

*The Discrete Analog of a Minimum Problem in Conformal Mapping**

CHARLES R. DEETER & C. WAYNE MASTIN

Communicated by P. R. GARABEDIAN

1. Introduction In this paper it is shown that the solution of a minimum problem in the theory of conformal mapping can be approximated by discrete functions. Using these discrete functions, the Riemann mapping function can be approximated for a certain class of simply-connected regions (domains). It is also shown that the Bergman kernel function can be approximated, for certain regions, by using these discrete functions.

Discrete methods have been employed by Ferrand [3] to approximate the conformal mapping of a simply-connected region onto the interior of a triangle and by Lelong-Ferrand [4] to approximate the conformal mapping of a simply-connected region onto the interior of a rectangle. In both cases the mapping function was normalized by specifying the correspondence between sets of boundary points. Lelong-Ferrand also considered the problem of mapping multiply-connected regions.

The conformal mapping of a bounded simply-connected region onto the unit disk can also be obtained by solving a Dirichlet problem. The solution of the Dirichlet problem can be approximated by discrete functions provided the boundary of the region is sufficiently smooth.

There does not appear to be any previously known discrete method for approximating the Bergman kernel function. The Bergman kernel function can be used to obtain solutions to certain interpolation problems.

The main result in this paper is the development of a sequence of discrete functions converging to the solution of a minimum problem. Additionally, there are results which bear on two other concepts: the convergence of discrete functions and the approximation of rational functions by discrete functions.

2. Properties of discrete analytic and discrete harmonic functions. As an introduction to the theory of discrete harmonic and discrete analytic functions,

* This work was partially supported by Texas Christian University Research Foundation Grant No. M6891.