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UNIQUENESS RESULTS FOR SOME PARABOLIC INTEGRO-DIFFERENTIAL INVERSE PROBLEMS

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We present uniqueness results for two identification problems for parabolic integro-differential equations (PIDE) containing convolutions over time with kernels h. These results essentially use extremum principles.

The first problem is to determine an unknown x-dependent (i.e. space-dependent) factor of a source term by means of final over-determination of the solution of PIDE. We prove a positivity principle for PIDE with scalar kernels and use this principle to establish the uniqueness for the inverse problem. As a corollary, the uniqueness for inverse problems to determine unknown x-dependent coefficients of PIDE follows, too.

Secondly, we consider an inverse transmission problem for PIDE in an open domain Ω where the subdomains of continuity are Ω_1 and $\Omega_2 = \Omega \setminus \overline{\Omega}_1$ such that $\partial\Omega_2 = \partial\Omega_1 \cup \partial\Omega$ and $\operatorname{dist}\{\partial\Omega_1, \partial\Omega\} > 0$. The restrictions of h in the subdomains Ω_1 and Ω_2 are assumed to be scalar and denoted by h_1 and h_2, respectively. The inverse problem consists in determination of h_1 from measured flux in $\partial\Omega$ over the time. This problem is severely ill-posed, because it reduces to an equation with an infinitely smoothing operator. In case the problem is formulated in the infinite time interval $(0, \infty)$, we apply the Laplace transform and use the extremum principle and Giraud theorem for the resulting elliptic problem to prove the uniqueness for the inverse problem. The uniqueness in the finite time interval $(0, T)$ is an open problem in the moment of submission of this abstract, as it requires an extremum principle for PIDE with non-scalar h.