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# Solution to the Dirichlet problem for an infinite strip domain with holes

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**ABSTRACT**
The aim of this work is to develop the method of functional equations to boundary value problems for a strip with mutually disjoint circular holes. The boundary of the strip domain, two parallel straight lines, is treated as two touching circles on the extended complex plane. The general algorithm is effectively implemented to computation of the local flux around holes.

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## 1. Introduction

Constructive solutions of two-dimensional boundary value problems for multiply connected domains are important in the theory of analytic functions and their applications to fibrous composites[1–5]. An extension of the Poisson formula for the unit disk [6] to exterior of the mutually disjoint disks gives a description of various mechanical fields in perforated domains[7,8]. The Riemann-Hilbert and $\mathbb{R}$-linear problems were solved for an arbitrary circular multiply connected domain in terms of the generalized uniformly convergent Poincaré series for the classic Schottky groups by the method of functional equations[10,11]. This approach is equivalent to application of the generalized Schottky-Klein prime function since its second derivative coincides with the generalized Poincaré series[10,11]. In particular, Poisson's-type formula (Schwarz's operator) was exactly written in [10].

The method of functional equations is valid for non-overlapping and touching circles. A general theoretical scheme for the application of the method of functional equation to strips and to rectangles with holes was described in [13], where two parallel straight lines were considered as two touching circles in the extended complex plane. Application of the conformal mappings was used to extend the method to a half-plane with holes[12]. The boundary of the half-plane is a straight line treated in complex analysis as a circle.

In the present paper, we develop the method of functional equations [10,13] to a strip domain with mutually disjoint circular holes. Using the successive approximation method,

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