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Lenses: symmetric and asymmetric

The two types of "lenses" discussed arise from related problems in Computer Science. First, suppose y is a "local" model state derived, for example, as $y = gx$ for a view $g : X \to Y$ defined on database states X. When can an update from y to another model state y' be correctly (and minimally) propagated to an update from x to x' of global model states? This is a lifting problem. Second, suppose two model domains X, Y are given having model states x, y that are known to be "synchronized" by some (external) c. How should an update to either of the states, say from x to x', be correctly propagated to an update of the other state, say from y to y', with the updated states x', y' synchronized by some c'?

What we now call *asymmetric lenses* were introduced to provide an "update strategy" resolving the first problem. There are several kinds of asymmetric lenses depending on what structure is assumed for the model states and what is required of the propagation operation. To address the second problem there have recently been studies of several kinds of what are called *symmetric lenses*. Both asymmetric lenses and (equivalence classes of) symmetric lenses of the various kinds can be viewed as arrows of corresponding categories. We show that the symmetric lenses of each sort can be generated from spans of asymmetric lenses of the same sort. Moreover, a category of spans of asymmetric lenses is a suitable category of symmetric lenses.

This is joint work with Michael Johnson.