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The Faber isomorphism, Grunsky operator, and Schiffer operator on quasidisks

In previous work we characterized the boundary values of harmonic functions of finite Dirichlet energy on a quasidisk as a certain Besov space on the quasicircle. We also showed that the Dirichlet problem and Plemelj-Sokhotski jump problems have solutions which depend continuously on the boundary data. In this talk we use these results to define a reflection on harmonic functions in quasidisks obtained by first taking the boundary values and then solving the Dirichlet problem on the complementary domain. We derive formulas relating Faber series, the Grunsky operator and this reflection. In particular, we give an isomorphism between Dirichlet spaces of quasidisks closely related to Faber series, which respects composition of the conformal map between the complements. Finally, we show that the space of L^2 harmonic one forms on a quasidisk is isomorphic to the direct sum of the Bergman spaces of the quasidisk and its complement, and relate this to an operator of Schiffer. Joint work with Wolfgang Staubach.