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Orthogonal Factorization Systems for Double Categories

In this talk we will introduce a notion of orthogonal factorization system (DOFS) for double categories that interacts well the notion of double fibration. A DOFS consists of two ordinary orthogonal factorization systems: one for the (strict) arrows of the double category and one for the double cells as arrows between the proarrows of the double category. In other words, we may think of a double category with a DOFS as a pseudo-category internal to a category of categories with an orthogonal factorization system (OFS). As categories with an OFS are algebras for a monad, there are four options for the morphisms in this category: strict, pseudo, lax and colax morphisms of algebras. (Lax morphisms of these algebras are the ones that preserve the right class of arrows.) Analogous to what was needed for double fibrations, we require that the source, target and identity morphisms are strict morphisms of algebras. There are then two versions of DOFS: the ones for which proarrow composition of double cells is a lax morphism of algebras and the ones for which it is colax.

I will discuss the details of this construction and present several examples. I will also present a 2-monad for which the double categories with a DOFS form the algebras, and describe the induced maps between these double categories. I will also discuss the interaction between these factorization systems and double fibrations.