Abstract

The work is situated within the theory of slice analysis, a generalization of complex analysis for hypercomplex numbers, considering function of both quaternionic and Clifford variables, in both one and several variables. The primary focus of the thesis is on the harmonic and polyharmonic properties of slice regular functions. We derive explicit formulas for the iteration of the Laplacian on slice regular functions, proving that their degree of harmonicity increases with the dimension of the algebra. Consequently, we present Almansi-type decompositions for slice functions in several variables. Additionally, using the harmonic properties of the partial spherical derivatives and their connection with the Dirac operator in Clifford analysis, we achieve a generalization of the Fueter and Fueter-Sce theorems in the several variables context. Finally, we establish that regular polynomials of sufficiently low degree are the unique slice regular functions in the kernel of the iteration of the Laplacian, whose power is less than Sce index.