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Informational efforts for solving exponentially ill-posed problems

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We consider exponentially ill-posed problems in the spaces $L_2(0,1)$ that are given as

$$Ax(t) \equiv \int_0^1 a(t,\tau)x(\tau)d\tau = f, \quad t \in [0,1]. \tag{1}$$

Here it is assumed that input data a and f are given with perturbation and function a has mixed partial derivatives up to order r by each variables. For numerical solving (1) with minimal informational efforts we proposed classical regularization methods with modified projection discretization (see [1]). According to our approach for solving (1) the regularization parameter is chosen by a balancing principle. It is proved that such numerical method is optimal by the order and saves informational efforts on minimal level.

[1] S. G. Solodky, G.L. Myleiko *Journal of Inverse and Ill-Posed Problems* **5**, (2014), p. 735.