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7. Lie Groups and Lie Algebras

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Bergmann, Wolfgang Reinhold, Università della Basilicata, Potenza, Italy

Amenable Groups and Generalized Cuntz Algebras

Consider the C^*-category $\mathcal{C}$ with arrow sets $(r,s) := \mathrm{B}(\otimes^r H, \otimes^s H)$, H Hilbert space. Identifying (r,s) inside $(r+1,s+1)$ with $T \mapsto T \otimes I$ starts a process which collapses $\mathcal{C}$ into O_H, the graded **generalized Cuntz C^*-algebra over H**, obtained by completion from the (suitably normed) *-algebra $\sum_{k\in\mathbb{Z}} \lim_{\rightarrow,r} (r, r+k)$. The action of $V \in \mathrm{U}(H)$ on the arrows of $\mathcal{C}$ given by $T \in (r,s) \mapsto \otimes^s V \circ T \circ \otimes^r V^* \in (r,s)$ resists this construction, giving the action Λ of $\mathrm{U}(H)$ on O_H. Results: We introduce, by infinite tensor product and Rieffel induction, a natural family $\mathcal{S}$ of representations of O_H. With G noncompact Lie group and λ the left regular representation of G on $H = L^2(G)$, we get: G is amenable IFF there exist infinite tensor powers of λ IFF there exist, in $\mathcal{S}$, irreducible $\Lambda\circ\lambda$-covariant representations of O_H. We started from a conjecture of S. Doplicher.

Reference: M. Aita, W. R. Bergmann and R. Conti, *Amenable Groups and Generalized Cuntz Algebras*, J. Funct. Anal. **150** (1997), 48–64.