

Ultra-Wideband Communications: An Idea whose Time has Come

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Abstract

Ultra-wideband (UWB) refers to bandwidths in excess of 2 GHz, whose utilization by radar systems dates back to the late '60s. The renewed and rapidly growing interest for UWB was sparked by the spectral mask released by FCC in February 2002, and is well motivated by the attractive features UWB brings to commercial communications: low-power carrier-free transmissions, ample multipath diversity, enhanced penetration capability, low-complexity transceivers, ability to overlay existing systems, and a potential for increase in capacity.

This talk outlines features and challenges unique to UWB, with emphasis on timely Signal Processing issues that focus on synchronization, channel estimation, multiple access, and suppression of interference. UWB systems cause to (and suffer from) co-existing narrowband systems. Application areas include short-range indoor wireless links at home, and in the workplace for low-cost multimedia communications and storage, as well as secure connectivity for ranging, and covert communications.

About the presenter:

G. B. Giannakis received his Diploma in Electrical Engineering from the National Technical University of Athens, Greece, 1981. From September 1982 to July 1986 he was with the University of Southern California (USC), where he received his MSc. in Electrical Engineering, 1983, MSc. in Mathematics, 1986, and Ph.D. in Electrical Engineering, 1986. After lecturing for one year at USC, he joined the University of Virginia in 1987, where he became a professor of Electrical Engineering in 1997. Since 1999 he has been a professor with the Department of Electrical and Computer Engineering at the University of Minnesota, where he now holds an ADC Chair in Wireless Telecommunications.

His general interests span the areas of communications and signal processing, estimation and detection theory, time-series analysis, and system identification -- subjects on which he has published more than 150 journal papers, 300 conference papers, and two edited books. Current research topics focus on transmitter and receiver diversity techniques for single- and multi-user fading communication channels, complex-field and space-time coding for block transmissions, multicarrier, and ultra-wide band wireless communication systems.

G. B. Giannakis is the (co-) recipient of four best paper awards from the IEEE Signal Processing (SP) Society (1992, 1998, 2000, 2001). He also received the Society's Technical Achievement Award in 2000. He co-organized three IEEE-SP Workshops, and guest (co-) edited four special issues. He has served as Editor in Chief for the IEEE SP Letters, as Associate Editor for the IEEE Trans. on Signal Proc. and the IEEE SP Letters, as secretary of the SP Conference Board, as member of the SP Publications Board, as member and vice-chair of the Statistical Signal and Array Processing Technical Committee, and as chair of the SP for Communications Technical Committee. He is a member of the Editorial Board for the Proceedings of the IEEE, and the steering committee of the IEEE Trans. on Wireless Communications. He is a Fellow of the IEEE, a member of the IEEE Fellows Election Committee, the IEEE-SP Society's Board of Governors, and a frequent consultant for the telecommunications industry.