An introduction to the moment approach for optimal control

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This tutorial talk is devoted to the moment/sum-of-squares approach, which provides a general framework for global optimization of many problems, including optimal control.

In the first part of the talk, we will review the philosophy of the approach on the problem of global minimization of a polynomial function, for which the user-friendly GloptiPoly toolbox is readily available. The focus will therefore be on introducing the mathematical tools and the elegant transformations that are used behind the scene by the software: transformation of the original problem into a linear problem on measures, then manipulation of those measures by their moments to obtain tractable semi-definite relaxations.

The second part of the talk will show how to extend the approach for functional optimization problems such as optimal control. Measures arise quite naturally in this context, and the moment approach is therefore well suited to tackle those problems fruitfully. This will be shown on the two examples of bounded and impulsive control problems.