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SOLVING WIENER-HOPF EQUATION INVOLVING XOR-OPERATION

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Abstract. In this study, we explore a novel application of the Wiener-Hopf equation by incorporating the XOR-operation. Our findings reveal that the Wiener-Hopf equation involving XOR-operation is mathematically equivalent to a variational inequality problem. To solve this equation, we propose an iterative algorithm specifically tailored for XOR-based Wiener-Hopf equations. By utilizing the Bounded Inverse Theorem, we successfully obtain the solution. Furthermore, we discussed the convergence criteria associated with this approach.

1. Introduction

The Wiener-Hopf method is a well-established mathematical technique that finds extensive applications in applied mathematics. It is particularly useful for solving two-dimensional partial differential equations with mixed boundary conditions on a shared boundary. The introduction of Wiener-Hopf equations can be attributed to Robinson [21] and Shi [26, 27], who initially employed them in specific contexts. These equations are employed in various scenarios to analyze the properties of solutions for different classes of variational inequalities and their extensions.

Variational inequalities find applications in a wide range of fields, including fluid flow through porous media, moving boundary value problems, traffic assignment problems, optimization problems, economic equilibrium and more. For detailed information on variational inequalities and Wiener-Hopf equations, one can refer to works such as [1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 22, 23, 24, 25] and the references provided therein.

In logic, there exists a connective called 'exclusive or' also known as exclusive disjunction. It evaluates to true when exactly one (but not both) of two conditions is true. The XOR operation often represented as $\oplus$ is used

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