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Title: Estimation of Overspread Scattering Functions

Abstract: In many radar scenarios, the radar target or the medium is assumed to possess randomly varying parts. The properties of a target are described by a random process known as the spreading function. Its second order statistics under the WSSUS assumption are given by the scattering function. The target is identifiable if its spreading function can be determined from the echo reflected of a target to a sounding signal.

It is known that due to the uncertainty principle, the spreading function must be supported on a compact set of area less than one in order to be identifiable. Using a familiar compressed sensing technique, it is possible to determine the location of the support set without prior knowledge.

We propose a channel sounding procedure that allow for the determination of the spreading function given complete statistical knowledge of the operator echo from a single sounding by a weighted pulse train. In the WSSUS case, this technique guarantees identifiability whenever the scattering function is supported on a compact subset of the time-frequency plane without any restrictions either on the area of the support set, or on its geometry.