1107-93-111 **Matthias Kawski*** (kawski@asu.edu), School of Mathematical and Statistical Scienc, Tempe, AZ 85044. *Iterated Integrals in Control and Feedback Transformations.* Preliminary report.

Nonlinear control theory fundamentally rests on noncommuting flows whose geometry is described by Lie and Leibniz algebras. Together with the corresponding iterated integral functionals the underlying structure is now well understood in terms of combinatorial Hopf algebras. These clarify e.g. the factorization of the exponential Lie series that describe solution curves (path planning) and the endpoint map (optimal control) as infinite directed products of exponentials. We investigate some of the combinatorial algebra involved in the step from this, now classical, work, that relies on a choice of controls and vector fields, to a geometric description that involves only distributions and thus is feedback-invariant. (Received January 08, 2015)