

## Construction of Sign k-potent Sign Patterns and Conditions for Such Sign Patterns to Allow k-potence

**Sriparna Bandopadhyay**

Indian Institute of Technology Guwahati, Assam, India

**Partha Rana**

Indian Institute of Technology Guwahati, Assam, India

### Abstract

A sign pattern is a matrix whose entries are from the set  $\{+, -, 0\}$ . A square sign pattern matrix  $A$  is called sign  $k$ -potent if  $k$  is the smallest positive integer for which  $A^{k+1} = A$ , and for  $k = 1$ ,  $A$  is called sign idempotent. In 1993, Eschenbach [2] gave an algorithm to construct sign idempotent sign pattern matrices. However, Huang [3] constructed an example to show that matrices obtained by Eschenbach's algorithm were not necessarily sign idempotent. In 2011, J.W. Park and S.S.Pyo modified Eschenbach's algorithm to construct all reducible sign idempotent sign pattern matrices. In this paper, we give an example to establish that the modified algorithm by Park et al. [4] does not always terminate in a single iteration, the number of iterations depending on the order of the sign pattern could be large. In this paper, we give a new algorithm that terminates in a single iteration to construct all possible sign idempotent sign patterns. We also provide an algorithm for constructing sign  $k$ -potent sign patterns. Further, we give some necessary and sufficient conditions for a sign  $k$ -potent sign pattern to allow  $k$ -potence.

### Keywords

Sign pattern matrices, sign idempotent patterns, sign  $k$ -potent patterns.

