Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 86 (2016) 192 – 195

Procedia Computer Science

2016 International Electrical Engineering Congress, iEECON2016, 2-4 March 2016, Chiang Mai, Thailand

Development of a wireless electronic nose capable of measuring odors both in open and closed systems

Wichitchai Chansongkram, Nitikarn Nimsuk*

Department of Electrical and Computer Engineering, Thammasat University, Khlong Luang, Pathum Thani 12120, Thailand

Abstract

This paper presents an electronic nose (e-nose) technology for the odor measurement in open and closed systems, i.e. ambient air and the bottle headspace, respectively. Solenoid valves and an air pump control the air flow in the e-nose. Metal oxide semiconductor (MOS-type) gas sensors are used for the detection of odor. A humidity-temperature sensor is also equipped for monitoring the humidity and temperature of the air being measured. The e-nose also implements a wireless system for the real-time data transmission to a remote computer. The wireless system will realize the e-nose applications in the field work. In this paper, we demonstrate that the developed e-nose can measure an odor both in open and closed systems and precisely transmit the odor data via the wireless system.

© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Peer-review under responsibility of the Organizing Committee of iEECON2016

Keywords: Electronic nose;Open and Closed Systems; Wireless;

1. Introduction

Smell is one of the five senses of human. Human usually uses the nose to smell and identify odors. Odor testing using human nose, however, is likely to be unreliable due to the olfactory adaptation. Instead of the human nose, a device mimicking the olfactory system called electronic nose (e-nose) has been developed so far and used as a standard tool for the detection and recognition of odor. The e-nose is widely used in several fields nowadays, such as the quality analyses of foods and agricultural products, for examples, the classification of garlic breeds[1] and the

* Corresponding author. Tel.: +66-2564-3001 ext. 3056; fax: +66-2564-3021.
E-mail address: nsnitikarn@engr.tu.ac.th

1877-0509 © 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of the Organizing Committee of iEECON2016
doi:10.1016/j.procs.2016.05.060

investigation of black tea quality[2]. Moreover, medical analyses for health investigations such as checking for the beer smell in breath after drinking[3] and applications for safety such as fire detection[4] are also undoubtedly the applications of e-nose.

2. Electronic Nose

2.1. Principle

An electronic nose is a device mimicking the olfactory system. The e-nose is typically composed of three main components: an olfactory component, a signal accumulation component, and an evaluation component, described in Fig. 1. The gas sensor usually responds to the odor molecules which bind to the sensor surface or membrane, causing the change in electrical characteristics of the sensor. In general, multiple gas sensors are used in the e-nose to construct the patterns of odor which are further used in the odor recognition.

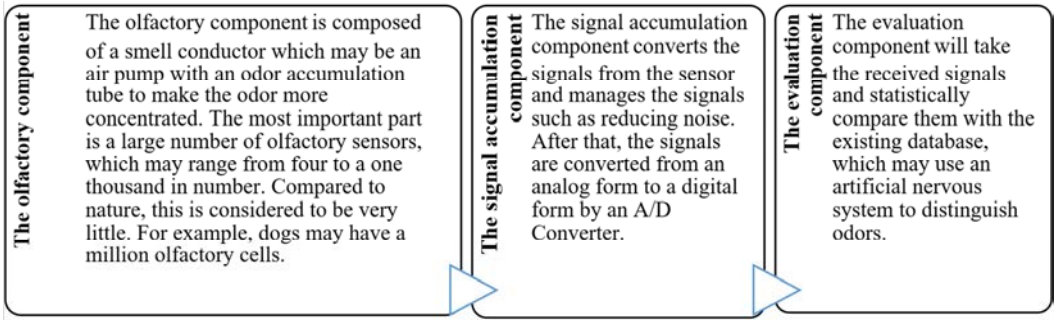

Fig. 1. Main components of electronic nose.

2.2. Structure and Working

In this work, the e-nose contains seven MOS-type gas sensors and a humidity-temperature sensor in the sensor array. The airborne odor molecules are drawn into the array by the air pump equipped inside the e-nose. The flow direction was controlled by two solenoid valves, which are controlled by an Arduino board. In this work, we implemented the Arduino board into the e-nose for ease of use and extension. As shown in Fig. 2, when measuring an odor, the solenoid valve A which is connected to the odor is opened to pass the odor vapor to the sensor array while the valve B keeps closed. After the odor exposure for a while, the sensors need to be recovered. Therefore, the valve A is closed and the valve B is opened for passing the reference gas or air to the sensor chamber. The Arduino is also used for the data transmission via wireless system. In addition to this, the developed e-nose can also transmit the sensor response data via a USB cable as well. To receive the transmitted data, a receiver is constructed by using an Arduino board and then is connected to a computer.

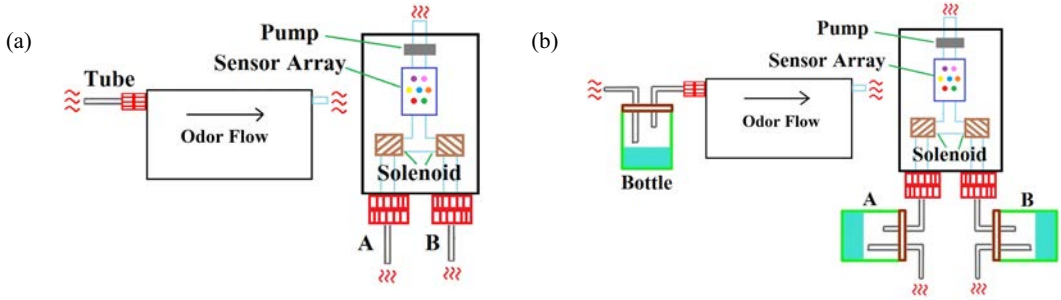

Fig. 2. Diagrams of the odor measurement in (a) open and (b) closed systems.

Download English Version:

https://daneshyari.com/en/article/486912

Download Persian Version:

https://daneshyari.com/article/486912

Daneshyari.com