Nonlinear Dynamics and Systems Theory, **19** (1-SI) (2019) 193–199

A Recursive Solution Approach to Linear Systems with Non-Zero Minors

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Received: June 3, 2018; Revised: February 4, 2019

Abstract: In this paper, we introduce a recursive solution approach to linear systems of the form $Ax = b$, where A is non-singular and its corner minors are all non-zero. For the first time in the literature, we show how one can exploit (possible) useful information provided by corner sub-matrices of A towards an efficient solution approach to the linear system. This is going to initiate a thorough study of solution methods whose goals are to fully exploit available information within the given linear system.

Keywords: *linear system of equations; corner minors; matrix inversion; recursive methods.*

Mathematics Subject Classification (2010): 15A06, 15A09.

1 Introduction

The problem of solving a linear system $Ax = b$ is central to scientific computation [1], a subject which is used in most parts of modern mathematics. Computational solution methods of such system are often an important part of numerical linear algebra (see [2,3]), and play an important role in engineering, physics, chemistry, computer science, and economics [4]. Even more, systems of non-linear equations are often approximated by linear ones with the aim of linearization, a helpful technique while making a mathematical model or computer simulation of a relatively complex system. A reader interested in the applications of linear systems is referred to [4–7].

Iterative vs. direct solution methods for solving general linear systems have been gaining popularity in many areas of scientific computing [8, 9]. Until recently, direct

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