

## Multidimensional BIBO Stability and Jury's Conjecture

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| FRI/P3<br>11:00–11:20 |
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We consider the linear partial differential equation  $P(\partial)y = Q(\partial)u$ , where  $P$  and  $Q$  represent differential operators, and  $u$  and  $y$  are interpreted as input resp. output. An output corresponding to a Dirac impulse as input is called a fundamental solution or impulse response of the equation. By means of an impulse response, one can construct via convolution an output to any given input with left bounded support. A partial differential equation is BIBO (bounded input – bounded output) stable, if to any bounded input the output obtained via the impulse response is bounded as well.

In this talk the unique impulse response in the space of distributions with left bounded support is presented and a criterion for BIBO stability of equations with proper transfer function  $H = Q/P$  is introduced. This criterion, which can be checked algorithmically by means of cylindrical algebraic decomposition, is a generalisation of a conjecture E.I. Jury stated in 1986 [1, Def. 6, Th. 23, and Remark] and which recently could be proved [3, 4] using the robustly stable polynomials investigated by V.L. Kharitonov und J.A. Torres Muñoz [2].

- [1] E. I. JURY: *Stability of multidimensional systems and related problems*. In: *Multidimensional Systems. Techniques and Applications* (S. G. Tsafestas, ed). Marcel Dekker, New York, 1986, pp. 89–159.
- [2] V. L. KHARITONOV AND J. A. TORRES MUÑOZ: Robust stability of multivariate polynomials. Part 1: Small coefficient perturbations. *Multidimens. Systems Signal Process.*, 10(1):7–20, 1999.
- [3] M. SCHEICHER AND U. OBERST: Multidimensional BIBO stability and Jury's conjecture. *Math. Control Signal Systems*, 20(1):81–109, 2008.
- [4] M. SCHEICHER: A generalisation of Jury's conjecture to arbitrary dimensions and its proof. *Math. Control Signal Systems*, 20(4):305–319, 2008.