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Weighted pullbacks in V -graded categories and universal quantification in V -actegories

Introduced by Richard Wood in 1976, categories graded by a monoidal category V generalize both V -enriched categories and V -actegories. In this talk, we review some basics of V -graded categories, and then we introduce a notion of weighted pullback in V -graded categories. Weighted pullbacks are certain weighted limits that generalize the usual (conical) pullbacks, yet they also specialize to certain notions of universal quantification and certain dependent products. Indeed, we show that weighted pullbacks generalize simple products in the codomain fibration of a cartesian closed category with finite limits and, in particular, simple universal quantification in the subobject fibration of such a category. Generalizing the latter example, we introduce notions of simple product and simple universal quantification in V -actegories as special cases of the notion of weighted pullback. In particular, weighted pullbacks thus give rise to a notion of simple universal quantification in monoidal categories.