



MAKE A CHIP THAT “SMELLS”-TOWARDS AN ELECTRONIC NOSE SYSTEM-ON-CHIP

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ABSTRACT: Electronic noses (e-nose) have been studied for several years and extensively applied; however, they are limited by their volume and high manufacturing cost. Portable devices have become popular in recent years; therefore, it is crucial to integrate e-noses in portable devices (e.g., mobile phones). This study used TSMC 90nm 1P9M CMOS MSG technology to develop a front-end system-on-chip (SoC) for an electronic nose. The SoC contained interdigitated electrodes, multi-channel sensor interface circuits, an analog to digital converter, and a digital continuous restricted Boltzmann machine (CRBM). Various conducting-polymer materials were titrated on the interdigitated electrodes to form an on-chip sensor array. This SoC was controlled through a microprocessor to perform odor identification and analysis. The simulation results of the SoC and gas classification show that this chip is suitable for portable applications and further integration.

BIOGRAPHY: Dr. Kea-Tiong (Samuel) Tang received the B.S. degree in electrical engineering from National Taiwan University, Taipei, Taiwan in 1996, and received the M.S. and Ph.D. degree in electrical engineering from California Institute of Technology, Pasadena, CA, USA, in 1998 and 2001, respectively. During 2001-2006, Dr. Tang was a Senior Electrical Engineer with Second Sight Medical Products, Inc., Sylmar, CA, USA. He designed mixed signal ASIC for retina prosthetic device. In 2006, he joined the Electrical Engineering Faculty at National Tsing Hua University, Hsinchu, Taiwan, and is currently an Associate Professor. His research interests include bio/chemical sensing system, miniaturized electronic nose system, medical implant for deep brain stimulation, analog and mixed signal IC design, neuromorphic SoC design, and biomedical system design. He has published more than 60 peer-reviewed journal and conference papers in these areas. Dr. Tang is member of IEEE solid state circuit society (SSCS), circuits and systems society (CAS), and Engineering in medicine and biology society (EMBS). He is a technical program committee member of Biomedical Engineering Symposium on Biosignal, Biosensor, Bioelectronics, and Bioengineering, International Congress on Computer Application, etc. He is also a member of IEEE Biomedical and Life Science Circuits and System technical committee.