Differentiation of Scents and Gases Using Neural Network

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Semiconductor gas sensors are sensitive to a list of gases, which makes it difficult to get definite results using a single sensor. Using a number of different gas sensors together with a neural network, we've tried to create an affordable, portable, simple, fast and energy efficient device capable of distinguishing various gases and even scents with high accuracy. Our device consists of 10 different thin-film semiconductor gas sensors. During the operation all the sensors work simultaneously. Their output signals are transmitted to Arduino Mega's analog ports, which act as an ADC, and then passed on to RaspberryPi, data processing unit of the eNose, where all the data manipulations are handled. The data is processed in a neural network, which is trained to recognize certain gases and scents. The training dataset consisted of 6 gases and scents in total: orange, ethanol, butane, antiperspirant, glass cleaning liquid and air. Each of them had 2000 data points, resulting in 12000 in total. Validation accuracy on the test dataset was around 0.9, while further tests on the final neural network model gave accuracy of 0.96. This project reveals that it is possible to create a universal sensor capable of recognizing complex scents with high accuracy by using low price and simple semiconductor gas sensors. It enables us to create high quality sensors for a wide variety of applications.

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