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**Jared Culbertson, Paul Gustafson\*** (paul.gustafson@wright.edu), **Dan Koditschek** and **Peter Stiller**. *Formal composition of hybrid systems*. Preliminary report.

We define a double category of hybrid systems, extending a construction of a category of hybrid systems and semiconjugacies due to Lerman. We name our new class of morphisms “directed hybrid systems,” each of which maps an initial subsystem to a final subsystem in a Conley-theoretic sense. In addition, we formalize Full and Koditschek’s template-anchor model reduction within our double category, using spans of subdividing and embedding semiconjugacies.

This double category provides a formal framework for speaking about sequential, independently parallel, and hierarchical compositions of hybrid systems. Sequential composition corresponds to the composition of directed hybrid systems as morphisms, basically concatenation. A categorical product with respect to semiconjugacies models independent parallel composition. Hierarchical composition corresponds to taking pullbacks of template-anchor spans. (Received September 02, 2019)