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A differential algebraic approach of systems theory

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Differential algebraic geometry (and differential algebra) [1,2] was earlier recognized as particularly adapted as a language for the description of some of the systems theory problems. See the pioneering works by Jean-François Pommaret [3] and Michel Fliess [4]. In the latter paper the notion of invertibility, which was long studied in the control literature, was given a better clarification. And in the [5] differential algebraic elimination theory was invoked as, not only a better description of questions in the control literature, but a constructive answer, too. One of the fundamental notions of systems theory, that of observability, was also given a differential algebraic geometry description which clarified many aspects of that questions [6]. This contribution is a tentative comprehensive expose of differential algebraic geometry known answers to some of the systems theory questions. The latter include previously mentioned ones, and notions of invariants, structural issues, and constructivity.

Keywords
Systems theory, Nonlinear systems, Differential algebraic geometry

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