

Artificial olfactory system with fault-tolerant sensor array

ABSTRACT

Numerous applications of artificial olfaction resulting from research in many branches of sciences have caused considerable interest in the enhancement of these systems. In this paper, we offer an architecture which is suitable for critical applications, such as medical diagnosis, where reliability and precision are deemed important. The proposed architecture is able to tolerate failures in the sensors of the array. In this study, the discriminating ability of the proposed architecture in detecting complex odors, as well as the performance of the proposed architecture in encountering sensor failure, were investigated and compared with the generic architecture. The results demonstrated that by applying the proposed architecture in the artificial olfactory system, the performance of system in the healthy mode was identical to the classic structure. However, in the faulty situation, the proposed architecture implied high identification ability of odor samples, while the generic architecture showed very poor performance in the same situation. Based on the results, it was possible to achieve high odor identification through the developed artificial olfactory system using the proposed architecture.

Keyword: Artificial olfactory system; Electronic nose; Fault-tolerant sensor array; Gas sensor array architecture