1067-65-652 **Ahmed A. Naga*** (anaga@math.wayne.edu), 1703 Star Batt Dr., Rochester Hills, MI 48309, and **Zhimin Zhang** (zzhang@math.wayne.edu), Department of Mahtematics, Wayne State Unversity, Detroit, MI 48202. *Applications of recovery techniques in finite element methods.*

Recovery techniques are postprocessing algorithms that reconstruct the numerical solution or its gradient. The real interest in using them boosted after the work of Zienkiewicz-Zhu in which they used gradient recovery to produce asymptotically exact error estimators. Such idea gained lots of interest in the scientific computing community. The idea is to produce a more accurate continuous gradient using the gradient of the finite element solution in what is now known as Superconvergent Patch Recovery (SPR). This raised the following question: why not the function values? Answering this question led us to the Polynomial Preserving Recovery (PPR) method in which the gradient is recovered using the finite element solution itself. Babuska, et al, showed that the ZZ error estimator, based on SPR, was the most 'robust" error estimator among the existing error estimators. The ZZ error estimator based on PPR was found to be at least as robust as the ZZ-SPR estimator. Recently, recovery techniques found their way in eigenvalue problems and in recovering second order derivatives. For example, it is possible to use the recovered gradient and/or recovered functions to enhance the computed eigenvalues. The "recovered" eigenvalues ultra-converges to the exact ones. (Received September 12, 2010)