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On Unique Solvability and a Generalized Newton Method for Solving New General Absolute Value Equations

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Abstract: In this paper, we consider some sufficient conditions to guarantee the unique solvability of the new general absolute value equations (NGAVE), $Ax-|Bx| = b$, ($A,\ B \in \mathbb{R}^{n\times n}$, $b \in \mathbb{R}^n$). Besides Picard's iterative method for solving the NGAVE, a generalized Newton method is also proposed for solving the NGAVE. Moreover, under suitable assumptions, we show that the proposed methods are globally linearly convergent. We also report some numerical results of the proposed method for solving the NGAVE, which show the efficiency of our proposed methods.

Keywords: *absolute value equations; Picard's iterative method; generalized Newton method; global convergence.*

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1 Introduction

In this paper, we consider new general absolute value equations (abbreviated as NGAVE) of the type

$$Ax - |Bx| = b, \tag{1}$$

where $A, B \in \mathbb{R}^{n\times n}$ are given matrices, $b \in \mathbb{R}^n$, and $|Bx|$ is a vector whose i-th entry is the absolute value of the i-th entry of Bx. If $B = I$ is the identity matrix, then the NGAVE (1) can be reduced to the type

$$Ax - |x| = b. \tag{2}$$

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