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Relative extensions and natural transformations from disk and sphere chain complexes

In 2004, J. Gillespie constructed for every object C in an Abelian category $\mathcal{C}$, and every chain complex X over $\mathcal{C}$, a natural isomorphism $\mathrm{Ext}^1_{\mathbf{Ch}(\mathcal{C})}(X, D^m(C)) \cong \mathrm{Ext}^1_{\mathcal{C}}(X_{m-1}, C)$, where $D^m(C)$ is the mth disk complex centred at C. If in addition X is exact, one also has $\mathrm{Ext}^1_{\mathbf{Ch}(\mathcal{C})}(X, S^m(C)) \cong \mathrm{Ext}^1_{\mathcal{C}}(X_m/B_m(X), C)$, where $S^m(C)$ is the mth sphere complex centred at C. We extend Gillespie's results for pre-covering classes $\mathcal{F} \subseteq \mathrm{Ob}(\mathcal{C})$, to the more general context where $\mathrm{Ext}^1_{\mathcal{C}}(-,-)$ is replaced by the first right derived functor $\mathcal{F}\text{-}\mathrm{Ext}^1_{\mathcal{C}}(-,-)$ of $\mathrm{Hom}_{\mathcal{C}}(-,-)$, computed by using left $\mathcal{F}$-resolutions of the left variable.