

Quadratic Programming Approach for UWB Pulse Shaping Filter Design with Nonconstant Upper Bounds

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Abstract—In UWB pulse shaping filter design, FIR filter formulated as a semi-definite programming problem has been widely used. Recently, piece-wise continuous bounds has been incorporated into the FIR filter design to avoid power loss due to the constant spectral mask indirectly assumed in the design. In this paper, we formulate the pulse shaping filter design as a semi-infinite quadratic optimization problem using Hermite-Rodriguez basis functions. Computationally effective approach to solving the optimization problem is proposed. Through numerical design examples, we compare the spectral utilization of our approach with those FIR-based pulse shaping filter designs. We demonstrate that our proposed approach is easy to implement and achieves better spectral utilization than a recent result when a suboptimal basic pulse is used.

Keywords-pulse shaping; filter design; semi-infinite programming; ultra-wideband (UWB); Hermite-Rodriguez functions;



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Dr Zang's current main research interest lies in the areas of constrained analog and digital filter set design for bandwidth-efficient multiuser communications, wideband waveform design for radar and sonar, and computationally efficient optimization methods and their application to array signal processing, system modeling, identification and control, and multiuser wireless communication networking.