Solvability analysis of delay differential-algebraic equations

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Delay differential equations (DDEs) arise in a variety of applications, including biological systems and electronic networks. If the states of the physical system are constrained, e.g., by conservation laws or interface conditions, then algebraic equations have to be included and one has to analyze delay differential-algebraic equations (DDAEs).
In this talk, we study the solvability analysis of linear time invariant delay differential-algebraic equations. We propose algorithms that explicitly read off underlying delay differential equations, and also all hidden constraints. The constructed condensed forms are used to address structural properties of the system like solvability, regularity, consistency and smoothness requirements.