

Aspects of Harmonic Analysis Related to Hadamard's Method of Descent

William O. Bray

Department of Mathematics and Statistics
University of Maine

Abstract

It is well known that many problems in analysis present simpler analytic structure, and hence simpler solution, when the underlying dimension is odd. A classic example of this is found in the Cauchy problem for the wave equation on Euclidean space. In the setting of Euclidean space, real hyperbolic space, and more generally, rank one symmetric spaces of non-compact type, we define partial Radon transforms which intertwine the Laplacian on manifolds of different dimension. This leads to formulas relating their spherical functions and associated Plancherel measures. In effect, this allows transplantation of local problems in analysis from one setting to another, e.g., from even dimensional to odd dimensional Euclidean space, manifesting the method of descent in the formulas of harmonic analysis. Alternatively, the results provide geometric interpretation of certain integral formulas for classes of special functions, e.g., Sonine's integrals for Bessel functions.