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The Graham–Kohr extension operator for spirallike and plurispirallike mappings on pluristarlike domains in complex Banach spaces

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Abstract

Given a complex Banach space $(\mathbb{X}, \|\cdot\|_{\mathbb{X}})$, let $(\mathbb{X}^*, \|\cdot\|_{\mathbb{X}^*})$ denote its dual space. By the Hahn–Banach theorem there exist pairs $(u, u^*) \in \mathbb{X} \times \mathbb{X}^*$ such that $\|u\|_{\mathbb{X}} = \|u^*\|_{\mathbb{X}^*} = u^*(u) = 1$. For such a pair and a boundary profile δ, we introduce the pluristarlike domain $\mathbb{B}_\delta[u, u^*] \subseteq \mathbb{X}$. Our main goal is to construct normalized biholomorphic mappings that map $\mathbb{B}_\delta[u, u^*]$ onto spirallike domains of type $\gamma \in (-\pi/2, \pi/2)$ in $\mathbb{X}$, and, under more restrictive assumptions, onto plurispirallike domains of type γ in $\mathbb{X}$. These mappings are constructed using normalized spirallike functions of type γ on the unit disc U of the complex plane $\mathbb{C}$. For explicit constructions, we use the Graham–Kohr type extension operator, which maps normalized spirallike functions on U to mappings defined on $\mathbb{B}_\delta[u, u^*]$.

Concrete realizations of the main results are obtained by considering the Graham–Kohr transformation on special domains in the sequence space ℓ^p, the Lebesgue space $L^p(\mathbb{T})$, and the Hardy space $H^p(U)$, for $1 \leq p \leq \infty$.