Analysis of a novel preconditioner for solving lower rank extracted systems derived from convolution integral equations

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In this talk we describe and analyze the application of a novel preconditioner that can be used to solve the large systems of algebraic equations that are obtained from the discretization of convolution type singular integral equations. Although the preconditioner is constructed by exploiting the underlying convolution structure of the problem, it is shown to be extremely useful for solving problems in which the representation of irregular geometric effects yields a system of equations which is not shift invariant. We will demonstrate the extension of the procedure to layered materials as well as to low-rank updates associated with boundary correction procedures. We will provide numerous numerical examples of the performance of the algorithm.

(This is work done in collaboration with Srinivasa Salapaka at UCSB)