TEXAS A&M UNIVERSITY at QATAR

ELECTRICAL AND COMPUTER ENGINEERING PROGRAM

THE ELECTRICAL & COMPUTER ENGINEERING PROGRAM PRESENTS

Orthogonal bi-pulse UWB: Timing and non coherent (de)modulation

Hichem Besbes, Associate Professor

Tuesday, April 21, 2009
4:00 – 5:00 p.m.
Lecture Hall 143 / 1st floor

We present a novel orthogonal bi-pulse ultra-wideband (UWB) system, which uses an even pulse and an odd pulse to convey information symbols in an alternating manner. Due to the orthogonality of these pulses, their corresponding received waveforms remain orthogonal after propagating through multipath channels. Then we consider two major challenges in the realization of our proposed UWB system: timing synchronization and symbol demodulation. In particular, the idea of timing with dirty template (TDT) is employed for timing synchronization and the noncoherent scheme is used to bypass channel estimation. Both of these techniques are characterized by correlating adjacent waveform segments. In the implementation of these techniques, we will gradually reveal the advantages of our proposed system. The correlation of adjacent waveform segments only contains the information of a single symbol. This enables a significant enhancement of the synchronization speed of TDT when no training sequence is transmitted. For the same reason, our demodulation approach completely mitigates the inter-symbol interference (ISI) and entails a simple demodulator even in the presence of unknown timing errors.

Hichem Besbes received his B.S. (with honors), M.S. degrees and his Ph.D. in Electrical Engineering from the Ecole Nationale d'Ingénieurs de Tunis' (ENIT) in 1991, 1991, and 1999, respectively. He has been with the Ecole Supérieure des Communications de Tunis (Sup'Com), as a lecturer during 1991–1999 and then as an assistant professor. From July 1999 to October 2000, he held a postdoctoral position at Concordia University, Montréal, Canada. In July 2001, he joined Legerity, Inc., Austin, Texas, USA, where he was a senior system engineer working on broadband modems. From March 2002 to July 2003, he was a member of Technical Staff at Celite Systems, Inc., Austin, Texas, where he contributed to definition, design, and development of Celite's high-speed data transmission systems over wireline networks. He served as a consultant to several US startups. He is currently an associate professor at the Ecole Supérieure des Communications de Tunis (Sup'Com), Head of Department "Applied Maths, Signals & Communications" and Head and co-founder of research unit "TECHTRA". His research interest is in the area of wireless communications with special emphasis on signal processing for communication.

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