On an alternative approach for mixed boundary value problems of the steady state elastic oscillations

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(The talk is dedicated to the 120th anniversary of the birth of Viktor Kupradze)

We consider an alternative approach to investigate mixed boundary value problems (BVP) for the steady state elastic oscillation equations of elasticity theory in the case of three-dimensional unbounded domain $\Omega \subset \mathbb{R}^3$, when the connected compact boundary surface $S = \partial\Omega$ is divided into two disjoint parts, S_D and S_N, where the Dirichlet boundary condition (the displacement vector) and Neumann type boundary condition (the stress vector) are prescribed respectively. Our approach is based on the potential method. We look for a solution to the mixed boundary value problem in the form of special linear combination of the single layer and double layer vector potentials with densities supported respectively on the Dirichlet and Neumann parts of the boundary. This approach reduces the mixed BVP under consideration to a system of integral (pseudodifferential) equations which do not contain neither extensions of the Dirichlet or Neumann data, nor the Steklov-Poincaré type operator. Moreover, the right hand sides of the resulting pseudodifferential system are vectors coinciding with the Dirichlet and Neumann data of the mixed BVP problem in question. It is shown that the boundary matrix integral operator generated by the system of integral (pseudodifferential) equations is invertible in the L_p based Besov spaces, which under appropriate boundary data implies an optimal C^α-Hölder continuity property of solutions to the mixed BVPs in the closed domain $\overline{\Omega}$ with $\alpha = \frac{1}{2} - \varepsilon$, where $\varepsilon > 0$ is an arbitrarily small number.