On some nonclassical problems for nonlinear first-order evolution equations

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Abstract

This paper deals with initial value problems for nonlinear first order evolution equations in abstract spaces with nonclassical initial conditions. Nonclassical problems with nonlinear nonlocal initial conditions connecting values of the unknown vector-function at the initial and some other moments of time are studied for first-order evolution equations with semicontinuous and monotonic nonlinear operators. In suitable spaces of vector-valued distributions the existence of solution of the nonclassical problem is proved. An iteration algorithm for approximation of the solution of the nonlocal in time problem by solutions of classical problems is constructed. Under suitable conditions on nonlocal operators and given vector-functions in the initial conditions it is proved that the nonclassical problem possesses a unique solution and the sequence of solutions of the constructed classical problems converges to the solution of the nonlocal in time problem. The applications of the obtained general results to nonlocal in time problems for nonlinear parabolic equations are considered.

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