

Results

The QR code implementation was successful and we were able to build prototypes for the mask that linked to the designated website.

The distance implementation hardware proved to be slightly less versatile since we opted to use an attached Android phone instead of just a distance sensor to run the Android app. The reason we chose to use the phone was because the Android app could run more effectively on a device with a complete operating system. The drawback of this is that the mask becomes heavier. To counter this problem, we must use a smaller, independent location sensor instead of the inbuilt location sensor in the phone.

With that in mind, both implementations satisfy our original goals for a mask capable of resolving the problems of misinformation and lack of social distancing, pending larger scale testing of the product.

Further Developments and Conclusions

The product's current ability to combat two of the problems created by the circumstances of the COVID-19 pandemic makes it a powerful tool to reduce the rate of the spread of COVID-19. We intend to extend the capabilities of the product by optimizing the distance detection and replacing the phone with a simpler sensor, keeping in mind the mask's primary purpose is still to be a comfortable, user-friendly, and protective filter.