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WIBN–A novel framework for multi-hop wireless In Vivo biosensor Networks

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Wireless biometric networks (WBNs) are conceived as a result of the integration of biometrics and wireless sensor networks. In its most limiting primitive form, a WBN is comprised exclusively of wearable medical sensors used for non-intrusive, real-time monitoring of vital signs in humans or animals. An unrestrictive monitoring model retrieves data from minuscule implantable medical sensors in addition to wearable nodes. In this paper, we show that an interconnected, possibly multi-hop, wireless implanted/in vivo biosensor network (WIBN) facilitates a plethora of monitoring, diagnosis, and drug delivery applications. For instance, a WIBN could be used to monitor and risk-stratify the growth aggressiveness of a tumor, salvage cardiac biomarkers diffused into the bloodstream signaling heart disease, or gauge the impact of brain pacemakers developed for deep brain stimulation in neurological patients. In a WIBN, data is routed between implanted sensors, body-mounted devices, and remotely deployed stations at a healthcare facility to assess intervention options, both diagnostic and therapeutic. We propose a novel routing and medium access framework for multi-hop connectivity in WIBNs with an eye toward developing innovative solutions to reduce power dissipation, thus extending the lifetime of in vivo sensors and minimizing the harmful effects of electromagnetic radiation on internal human tissues. Low computational complexity, minimal communication overhead, and high power efficiency are intrinsic to the WIBN framework.

Biography

Professor Ahmed M. Safwat was born in Egypt. He received his B.Sc. with Honours from Kuwait University. He received his M.Sc. from Queen's University, where he completed his Ph.D. work in two years. He joined the Department of Electrical and Computer Engineering at Queen's University in June 2003. He is the Founding Director of the Laboratory for Advanced Wireless Networks (AWN). Professor Safwat was the Co-Chair of the International Conference on Wireless Networks, Communications, and Mobile Computing (WirelessCom) 2005. He also served as the Publicity Co-Chair for the IEEE International Workshop on Information Assurance in Wireless Sensor Networks (WSNIA) 2005. He was the Co-Chair of IEEE GLOBECOM 2004 Wireless Ad hoc and Sensor Networks. In addition, he was the Chairman of the IEEE IPCCC 2004 Workshop on Energy-Efficient Wireless Communications and Networks (EWCN). He was also the Chairman of the IEEE VTC 2003 Wireless Ad hoc and Sensor Networks Symposium. He also served as the Co-Chair of the Technical Program for the Workshop on Energy-Efficient Wireless Communications and Networks (EWCN) in conjunction with IEEE IPCCC 2003. He serves on the editorial and advisory boards of many international journals and conferences, respectively. Professor Safwat has been tasked to lead cutting-edge projects in the field of wireless networks and nanotechnology. He is the inventor of many landmark technologies, including PA-VBS, Q-GSL, ECPS, E2LA, A-Cell, ACA, ECCA, MTCD, ASRS, ISRS, PIMCM, R-MIMD, X-MIMD, and E-MIMD, among others.

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