Algorithmic approach to the global dynamics of multi-parameter systems of ODEs

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I will discuss an algorithmic approach for identifying the global dynamics of multi-parameter systems of ODEs. We are far from achieving this goal. However our initial effort requires a variety of techniques and arguments, and thus I will limit myself to a few major points: (1) I will discuss what we mean by solve, argue that a non-traditional notion of solution is necessary, and suggest one based on order theory and algebraic topology. (2) I will discuss the philosophy of the approach we are taking. (3) I will introduce a specific family of differential equations (ramp systems) for which we can produce a combinatorial representation of the dynamics, a well defined finite decomposition of parameter space, and show results from some of the computations that can be done currently.

This is ongoing work with W. Duncan, D. Gameiro, M. Gameiro, T. Gedeon, H. Kokubu, H. Oka, B. Rivas, and E. Vieira.