

Wireless Network Technologies for Monitoring Human Health

By

Dr. Dharma P. Agrawal

**Ohio Board of Regents Distinguished Professor and
Director, Center for Distributed and Mobile Computing**

Center for Distributed and Mobile Computing

University of Cincinnati, Cincinnati, OH 45221-0030

Tel: 513-556-4756 E-mail: dpa@cs.uc.edu web: www.cs.uc.edu/~dpa

Recent interest in providing better quality of medical services is booming. This has given rise to development of many new sensors and has made Wireless Body Area Sensor Network (WBASN) as one of the popular areas of research. We show the use of WBASNs in providing better healthcare services. We introduce an interesting application of WBASN in the field of Sports Medicine by monitoring postural balance and stability of athletes in real time and providing valuable feedback to the coaches so as to minimize the injury to the athletes and maximize their playing potential. We also consider a fascinating application of continuous, non-invasive wireless home monitoring of patients with movement disorders and Parkinson's disease. This is expected to prevent potential falls, and recording the number of occurrences of Freezing of Gait (FoG) over single or multiple days. We propose a home based monitoring system which involves embedding of wireless sensors in the patient's vicinity, such as in his room. Many other relevant examples are considered in detail. Since sensors in a WBASN collect the data from person's body and surroundings, maintaining security of such personal data is of a primary concern. The security scheme ought to be lightweight and easily portable, should be ultra-low-power and supplemented with energy harvesting techniques for long term and efficient operation. Finally, we consider some open questions for future research.

Short Biography



Dharma P. Agrawal is the Ohio Board of Regents Distinguished Professor and the founding director for the Center for Distributed and Mobile Computing in the School of Computing Sciences and Informatics. He has been a faculty member at the ECE Dept., Carnegie Mellon University (on sabbatical leave), N.C. State University, Raleigh and the Wayne State University. His current research interests include resource allocation in wireless mesh networks, query processing and secured communication in sensor networks, environmental monitoring using sensor networks, and effective traffic handling in integrated wireless networks. His recent contribution in the form of a co-authored introductory text book on *Wireless and Mobile Computing* has been widely accepted throughout the world and third edition has just been published. The book has been reprinted both in China and India and translated in to Korean and Chinese languages. His co-authored book on *Ad hoc and Sensor Networks*, 2nd

edition, has been published in spring of 2011. A co-edited book entitled, *Encyclopedia on Ad Hoc and Ubiquitous Computing*, has been published by the World Scientific and co-authored books entitled *Wireless Sensor Networks: Deployment Alternatives and Analytical Modeling*, and *Innovative Approaches to Spectrum Selection, Sensing, On-Demand Medium Access in Heterogeneous Multihop Networks*, and *Sharing in Cognitive Radio Networks* have been published by Lambert Academic.

He is an editor for the *Journal of Parallel and Distributed Systems*, founding Editorial Board Member, *International Journal on Distributed Sensor Networks*, *International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC)*, *International Journal of Ad Hoc & Sensor Wireless Networks* and the *Journal of Information Assurance and Security (JIAS)*. He has served as an editor of the *IEEE Computer magazine*, and the *IEEE Transactions on Computers* and the *International Journal of High Speed Computing*. He has been the Program Chair and General Chair for numerous international conferences and meetings. He has received numerous certificates from the IEEE Computer Society. He was awarded a *Third Millennium Medal*, by the IEEE for his outstanding contributions. He has delivered keynote speech at 25 different international conferences. He has published over 592 papers, given 32 different tutorials and extensive training courses in various conferences in USA, and numerous institutions in Taiwan, Korea, Jordan, UAE, Malaysia, and India in the areas of Ad hoc and Sensor Networks and Mesh Networks, including security issues. He has graduated **62 PhDs and 52 MS students**. He has been named as an **ISI Highly Cited Researcher**, is a Fellow of the **IEEE**, the **ACM**, the **AAAS** and the **World Innovation Foundation**, and a recent recipient of **2008 IEEE CS Harry Goode Award**. In June 2011, he was selected as the **best Mentor for Doctoral Students** at the University of Cincinnati. Recently, he has been inducted as a **charter fellow of the National Academy of Inventors**. He has also been elected a **Fellow of the IACSIT** (International Association of Computer Science and Information Technology), 2013.