Interval Analysis and Robotics

Jean-Pierre Merlet

Institut National de Recherche en Informatique et Automatique (INRIA)
BP 93
06902 Sophia-Antipolis Cedex, France
Jean-Pierre.Merlet@sophia.inria.fr

Robotics is a field in which numerous linear and non linear problems are occuring. The unknowns of these problems have a physical meaning and roboticians are usually interested only in solutions within restricted bounds. Furthermore dealing with uncertainties is unavoidable as any robot is a controlled mechanical system with manufacturing and control errors. Hence interval analysis is a tool of choice for solving many problems in robotics and managing uncertainties while providing certified answers (the reliability of the result is very often a critical aspect, for example in medical robotics). In this talk we will exemplify how interval anlysis may be used to efficently solve systems of equations appearing in the geometrical modeling of robots, to check the regularity of parametrized interval matrices that is required for singularity analysis and to design robots so that their performances will meet pre-defined requirements whatever are the manufacturing errors of the real robot within reasonable ranges.