A brief Report on the article "A Posteriori Error Analysis and Adaptive Finite Element Methods for Electromagnetic and Acoustic Problems "

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Last update: Tuesday 3rd January, 2012; my hope to get a time to come back to this useful article.

Abstract: The objective of this paper is to report some recent contributions for the author in adaptive finite element methods based on a posteriori error estimates initiated in Babušska, I., Rheinboldt, C. "SIAM J. Numer. Anal. 15, 736-754 (1978)" to resolve Maxwell singularities. A posteriori error estimates are computable quantities in terms of the discrete solution and known data that measure the actual discrete errors without the knowledge of exact solutions.

Several problems have been studied in the article. The first problem is the time-harmonic Maxwell equation in the bounded domain, that is, the time-harmonic Maxwell cavity problem. This problem is very interesting from the point of view that the solution of the time-harmonic Maxwell equations could have much stronger singularities than the corresponding Dirichlet or Neumann singular functions of the Laplace operator when the computational domain is non-convex or the coefficients of the equations are discontinuous.

The second problem concerns an adaptive perfectly matched layer technique for solving the time harmonic electromagnetic scattering problem with the perfectly conducting boundary condition.

The third considered problem is the time-dependent eddy current problems which involve discontinuous coefficients, reentrant corners of material interfaces, and skin effect.

The article under review is useful and deserves to be read.

Key words and phrases: a posteriori Error Analysis; adaptive Finite Element Methods; electromagnetic; acoustic Problems

Subject Classification : 78M10; 76Q05; 65N15; 65N30; 35Q60

some basic information

(Some information have been taken from the book of Monk [MON 03].)

- It is useful to refer to the reference [MON 03] for more understanding the finite element methods for Maxwell's equation.
- In 1873 Maxwell created the modern theory of electromagnetism with the publication of his Treatise on Electricityand Magnetism, in which he formulated the equations that now bear his name.
- These equations consist of two pairs of coupled partial differential equations relating six fields, two of which model sources of electromagnetism.

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