
Summary: Nowadays, certain problems in automata theory, manufacturing systems, telecommunication networks, parallel processing systems and traffic control are intimately linked with linear systems over tropical semirings. Due to non-invertibility of matrices – except monomial matrices – over certain semirings, we cannot generally take advantage of having the inverse of the coefficient matrix of a system to solve it. The main purpose of this paper is to introduce two methods based on the pseudo-inverse of a matrix for solving a linear system of equations over tropical semirings. To this end, under suitable conditions, we first reduce the order of the system through some row-column operational analysis. We then present a necessary and sufficient condition for the system to have a maximal solution. This solution is also obtained through a new version of Cramer’s rule for overdetermined system of equations. Finally, some illustrative examples are given to show the efficiency of the proposed methods, and Maple procedures are also included in the end.

MSC:
15A80 Max-plus and related algebras
15A06 Linear equations (linear algebraic aspects)
16Y60 Semirings
65F05 Direct numerical methods for linear systems and matrix inversion

Keywords:
tropical semiring; linear system; row-column analysis; pseudo-inverse; maximal solution

Software:
Maple

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References:

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