Public Abstract

First Name:Michail

Middle Name:

Last Name:Mourgoglou

Adviser's First Name:Steven

Adviser's Last Name:Hofmann

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:Endpoint solvability results for divergence form, complex elliptic equations

In Harmonic Analysis one investigates properties of functions and operators (i.e., mappings which transform one function into another) by decomposing them into smaller, constituent pieces, which are easier to understand, and then reassembling the pieces. The name itself arose by analogy to the decomposition of a musical sound into its various frequency components, or harmonics. Partial differential equations (PDEs) describe a wide variety of phenomena in the real world, including electrostatics, and steady-state temperature distributions and elastic deformations. Our goal is to develop techniques to study the solvability of boundary value problems (BVPs) for complex elliptic equations, with rough coefficients and non-smooth data. An important category of operators which arise in the study of PDEs, is that of the Singular Integral Operators (SIOs). The key fact of relevance to this project is that SIOs mediate between rates of change, in different directions, of the solutions of the PDE, and in turn, this fact is often of use in establishing existence and regularity of solutions. This mediating role is useful in both the interior and boundary regularity theory. In particular, the rate of change of a solution, as one moves tangentially along the boundary, and its rate of change normal (i.e., perpendicular) to the boundary, are related via a SIO. We are able to exploit previously developed theory to solve BVPs with endpoint data, i.e. data belonging to very rough, difficult to handle, spaces.