POEMA

Meeting Type	***Online Learning Weeks***
Date	***01 July 2020***
Time	***16:00 – 17:30 CEST***
Talk	***Christoffel-Darboux Kernels***
Lecturer	***Edouard Pauwels (Institut de Recherche en Informatique de Toulouse)***
No of attendants	***50***

1. Questions during the course

- In slide 35 do you assume S is semi-algebraic ?
- If S is transcendental, then V is the whole space ?
- I am a Lasserre hierarchist and I am wondering whether we can use the stability result of slide 38 to quantify the distance between a given vector of pseudo-moments and the cone of genuine moments (for a given support) ?
- Please can we get a copy of that paper? → https://arxiv.org/abs/1904.01833
- How do you compute the minimum of Q? and the argmin?
- The convergence rate of page 45 is for whch optimization question exactly? distance of calculated (x,u) to the trajectory?
- What is the conditionning of the CD approach with respect to noise on moments ? (regular / singular)
- Heuristically speaking, the information conveyed by the approximate CD kernel defined using pseudomoments should be available also on the dual (SOS) side. Has this duality question been considered? If so, what is the "dual object" corresponding to the CD kernel? I am asking because inverting the pseudomoment matrix could cause issues, but perhaps working on the dual side can avoid this matrix inversion?
- So you regularize when it is singular?

Chat history:

- Didier Henrion to everyone: Usually we want to retrieve the graph of each individual component of x(t) or u(t), and hence if you sample in t and in one component of x or u, it is only a 2 dimensional grid over which you minimize the CD polynomial
- Giovanni Fantuzzi to everyone: Back to the argmin problem: for a multivariate problem, one could use nonlinear optimization routines. As far as I can tell the minimization of the approxiate CD kernel

is similar (perhaps related by duality?) to what was done in this paper to approximate unstable periodic orbits in ODE systems: https://arxiv.org/abs/1906.04001 In that work, nonlinear minimization worked reasonably well in practice for a 9-dimensional ODE. I don't know if this strategy can work in other cases, too.

- Didier Henrion to everyone: the CD polynomial is SOS by construction. We do not invert the moment matrix, we use eigenstructure computation. The moment matrix is normal, so eigenstructure computation is backward stable