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Extraordinary multicategories

The theory of 2-categories gives a convenient context in which to study analogues of natural transformations in different contexts. However, a satisfactory theory which does the same for “extraordinary” natural transformations, such as evaluation and coevaluation in a closed monoidal category, has proven elusive. One possibility is an “autonomous bicategory” or “autonomous double category,” such as those consisting of categories and profunctors. However, this introduces additional structure which is unnecessary for the particular purpose. I will present a structure called an “extraordinary 2-multicategory,” which is the “minimal extension” of a 2-category including extraordinary natural transformations. It is an example of a “generalized multicategory,” and turns out to be related to autonomous double categories in much the same way that ordinary multicategories are related to monoidal categories.