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Inverse Problem Involving an Integral Equation in Irrigation Theory OLESYA SARAJLIC, ALEXANDRA SMIRNOVA, Georgia State University — The use of Laplace transforms and other computational tools allows to study an elementary inverse problem in hydraulics. Given basic equation

$$r(h) = 16 \int_0^h \sqrt{h - y}\, f(y)\, dy$$

which relates notch shape $f(y)$ and flow rate $r(h)$, we can directly determine the flow rate function r from the notch shape function f through straightforward integration. However, the inverse problem arises from Torricelli's law that is expressed as a particularly simple convolution-type Volterra integral equation of the first kind, which can be solved by Laplace transforms. Unlike the direct problem, the process of solving the inverse problem is unstable in a sense that even a small error in the input data can result in a substantial error at the computed solution. The goal of our research is to develop a regularized numerical algorithm for getting less noisy and more stable outcome of the inverse problem.

Olesya Sarajlic
Georgia State University

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