An Algorithm for the Study of the Parameter Dependence for PDEs

Monica Gamba, Gianni Arioli, Nicholas Tarabelloni
Politecnico di Milano, Italy

We introduce a new technique for computing the explicit dependence of the result of the numerical solution of a PDE with respect to one or more parameters. The method is intrusive, but it relies on an automatic differentiation algorithm, therefore it requires minimal modifications of the code used for the plain numerical integration. We present an example of application to the study of the shock tube, that is Euler's system of equations with discontinuous initial conditions, and the aerodynamics of an airfoil of variable geometry.