

On a generalized method of Lavrent'ev regularization

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The usual method of Lavrent'ev has the qualification one, which doesn't guarantee smooth convergence of regularized solutions even if the exact solution is smooth. We construct a generalized method of Lavrent'ev which preserves the triangular structure of Volterra equations but has higher qualification. The higher qualification is achieved introducing some additional infinitesimal terms including derivatives in the regularizing equation.

Assuming source condition in terms of the inverse of the unbounded operator, we derive error estimates of scale type for the regularized solution. We also construct a corresponding a posteriori parameter choice rules for the method and prove the error estimates for these rules.

Finally, we discuss some particular cases. Namely, we apply the method to self-adjoint problems and Volterra equations of the first kind. Applications to Abel integral equations are considered as well.