Parareal type algorithms for optimal control

Salomon Julien*
INRIA Paris
julien.salomon@inria.fr

Abstract

Part I. In the first part of this lecture, I will recall basics on the Parareal algorithm and discuss how its principles can be used to design efficient time-parallelized solvers for optimality systems. The precise formulation of these "ParaOpt" procedures will be derived from a standard Newton fixed-point iteration. I will then focus on the analysis of convergence of the method. Applications to specific example will conclude this part.

Part II. In the second part of this lecture, I will focus on the itermediate state method (ISM). This approach specificaly tackles optimal control problems associated with (L^2-)norm preserving models such Schrödinger or Bloch equations. On the contrary to the Paraopt approach, the optimization method can be chosen arbitrary since it only enters as an inner loop of ISM. After having presented the general principle of this method, I will discuss its convergence analysis. I will complete this presentation with some examples in quantum chemistry and physics.