

Hara Mask

Functional Design Specification

Background

Good air quality is important for general health. People working in dusty or contaminated environments need to wear masks to protect their health. The quality and effectiveness of masks varies greatly and, following Covid19, the preponderance of masks currently on the market is enormous. Many masks claim to be N95 with a capability of filtering out particles as small as 2.5microns but there is no readily available means of testing these claims. Much of the effectiveness of the mask lies in its ability to form a robust seal on the users face and ensure that all the air being inhaled is being filtered. For cyclists in particular, avoiding areas of high contamination from road works, diesel fumes, dust or other sources is becoming a major concern. Our market research has confirmed that being able to identify these areas on a daily basis with accuracy and speed is important to our target market.

Hara Mask

The Hara mask will endeavour to achieve three main objectives:

1. To provide a highly effective mask that seals to the face and can be proven to filter out 99% of contaminants above 2.5 microns in diameter. This will rely on the use of replaceable N95 activated charcoal filters which can be independently tested and certified by a company such as SGS.
2. To have embedded electronics in the mask that can test the air quality by means of an inbuilt electronic dust particle sensor that will provide quantitative data on the level of contaminants in the air as a PPM figure and relay this information via Bluetooth to a phone. The electronics will also need to report temperature and relative humidity.
3. To have an amplifier and speaker embedded in the mask that will allow the user to be heard easily when speaking without the need to remove the mask. The amp should be voice activated and the entire mask should be capable of being recharged using a mini or micro-USB cable.

Functionality

The user will have an app on their phone that will tell them if they are in an area of high contamination based on the readings it receives from the mask. The app will accumulate information from many different users/masks across a region in order to build a picture of the levels of air pollution across that region. By clicking on a location on a map (like Google Maps for example) the user will be able to see the temperature, relative humidity, and level of air pollution in that area. The app will also inform them as to the level of effectiveness of the mask itself and give them an accurate estimate of the amount of contamination they avoided in a day by wearing the mask in a particular region.

Project Stages

1. Initial design and production of a proof of principle model that we can use to verify that the concept actually works from an electronics standpoint. This will essentially comprise a PCB (probably Arduino) with a dust sensor (2.5 micron), temperature sensor, humidity sensor, voice amplifier/speaker and Bluetooth module. We should be able to mount the parts on a mask ourselves so that we can test the functionality with an extremely basic app created using something like Appinventor. This stage should also give us an idea of the size of battery (Ah) needed for a commercial product. An estimated cost of producing the electronics at commercial stage should be available from this stage also.
2. Assuming that the POP works, this stage will involve some redesign of the board elements to reduce size, weight, and power consumption. A bespoke PCB will need to be designed and a full BOM generated. A number (up to five) of functional prototypes will need to be produced using prototype boards populated by hand for market testing with consumers. This phase will also be informed from the initial testing as to where and how components and parts should be mounted on the facemask. A more sophisticated version of the App will be required to test the principal of several data sources feeding into one location and the information being disseminated in the App.
3. The third stage of development is to refine the product for commercial production on a volume scale. This will be an iterative process involving the manufacture of pre-production samples in a factory that can be tested in the market prior to mass production.

The Hara Team

Our team comprises a Medical Doctor with over thirty years' experience working with patients in hospitals and private practice, a Marketing Director/CEO with twenty years' experience working with companies like Just Eat and Vromo, and a Mechanical Engineer with thirty years' experience in product development across a wide range of industries.



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