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COMMENTS ON THE PAPER: STRESS WAVE PROPAGATION IN RECTANGULAR BARS†

THE author presents interesting results using the collocation or point matching technique. It may prove useful to list some additional references dealing with applications of the same technique in other fields of technology. The determination of cutoff frequencies, wave functions and attenuation constants of electromagnetic waveguides of arbitrary simply and doubly connected cross sections has been studied by several authors and the collocation technique has been used quite extensively [1–6]. Axial-shear vibrations of infinitely long cylindrical rods have also been studied by the collocation technique. Baltrukonis [7] deals with a star-shaped boundary given by the equation

$$S(r, \theta) \equiv r-(a+b\cos 4\theta) = 0.$$

The circle is one curve of the family. The first four eigenvalues were calculated and plotted in function of the dimensionless parameter b/a. When b/a approaches zero the boundary is circular, for which the exact solution is known. This study shows that, for the problem under consideration, the calculated eigenvalues depend rather drastically on the distribution of points. Furthermore, little or no convergence is demonstrated for as many as seven collocation points taken within an octant of the boundary.

Jain [8] has introduced a new criteria for the collocation procedure. In this procedure one requires that the error at adjacent matching points be equal in magnitude but opposite in sign. Furthermore, the error at the matching points must be larger than that at any other point. This technique seems to yield better results than the straight collocation method [9]. Convergence of the technique when applied in the approximate solution of linear and non-linear differential equations has also been treated in several papers [10–12].

In summary it seems that for extremely complicated cross sections, the stability of the straight collocation method is questionable but improvement is possible by adding some mathematical "constraints" such as the "extremal point collocation" [8], "least squares" fit; integration along boundary segments [13]; integration along internal segments [14, 15], etc.

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