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Symmetric lenses and universality

A *lens* between two domains of model states is an important example of what is known in Computer Science as a *bidirectional transformation* (*BX*). A *symmetric lens* has both state synchronization data and operations to restore synchronization after state change. They have applications in model-driven engineering. An *asymmetric lens* has only one-way synchronization data and restoration operations. They define a strategy to lift a state change (update) in the target model domain back through the one-way synchronization, and for databases to solve *view update problem*.

If the domains of model states are categories, lenses are called *delta-(or d-)lenses*. Earlier we showed that spans of asymmetric d-lenses represent symmetric d-lenses. The one-way synchronization for an asymmetric d-lens is a functor. In the special case that we named (asymmetric) *c-lenses* the update lifting satisfies a universal property. This makes c-lenses what the BX community calls *least change* (and makes the functor exactly a split op-fibration). We might define spans of c-lenses to be symmetric c-lenses with the hope that they characterize those symmetric d-lenses satisfying a least change universal property. However, we will explain why we now do not expect this. Instead, motivated by applications to database interoperation, we consider *co*spans of c-lenses. We show that such cospans do indeed generate symmetric d-lenses with a universal property. We also consider how to characterize those symmetric d-lenses that arise from cospans of c-lenses.

*Joint work with Michael Johnson.