MEMS Sensor Technology and Development of New Age Sensors

Prof. Rudra Pratap
Centre for Nano Science and Engineering
Indian Institute of Science, Bangalore

Abstract

Micro-Electro-Mechanical Systems (MEMS) have revolutionised the world of sensing by leveraging the well-established CMOS technology for batch fabrication to combine physical sensing with signal processing at micro-scale. This technology is continuously evolving with the advances in nanotechnology that provide an ever expanding palette of materials and techniques to realize patterned structures at ever decreasing length-scales. Shrinking sensors to micro and nano scales has opened up applications for these sensors in areas that no one imagined before. For example, the new avatar of an acoustic transducer called phone, in the form of a smart phone, has no resemblance to its ancestors from the last century. It is becoming smarter by the day — all because of the ever increasing number of sensors it is able to incorporate in its sleek form factor. Smart phones, smart watches and other wearables will be using more and more sensors in the future as MEMS technology offers multi sensor platforms on chips. The hyped benefits of IoT will remain a pipedream unless we are able to embed sensors in everything. Such ubiquity of sensors depends on their availability in extremely small form factor, very low cost to the customer as well as to the environment, and zero or close to zero power consumption. MEMS sensor technology has the ability to deliver on all of these promises. India too has made huge strides in this technology and is poised to develop these new age sensors not only for its own use but for the world. I will present several examples of such sensors in this talk and also show how these are being developed in India. This technology has the potential to deliver on the premise of *Atmanirbhar Bharat*.

Brief bio of the speaker

Rudra Pratap (Ph.D., Cornell University, 1993, M.S., University of Arizona, 1987, B.Tech., IIT Kharagpur, 1985) is a professor at the Centre for Nano Science and Engineering (CeNSE), and Deputy Director of IISc Bangalore. He is also an associate faculty of Mechanical Engineering, IISc, where he served full time until 2010 when he moved to CeNSE as the Founding Chairperson. He joined IISc in 1996 after teaching at the Sibley School of Mechanical and Aerospace Engineering, Cornell University, for almost three years. For the last 20 years, he has worked in the area of Micro-electro-mechanical systems (MEMS) and dynamics of micro and nano-scale systems. His research interests include MEMS and NEMS, vibroacoustics, bioacoustics, mechano-biology, and computational mechanics. He has published approximately 200 papers in journals and conference proceedings. He is author or co-author of three books. He is an Associate Editor of IEEE/ASME Journal of MEMS and Journal of ISSS. He is an elected Fellow of the National Academy of Engineering and National Academy of Science, India, and a Distinguished Lecturer of the IEEE Sensors Council.