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Extension and non-extension theorems for coarse properties of metric spaces

There is a collection of large scale properties of metric spaces that are popular in topology related to the Novikov, Farrell-Jones, and Baum-Connes conjectures. They include finiteness of the asymptotic dimension of Gromov, finite decomposition complexity of Guentner-Tessera-Yu, asymptotic property C of Dranishnikov, property A of Yu. We generalize well-known extension theorems for these properties and prove some new results. We also show how some natural relaxation of assumptions makes the extension statements fail. We also promote the following idea: even the relaxed extension constructions allow to run variants of familiar proofs of the Novikov conjecture, in particular. From this perspective, non-extension results are very desirable because they should help to enlarge the class of groups satisfying the conjectures. This is joint work with Susan Beckhardt.