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On the multiplicative structure of internal categories and internal groupoids

In this work we relate the multiplicative structure of an internal category or an internal groupoid with the one of a triangulation. The triangles are obtained by considering a composable pair of morphisms, together with its associated composition morphism, which forms the third edge in the directed triangle. We characterize the triangulations which are obtained by this procedure and construct an equivalence of categories between internal groupoids and what we call reflexive, representable, transitive, associative and symmetric triangulations.