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Michael Shulman* (shulman@sandiego.edu) and **Linde Wester Hansen**. *Constructing symmetric monoidal bicategories functorially.*

Many naturally-occurring bicategories, including bicategories of open systems, networks, decorated and structured cospans, and so on, are in fact the underlying bicategory of some double category. One reason this is useful is that monoidal structures on double categories are significantly simpler to construct than monoidal structures on bicategories, while if a monoidal double category has “isomorphism-lifting” then its underlying bicategory is automatically also monoidal (and similarly for the braided and symmetric cases). This provides a convenient and rigorous way of constructing many naturally-occurring monoidal bicategories.

We abstract and generalize this construction by exhibiting the “underlying bicategory of a double category” as a product-preserving functor between locally cubical bicategories, and observing that any such functor preserves “monoidal objects”. It follows in particular that the construction is also functorial: monoidal functors between double categories induce monoidal functors between their underlying bicategories. Such functors arise naturally in applications, such as the Baez-Courser black-boxing functor from open Markov processes to linear relations. (Received September 03, 2019)