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# Technology of Electronic Nose and its Applications

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**ABSTRACT**

In the last twenty years, improvements in materials, sensors and machine learning technologies have led to a rapid extension in development of electronic nose related research topics with diverse applications. The food and beverage industry, forestry and agriculture, medicine and health-care, monitoring of outdoor and indoor, military and civilian security systems, environmental monitoring, garbage control are the leading fields which are taken more and more great advantage from the portable, rapidability, stability and compactness of electronic nose. Although the electronic nose technology provides variety of various advantages and further enhancements within the both hardware and software components are very necessary for utilizing the electronic nose in practice. During this study of the electronic nose and integrating ten MQ gas sensors is supposed to model of olfactory system which generally classifies smells supported ten basic categories in electronic nose namely: fragrant, sweet, woody/resinous, pungent, peppermint, sour, bitter, decaying, chemical, citrus, fruity, perfume smell and popcorn using artificial neural network is required for this recognition of the performance of that smell takes place within the artificial neural network as its pattern of recognition algorithm electronic nose application

Keywords: Electronic nose, machine learning, sensors, pattern recognition

## I. Introduction

Until now the withinside the electronics conversation is worried most effective of our senses, first one is feel of sight and 2nd one is feel of hearing. Soon it'll contain the third, this is the feel of odor. A new generation has being evolved to benefit mass enchantment to our feel of odor. Bringing a stay of our enjoy, generation now goals at the feel of odor. We are capable of feel a odor the matters via way of means of the usage of a digital nostril and with a generation known as Digital heady fragrance generation. In virtual heady fragrance generation it's miles feasible to feel a odor to acquire and transmit a odor via internet, like smelling a fragrance on-line earlier than shopping for them or smelling a end result and veggies earlier than shopping for them, dispatched scented E-playing cards via heady fragrance enabled websites, and to enjoy the burning odor of rubber for your favorite TV video games etc. If this generation profits mass enchantment no person can forestall it from stepping or getting into the digital world. Just believe you're capable of odor matters using a it is linked to the tool an that tool it is linked for your computer. It's feasible with the help of Digital heady fragrance generation this is probably made it a reality. There's a whole software program and hardware answer for scenting virtual media and user. An digital nostril is an array of non-particular chemical sensors, managed and analysed electronically, which mimics the movement of the mammalian nostril via way of means of spotting styles of reaction to vapours. The sensors used right here are behavior metric chemical sensors which extrade resistance whilst uncovered to vapours.

## 2. Technical Details of The Paper

Manually electronic nose have a extracted features they were sufficient for odor discrimination in many cases and were widely employed in various of applications. In drift compensation the adversarial training framework for gas sensor is used in the compensation of drift. The recent significant for improvement in E-Nose's stability and performance in both qualitative and measurement could be a results of adopting machine learning methods. This review is presented an summary of machine learning and its methods in smart sensing with attention on feature extraction, modeling, and sensor drift compensation. Previous works in E-Nose technology have extensively studied the time-domain and frequency-domain features within the signal analysis of an E-Nose. Manually extracted features were sufficient for odor discrimination in many cases and were widely employed in various applications. However, manual feature extraction requires for the prior knowledge of gas sensor technology and time-consuming feature selection wishes very careful. In contrast, the recent studies showed that electronic nose has a successful feature learning of raw sensing signals with the artificial neural networks, like deep belief network and autoencoder.

***Specialist of olfactory system:***

The basic concept of an electronic nose, or machine olfaction, is a measurement unit that generates complex multi-dimensional data for each measurement combined with a pattern recognition technique that interprets the complex data and relates it to a target value or class.

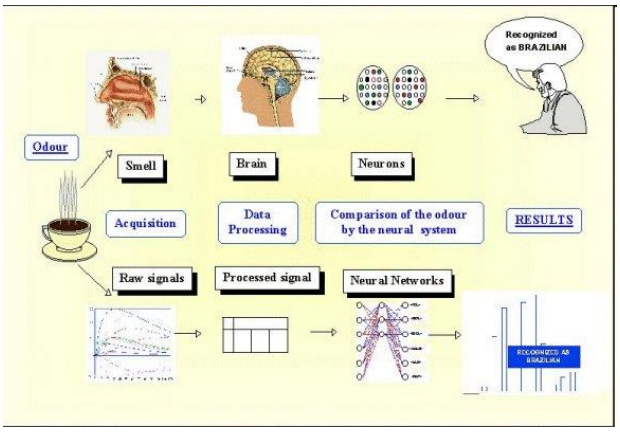


Fig: Specialist of olfactory system

In academic literature systems based on (for example) a mass-spectrometer in combination with pattern recognition are sometimes presented as an 'electronic nose' application or artificial olfaction. However, in this section only relatively low-cost sensor technologies are discussed which are in principle suitable for bench-top or portable devices are discussed.

The requirement that a multi-dimensional measurement signal is generated excludes single detection elements used for example PID meters. This is often overcome by using an array of broadly sensitive elements with different sensitivities to important chemical compounds. As an electronic nose device is frequently exposed to volatile chemicals arrays of potentiometric sensors are not useable.

## III. Working of Electronic Nose

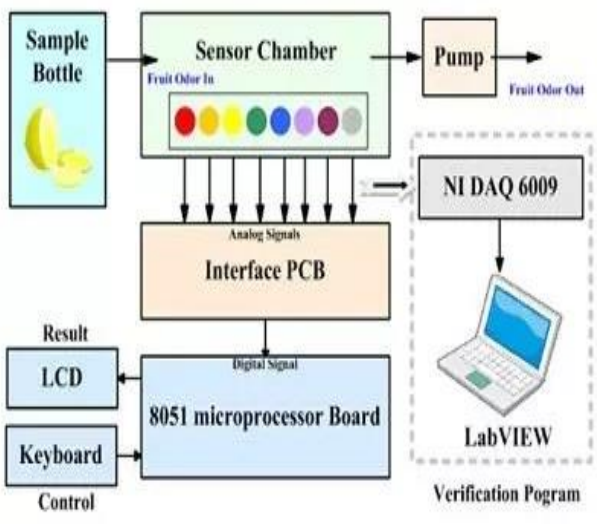


**Fig: Electronic Nose System**

This figure shows the proposed electronic nose system was tested with the different types of smells in the three fruits namely, banana, orange, lemon and litchi. These smells were prepared by placing at a sample of fruits is placed within the breakers by sealed within a cover. The 8051 was set in to testing or training mode. If the system is in the training mode, the sensor value is shown on the LCD. If the system is in testing mode, the target fruit of classification results is shown on the LCD. The sensor array gets the gas through Valve1, which is usually closed. The pump is turned on for 20 sec to pump the gas out of the sensor array. The PCB could also be a most useful when no known sample is on the market. The artificial neural network is that the simplest known and most derived analysis techniques utilized and used in an exceedingly statistical software packages for commercially available in the electronic nose.

## IV. Applications

The potential applications for the electronic nose technology are very useful in extensive and experience. Electronic nose technology has been applied to a spread of food science, medical and environmental applications, air and water quality environment additionally to this technology offers a great

potential for the detection of various microbial species in the plants. Some chemical products are specific to fungal and bacterial species and are commonly used as a useful for a diagnosis tool. The electronic nose has been utilized in a spread of applications and will help of to solve problems in many fields. The electronic nose is applied by food manufacturers to such tasks like freshness testing, spoilage and contamination testing and quality screening of coming staple, and monitor for accidental or intentional contamination. within the medical field, electronic nose it incorporates a sort of application like rapid diagnosis of actuate infection through breath analysis and screening of bacterial cultures for early detection of pathogens. E-nose can serve in safety and security applications like passengers for explosives and drugs. Its military applications include land- mine detection, biological and chemical agent detection.

## V. Advantages

- It can be used without fall over hours, days, weeks and even months and can even circumvent problems associated with the use of human panels such as individual variability, adoption, fatigue mental state and exposure to hazardous material.
- The e-nose is a compact device and so it is portable and reliability is very high.
- It can identify simple molecules which cannot be accomplished by human nose.
- It can identify a smell objectively.
- Calorimetric is a fast response and recovery time is high, high specificity for oxidized compounds.
- Catalytic field-effect sensor has small sensor size, inexpensive operating costs.
- Conducting polymer sensors is ambient temperature operation, sensitive to many VOCs, short response time, diverse sensor coatings, inexpensive, resistance to sensor poisoning.
- Electrochemical sensors is ambient temperature operation, low power consumption, very sensitive to divorce VOCs.
- Metal oxide semiconducting has very high sensitivity, limited sensing range, rapid response and recovery time for low molecules.
- Optical sensors has very high sensitivity, capable of identification of individual compounds in mixture, multi parameter detection capabilities.

## VI. Conclusion

In this review we have described the applications of electronic odour sensing systems for microbial detection within the fields of health care, food technology, environmental and plant pathology. Published literature is considerable and explores different experimental conditions to develop and implement these new analysis methods. Electronic noses are resistivity modulated sensing devices containing a sensor array capable of manufacturing a digital fingerprint of volatile organic compounds released from any source. The utilization of the e-nose system in the several fields for the detection and classification and visualization is one of the promising electronic technologies in these days. Research efforts in the e-nose field are continuing in improving and ongoing and outgoing. However, these several aspects are still not having a clear meaning. This review is intended to contribute to the e-nose field by providing insights and understanding through surveying and classifying the related research efforts in this area. The review in this area of study can provide a significant path for the researchers in their research and learning path. The information in this research was obtained through intensive searching, surveying, and reading of the research papers in this field.

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