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Wearable Technology Regarding Air Pollution

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***Abstract*—— This paper aims to study the insights about the wearable technology in the field of air pollution by investigating the current scenario and the advancements coming from past few decades and analyzing their applications. It also focuses on detecting the air quality and the amount of pollution present nearby to you and would present a current map for air pollution. Wearable technology had crossed all the barriers in the perspective of its application as well as in the domain of finding a considerable advancement of enhancing human life through it. But, somewhere it lacks in the use of its consistency and sustainability. This paper first focuses on air quality detection, current pollutants present, present technology and secondly, it deals with air filters, air pollution map guidance. This paper will also guide providing the scale of cause of death from air pollution, major factors affecting pollution and the safety measures to be acquired to get prevented from such cause. Hence we provide a portable technology for measuring fined gained air quality in real time.**

***Keywords*:Enhancing human life, sustainability, air pollution mapping, particulate matter**

I. INTRODUCTION

[1]The technology is characterised by "wearable" as its implication in contrast with concept of simply holding portable compact computing devices. Wearable technology is human-computer interaction with data source collected from human body interaction and analyzed algorithm provides appropriate results. The consumer wearable has main focus on health and fitness sectors. Wearable technology use biosensors to monitor heart rates and footsteps over the day. However, apart from whether these functions and services are universal requirements from a user's perspective, it is not yet clear whether these functions are appropriate applications for the effectiveness of wearable devices. Consumers are keen to maintain their physical fitness but there in not such big evolution to detect the air pollution with wearable technology. Survey shows that one third people owing devices have stopped using it within six months. Devices are lacking with basic principle unable to connect people with their day to day activities. Wearable devices include the feature of activity tracking and sensing biometric information.Even, there are medical devices are made to detect blood glucose level and blood pressure.Coming from a past few decades, it has change a lot in enamours ways. The idea of wearable devices was generated from calculator watch back in 1980 and science evolution has leaded this to form air purifiers. Air purifies can detect smoke particles and volatile organic compounds (voc's) which pose risk to human life. Air filters are still lacking to capture the Indian market and we can see a huge future boom as the rate of pollution and air diseases are increasing rapidly.Companies are working to frame an on-time pollution map with clustering live data from the source and displaying it to the user providing a better passage with less pollutant area. Yet such technology is not available to any city except Sharjah.

Advancement of Technology:

There is nothing permanent except change. The rapid growth of wearable technology products, suppers by younger consumer, shows no sign ofslowing down. Technologies are advancing each day, appropriate size for wearables are designed and touching down the requirement of user efficiently. As seen in the market of air pollution detector and air purifier in field of technology, a huge presence of advancement is found. HEPA (High efficient particulate air) technology is considered the best among the other style of air purifiers. It absorb up to 99.97% of all the particles like allergens, pollen, dust and other .03 microns and larger in size; harmful indoor particles that can cause asthma symptoms. HEPA is widely used in combination of electrostatics which allows electric charge to trap particles travelling in air stream. Ozone generators are another type of air purifiers that intentionally produce ozone. They are not preferred for home appliances as they are not efficient, even can cause health problems. Some other types of air purifiers are activated carbon, UV. Air quality sensors are based on various types such as indoor and outdoor air detection even based on specialization to detect ozone, carbon dioxide, sulphur dioxide etc. Soot sensors are used for control and diagnostics of emission system utilizing DPF. [2]TZOA, AIRBEAM, MET ONE are some types of soot sensors. TZOA are the current leading technological modifiers in the branch of air filters, sensors and even they are working to figure a convenient air pollution map for common people.

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Pollutants:

The outdoor air contains several pollutants that can cause serious health hazards. The most dangerous pollutants in the air are dust, PM_{10}, $PM_{2.5}$, $PM_{0.3}$, virus, bacteria and gas pollution. These pollutants can cause respiratory diseases, cardiac diseases, COPD and lung cancer.

[4]The 2005 "WHO Air quality guidelines" offer global guidance on thresholds and limits for key air pollutants that pose health risks. The Guidelines indicate that by reducing particulate matter (PM_{10}) pollution from 70 to 20 micrograms per cubic metre (µg/m), we can cut air pollution-related deaths by around 15%.

The Guidelines apply worldwide and are based on expert evaluation of current scientific evidence for:

- particulate matter (PM)
- ozone (O_3)
- nitrogen dioxide (NO_2)
- sulphur dioxide (SO_2)

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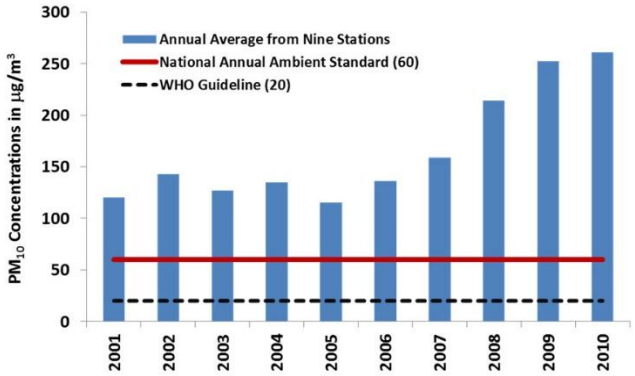
Safe limits for these pollutants in accordance to WHO Air quality guidelines are as follows:

Pollutants	**Limiting values as per the WHO air quality guidelines**
$PM_{2.5}$	10 µg/m^3 annual mean 25 µg/m^3 24-hour mean
PM_{10}	20 µg/m^3 annual mean 50 µg/m^3 24-hour mean
O_3	100 µg/m^3 8-hour mean
NO_2	40 µg/m^3 annual mean 200 µg/m^3 1-hour mean
SO_2	20 µg/m^3 24-hour mean 500 µg/m^3 10-minute mean

Graph illustrating PM_{10} concentration with respect to time in Delhi:



Sustainability:

There are so many possibilities for wearable technology in terms of sustainability. Combining innovative design with smart, built-in functionalities that help to tackle the core environmental impact of fast fashion. Primarily, by encouraging consumers to engage, interact and rely on their device. For sustainable and wearable technology to gain widespread acceptance, it should have features that are more functional, useful and even cheap from the competing market. Having realised the importance of this factor, wearable tech designers have come up with products that not only look and feel good but also address the specific demands of their customers.[3]Products such as TZOA not only pack exceptional features but are aesthetically pleasing too which attracts the greater consumers. Air quality sensors can be integrated to the current line of wearable tech such as smartwatches and fitness bands. These can be linked to smartphones which will enable these devices to interact and fetch data from cloud. This will ensure the growth and the sustainability of wearable tech and also establish a path for marketing of such products.

Sticking to a basic program is the biggest loophole in the field of market consumption of wearable technology. Along with fetching the best required result, it should act to generate a primary demand for the consumer. Sustainability of technology is challenging to such a high tech-world as new astonishing idea are implemented each day in every field of science.

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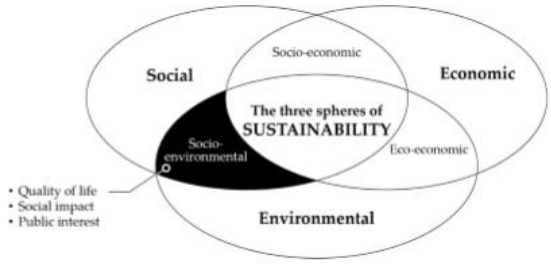
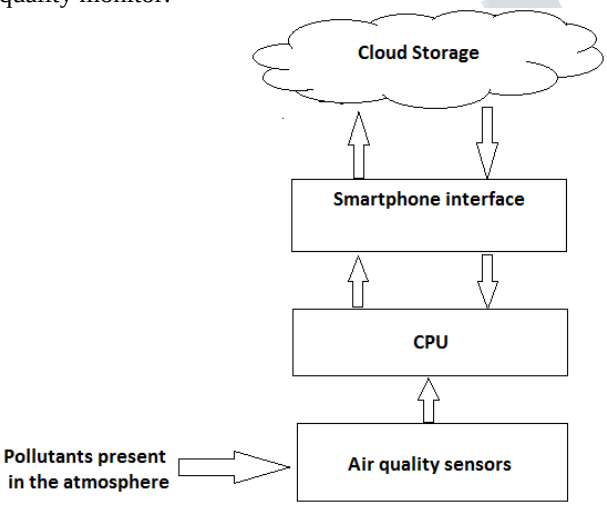


Air Pollution Mapping:

Air Pollution mapping really helps in monitoring the air quality in our surroundings. With this technology we are able to map the pollution levels of a city. The existing technology such as TZOA uses a cloud sourced map and the data collected from each device to indicate the pollution levels in a city. This has been already implemented in the city of Sharjah.Mapping of air pollution will help the user to commute in the safest possible route and will ultimately decrease the overall effects of air pollution on an individual.

Block diagram illustrating the working of wearable air quality monitor:



II. CONCLUSION

This paper provides a comprehensive review of wearable technology in the field of air pollution, air filters, air purifiers, air pollutants present, real time pollution mapping and sustainability of technology. The paper deals with guiding a layman about the wearable technologies present. It provides the details about the hazardous pollutants present and an overview concept of on-time mapping of pollution. Sensors that track the pollution level in your surroundings and safety measures required to avoid the intake of such particles are described. The sustainability of the wearable technology is a great concern and a brief data depicts the sustainability of technology is mandatory. Air pollution is a worldwide issue and data shows that more than 300 million people each day breathe polluted air. From the viewpoint of wearable technology both the quality of life and public awareness, which are the theme of this paper, a new direction will be found in this domain.

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