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Optimal control methods in inverse problems and computational processes. (English)

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Let W, Y, H_{c}, H_{ob} be given Banach spaces. The author considers the abstract equation

$$Lu = f_0 + Bv$$

where f is a given data vector; v is to be determined together with u, L and B are closed linear operators, which act from W into Y^* and from H_{c} into Y^*, respectively. To complete the setting of the problem the equation

$$Cu = g_{\mathrm{ob}}$$

is introduced, where the linear operator C acts from W into H_{ob} and g_{ob} is a given element from H_{ob}. The author considers the following optimal control or variational problem about minimization of the functional

$$J(u(v), v) = \alpha\langle K(v - v_0), v - v_0\rangle + \|Cu(v) - g_{\mathrm{ob}}\|^2$$

with respect to v, where α is a positive parameter, $\langle\ ,\ \rangle$ is a scalar product, K is a symmetric positive definite operator, v_0 is a given element of H_{c},$\|\ \|$ is the norm in H_{ob}. A solvability result for considering variational problems is established, application of this result to the inverse problem of determining the right-hand side of the abstract evolution equation and the boundary function of the transport equation, and to the Stokes problem are given.

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MSC:

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49J27 Existence theories for problems in abstract spaces
35Q30 Navier-Stokes equations

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