THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

Optimization and preconditioning: TPDv algorithms for nonlinear PDEs

By

Prof. Ruchi GUO
The Chinese University of Hong Kong

Abstract

In physics and mathematics, a large class of PDE systems can be formulated as minimizing energy functionals subject to certain constraints. Lagrange multipliers are widely used for solving these problems, which however leads to minmax optimization problems, i.e., saddle point systems. The development of fast solvers for saddle point systems, especially the nonlinear ones, is particularly difficult in the sense that (i) one has to consider the preconditioning in two directions and (ii) the preconditioners have to evolve in iteration due to the nonlinearity.

In this work, we introduce an efficient transformed primal-dual (TPD) algorithm to solve the aforementioned nonlinear saddle point problems. We prove the optimal convergence in terms of the condition number. We apply the algorithm to a nonlinear Maxwell equation and show that it is much more efficient than some traditional fixed point and projected gradient descent algorithms.

Date   : **06 June 2024 (Thursday)**
Time   : **1:30p.m.-2:30p.m.**
Venue : **Room 5506 (near Lift 25/26)**

All are Welcome!