A NON-STANDARD POST-PROCESSING TECHNIQUE IN THE FINITE ELEMENT METHOD

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§1.1 INTRODUCTION

Often the principal purpose for which a partial differential equation is solved in practice is to obtain accurate values for a few physically important quantities. For instance in stress analysis, the values of stresses (i.e. derivatives of the solution) or stress intensity factors at a small number of critical sites in a structure are important design criteria. Decisions on whether a structure meets design and safety specifications are often made on the basis of these few quantities. Less is demanded of the mass of remaining solution information. It may be completely disregarded, or only examined qualitatively with a view to determining whether the solution is physically reasonable. These considerations suggest that some thought should be given to how these few specific quantities can be efficiently approximated.

In the finite element method the most straightforward way of obtaining approximations to solution values and derivatives is to directly evaluate the finite element solution or its derivative. However there are sometimes more sophisticated ways of "post-processing" the finite element solution than this. In this paper we shall discuss one such method. For a more detailed account than we are able to give here see [1] - [3]. The above straightforward post-processing technique of course has the advantage of being computationally fast. Let us note however, that since only a few quantities will usually ever need to be calculated, there is no real disadvantage in expending a modest amount of computational effort in any post-processing calculation.