

Smart Wireless Nanosensor Systems for Healthcare

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Abstract

Due to the rapid advances in Smart Nanosystems, telecommunication and information technologies, efficient and reliable telemedicine (also known as remote point of care or remote healthcare), which has been a holy grail in medicine, is coming into practice. It is expected to significantly improve the quality of healthcare while reducing the costs, especially for patients with chronic illnesses, such as neurological, metabolic, and cardiovascular disorders which require constant long term untethered monitoring, as well as patients discharged after an operation or serious medical crises. It eliminates the distance barriers in medicine. Vital information about a patient, who lives far away from medical support, can be acquired by the medical staff. More importantly it saves lives in critical care and emergency situations by alerting medical staff if there is a dangerous change in patient status. Additionally, wireless communication and cloud storage allow users to upload and access sensor data in locations well beyond the clinic and increases in computing power provide more real time analysis. Topics covered will be:

- MEMS, NEMS
- Wireless Body Network
- Smart Wearables
- Human Anatomy and compatibility of nanosensors
- Implantable and non-invasive nanosystems
- Cardio and Neurological disorders; monitoring and control
- Diabetes, Neuropathy
- Selected videos of the patients monitoring

Biodata

Vijay K. Varadan is a co-founder and CMO/CTO/CIO of Nanowear Inc at the Penn State Innovation Park. Nanowear is the leading developer of patented, textile-based nanosensor technology with application in the cardiac, neurological, diabetic and sports medicine / performance diagnostic monitoring markets. The Company's proprietary technology enables wireless, real-time electrophysiological monitoring that provides medical professionals with accurate and continuous diagnostic data through a cost-effective and non-invasive wearable deployment.

Professor Varadan is also associated with the Department of Engineering Science and Department of Neurosurgery at Penn State Hershey Medical School as Distinguished Professor. He serves as the Twenty-First Century Endowed Chair in Nano-and Bio-Technology and Medicine, and Distinguished Professor of Electrical Engineering and Distinguished Professor of Biomedical Engineering (College of Engineering) and Neurosurgery (College of Medicine) at University of Arkansas from 2005 till 2017 and Emeritus-in-Service now. He also holds honorary doctorate degrees in Nano-, and Bio-Technologies and Medicine from India, Australia and Korea. He also served on the faculty of Cornell University, Ohio State University and Pennsylvania State University where he was Distinguished Professor of Engineering Science and Electrical Engineering and Neurosurgery since 1983. He was the Director of the University of Arkansas High Density Electronic Center and the NSF Center for Wireless Nanosensors and Systems (WiNS).

He is also the Director of Global Institute of Nanotechnology in Engineering and Medicine. This Institute currently has affiliation with various leading Universities around the world helping work force and economic development in Nanomaterials, Nanotubes and Nanocomposites, Low cost Flexible Electronics, Health-care and Health diagnostics, Renewable and Green Energy driven systems, and Information Technology.

Varadan has concentrated on the design and development of various electronic, acoustic and structural composites, smart materials, structures, and devices including sensors, transducers, Microelectromechanical Systems (MEMS), synthesis and large scale fabrication of carbon nanotubes, NanoElectroMechanical Systems (NEMS), microwave, acoustic and ultrasonic wave absorbers and filters. He has developed neurostimulator, wireless microsensors and systems for sensing and control of Parkinson's disease, epilepsy, glucose in the blood and Alzheimer's disease. He is also developing both silicon and organic based wireless sensor systems with RFID for human gait analysis and sleep disorders and various neurological disorders. He is a founder and the Editor-in-Chief of the Journal of Smart Materials and Structures. He is the Editor-in-Chief of the Journal of Nanotechnology in Engineering and Medicine. He is an Associate Editor of the Journal of Microlithography, Microfabrication and Microsystem. He serves on the editorial board of International Journal of Computational Methods. He has published more than 500 journal papers and 15 books. He has 15 patents pertinent to conducting polymers, smart structures, smart antennas, phase shifters, carbon nanotubes, and implantable device for Parkinson's patients, MEMS accelerometers, pressure sensors and gyroscopes. He is a fellow of SPIE, ASME, Institute of Physics, Acoustical Society of America. He has many visiting professorship appointments in leading schools overseas.