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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.

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