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Embedding spheres into Euclidean space using unbounded Kasparov products

We construct an unbounded representative for the shriek class associated to the embeddings of spheres into Euclidean space. We equip this unbounded KK-cycle with a connection and compute the unbounded Kasparov product with the Dirac operator on $\mathbb{R}^{n+1}$. We find that the resulting spectral triple for the algebra $C(S^n)$ differs from the Dirac operator on the round sphere by a so-called index cycle, whose class in $KK_0(\mathbb{C};\mathbb{C})$ represents the multiplicative unit. At all points we check that our construction involving the unbounded Kasparov product is compatible with the bounded Kasparov product using Kucerovsky's criterion and we thus capture the composition law for the shriek map for these immersions at the unbounded KK-theoretical level, while retaining the geometric information. The end goal of this project will be to generalize this construction to arbitrary immersions of manifolds.