Certified Static Condensation Reduced Basis Element Method

D. B. P. Huynh¹, D. J. Knezevic², and A. T. Patera¹

Abstract: We propose a reduced basis element based on component mode synthesis for parametrized partial differential equations. We first construct a library of interoperable parametrized components relevant to some family of problems in the Offline stage, we then rapidly form and query parametric systems by connecting components at ports in the Online stage. The method is based on static condensation at the interdomain level, conforming "port" representation at the interface level, and reduced basis approximation of finite element bubble functions at the intradomain level. Rigorous, inexpensive *a posteriori* error bound at the system level is recovered from reduced basis error bounds at the component level and matrix perturbation analysis. We present numerical results for several model problems in heat transfer, elasticity and acoustic.

Department of Mechanical Engineering Massachusetts Institute of Technology
77 Massachusetts Avenue, Cambridge, MA 02139, USA huynh@mit.edu, patera.mit.edu

 ² Harvard Institute for Applied Computational Science Harvard University
Pierce Hall, 29 Oxford Street, Cambridge, MA 02138, USA *dknezevic@seas.harvard.edu*