Pair preserving functors

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Coalgebras for a set functor F : **Set** $\to$ **Set** provide a framework for studying various types of transition systems in a uniform way. Concrete examples of coalgebras that are interesting from a modal logic perspective are Kripke frames, topological spaces and neighbourhood frames. Central in the theory of coalgebras is the question of when two states in a coalgebra should be considered "behaviourally equivalent". In case we are dealing with coalgebras for a weak pullback preserving functor F, behavioural equivalence can be nicely characterized using F-bisimulations. There are, however, interesting instances of coalgebras for functors that do not preserve weak pullbacks. For example (monotone) neighbourhood frames correspond to coalgebras for such a functor.

In my talk I will first focus on the case of (monotone) neighbourhood frames. We will see that behavioural equivalence between monotone neighbourhood frames can be succinctly expressed using the so-called "relational equivalences". We then characterize those functors F for which every behavioural equivalence between F-coalgebras is a relational equivalence. These "pair preserving" functors include all weak pullback preserving functors, but also several functors that do not fulfill this criterion.