SOLUTION OF A MIXED PROBLEM FOR A HYPERBOLIC DIFFERENTIAL EQUATION BY RIEMANN'S METHOD

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1. Introduction

This paper deals with a mixed initial and boundary value problem for a linear, hyperbolic partial differential equation of order n and with two independent variables. The values of the unknown function and its first $n-1$ normal derivatives are specified on an initial curve, and, in addition, the values of an appropriate number of normal derivatives are given on a boundary curve which intersects the initial curve. A solution of the differential equation which assumes the given initial and boundary values will be found by an extension of Riemann's well known solution of the initial value problem for a second order hyperbolic equation. The problem considered in the present paper is a special case of a mixed problem for which another method of solution has been given by Campbell and Robinson [2].

Hadamard [6, 7] adapted Riemann's method to deal with mixed problems for the second order equation. More recently, Bureau [1] and Durand [4] have treated mixed problems for second order equations by the same method. Rellich [9] has generalized Riemann's method to solve the initial value problem for linear, hyperbolic equations of order greater than two. In the present paper, a mixed problem for an equation of order greater than two is solved by an extension of the methods of Rellich and Hadamard. The complete existence proof will not be given here, but a method of obtaining the associated Riemann function will be outlined. A more complete proof is given in the author's thesis [3].