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Krylov Recycling for Sequences of Shifted Systems

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Solving many large scale sequences of shifted linear systems with multiple right-hand sides is the main computational bottleneck of many problems, such as nonlinear inverse problems. Specifically, this issue arises in the optimization problem found in diffuse optical tomography (DOT). An inner-outer Krylov recycling method was developed by Kilmer et al. for the non-shifted case to reduce this computational cost. In this paper, we extend this approach to the shifted case for a single right-hand side. Both real shifts as well as complex identity shifts are investigated. We show the value of our approach with two examples from DOT, however, our method has the potential to be useful for other applications as well.