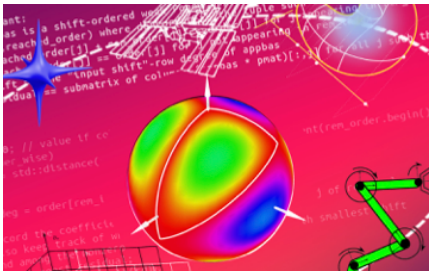

ID de Contribution: **36** Type: **Non spécifié**

Inverse kinematics with computer algebra and the Lasserre hierarchy by Didier Henrion. 14:00-15:00

mardi 24 octobre 2023 14:00 (1 heure)

The Inverse Kinematics (IK) problem consists of finding robot control parameters to bring it into a desired position under kinematics and collision constraints. We describe a global solution to the optimal IK problem for a general serial manipulator with 7 degrees of freedom (7DOF) with revolute joints. Classical modeling yields a polynomial optimization problem with constraints of degree four. A direct application of the moment-SOS (sums of squares) aka Lasserre hierarchy generates semidefinite optimization problems which are too large for state-of-the-art numerical solvers. Using computer algebra (Groebner basis computations), we show that the kinematic constraints due to rotations can all be generated by degree two polynomials. On this reduced problem, we demonstrate that the second relaxation of the Lasserre hierarchy is sufficient to solve the 7DOF IK problem on a KUKA LBR IIWA manipulator and we show that we are able to compute the optimal IK or certify infeasibility in 99% of the tested poses. This is joint work with Pavel Trutman (Prague), Tomas Pajdla (Prague) and Mohab Safey El Din (Paris).