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Decisive Dynamic Features from Complex Sensing Signals

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Editorial

Gas identification is one of the most important functions of a gas sensor system. To identify gas species from sensing signals without gas flow control such as pumps or mass flow controllers, it is necessary to extract decisive dynamic features from complex sensing signals due to uncontrolled airflow. For that purpose, various analysis methods using system identification techniques have been proposed, whereas a method that is not affected by a gas input pattern has been demanded to enhance the robustness of gas identification. Here we develop a novel gas identification protocol based on a transfer function ratio (TFR) that is intrinsically independent of a gas input pattern. Gas identification by a single sensing element is a challenging and promising technology. In this report, we demonstrate a novel gas identification strategy, which is based on a single-sensor sensor radiated by ultrasound. The identification is based on different ultrasonic catalysis effect on the steady sensing responses of an ultrasonically radiated MOS or catalytic combustible gas sensor to different gase analytes. It does not need a complicated feature extraction computation. Our experiments show that the success rate of identification can be up to 100% if strong enough ultrasound is employed. The identification process can also measure the concentration of the gas to be identified. The identification result is immune to the interference of impurity gases to some extent. The anti-interference capability can also be strengthened by increasing the ultrasonic vibration velocity.

Biography

Junhui Hu received his Ph.D. Degree from Tokyo Institute of Technology, Japan, in 1997, and B. E. and M. E. degrees from Zhejiang University, China, in 1986 and 1989, respectively. Currently he is a Chang-Jiang Distinguished Professor, and the deputy director of a State Key Laboratory in Nanjing University of Aeronautics and Astronautics, China. His research interest is in ultrasonic sensors and actuators, ultrasonic manipulations, etc. He is the author and co-author of more than 300 papers, disclosed patents and books, including more than 100 SCI journal papers. He is also the sole author of monograph “Ultrasonic Micro/Nano Manipulations”.