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FULLY EQUILIBRATED STRESS RECOVERED FIELD FOR ERROR BOUNDING

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Abstract. In this communication, we present a stress recovery technique based on the Superconvergent Patch Recovery (SPR) technique, for linear elasticity problems, solved within the framework of the Finite Element Method (FEM). This work pretends to investigate the application of recovery techniques that provide statically admissible stress fields.

Several error estimator techniques that provide upper bounds in energy norm are available, most of them based in equilibrating residuals, which do not always provide good accuracy levels. Furthermore, engineers prefer to use recovery techniques, because they are robust, easy to implement and provide a higher accuracy. In all cases the difference between a kinematically admissible field, i.e. the raw FE solution, and a statically admissible stress field, i.e. our recovered solution, provides an upper bound of the true error. This result is relevant in order to obtain an overestimation of the exact error in energy norm, which guarantees a certain error level in our simulation.

Using a previously proposed approach we were only able to obtain nearly statically admissible stress fields, consequently, to ensure an upper bound some extra correction terms were added to the Zienkiewicz & Zhu (ZZ) error estimator. As these correction terms depend on the exact displacement error, only an approximation of the upper bound was obtained. By using these new results, the correction terms are not needed any more, and the ZZ error estimator naturally yields an upper bound of the energy error.

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