

# Consistent Initial Values of DAEs: Looking for a General Purpose Method

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Differential-algebraic equations (DAE) contain natural and also hidden constraints. Therefore we can not require initial values for all components of the unknowns. But, how to formulate an IVP for DAEs?

The solution of an IVP for DAEs requires an initial value satisfying these constraints, so-called consistent initial values. The computation of consistent initial values for DAEs arising e.g. from circuit simulation or discretization of PDEs with constraints contains all difficulties we are facing when solving problems numerically, like high dimension and nonlinearities.

Up to now there does not exist a fast robust universal algorithm to compute consistent initial values for DAEs with arbitrary index. An overview discussing the advantages and disadvantages of the different index theories (differentiation, strangeness, structural, tractability, ...) and using them to compute consistent initial values will be presented.

Examples escort the lecture to illustrate why the computation of consistent initial values represents a real numerical challenge.