THE UNIVERSITY   OF HONG KONG

Department of Mathematics

Numerical Mathematics and Applied Analysis Group Seminar (NMAA)

Lecture Series —

A numerical linear algebra framework for solving problems with multivariate polynomials

Lecture 2: The Macaulay matrix

Dr. Kim Batselier

Department of Electrical and Electronic Engineering, HKU

on Thursday, February 20, 2014 at 2:30pm
in Room 309, Run Run Shaw Building, HKU

Abstract

In this seminar we will extend the Polynomial Numerical Linear Algebra (PNLA) framework with the Macaulay matrix. This matrix plays a key role in many applications. Interpretations will be given for two of its fundamental subspaces: its row space and null space. The row space will be shown to be related to the concept of a polynomial ideal and naturally leads to the ideal membership problem. It will also be shown how a canonical basis for the row space can be obtained from computing intersections between subspaces. This canonical decomposition will play an important role for root-finding. The null space will be shown to contain the roots of a given multivariate polynomial system. In addition, we will discuss multiplicities of roots and a special shift property of vectors in the null space. This property will be exploited in the root-finding algorithm in the third seminar.

Biography:
Kim Batselier received his Master of Science degree in Electrical Engineering from the KU Leuven, Belgium in 2005. He then worked for BIORICS on the development of real-time monitoring algorithms that use system identification techniques to monitor professional football players during their training. This was in collaboration with Milan Lab, the research centre of AC Milan. In 2013 he obtained a Ph.D. degree at the STADIUS research unit of the Department of Electrical Engineering of the KU Leuven, under the supervision of Prof. Bart De Moor. Currently, he is a post-doctoral research fellow at The University of Hong Kong. His main research interests are numerical linear and polynomial algebra, systems theory, scientific computing and signal processing.

All are welcome