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An Algorithm to Transpose Zero- One Matrix

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Abstract- This paper puts forward a method to transpose Zero- One matrix. Here, we combine the logical AND and logical OR operations to achieve the result.

Keywords: Zero-One Matrix, Matrix transpose

I. INTRODUCTION

In 2010, Sanil et al designed an algorithm for sequential data mining using correlation matrix memory [1]. We renovate the algorithm to transpose Zero- One matrix. A matrix with entities that are either zero or one is called a Zero- One matrix. The transpose of a matrix is obtained by interchanging the rows and columns.

Let M be a Zero- One matrix of size p x q. The transpose of M, denoted by M^T, is the q x p matrix obtained by interchanging the rows and columns of M. Boolean arithmetic is based on Boolean operations ∨ or ∧ which operates on pair of bits [2]. In this proposed method, we compute M^T by combining the characteristics of logical AND with logical OR operations.

II. ALGORITHM

In this method, the input binary matrix M of order p x q operates logical AND with reference matrix $D_{(i,j)}$, gives M^T with the cell values W_{ij}.

Step 1. Initialize the matrix M of order p x q .

Step 2. Create the reference matrix $D_{(i,\,j)}$, where

i=1,2…p and j=1,2,…q.

Step 3. Compute M^T with cell values

$$\sum_{i=1}^{p} W_{ij} \text{, where } j = 1,2, \ldots q$$

$$M^T \leftarrow M \ . \ D_{(i,\,j)}$$

Example

Consider the matrix of order p x q , where p = 3 and q = 6.

1	0	1	1	0	1
0	0	0	0	0	0
0	1	0	0	1	0

Let the reference matrix D(i,j) be

1	0	0
0	1	0
0	0	1

The input binary matrix M of order p x q operates logical AND with reference matrix $D_{(i,\,j)}$ gives M^T with the cell values W_{ij}.

1	0	1	1	0	1	∧	1	0	0
0	0	0	0	0	0	∧	0	1	0
0	1	0	0	1	0	∧	0	0	1

Logical AND

The value of W_{ij} can be computed as,

$$M^T \leftarrow M \ . \ D_{(i,\,j)}$$

This gives the transpose of the Zero- One matrix M of size p x q as the output, that is M^T with order q x p (q = 6, p = 3)

1	0	0
0	0	1
1	0	0
1	0	0
0	0	1
1	0	0

III SUMMARY

A novel algorithm to transpose Zero- One matrix has been described in the paper. This technique can possibly be implemented to develop a way of research in Computational Science.

REFERENCES

[1] Sanil Shanker K P, Aaron Turner, Elizabeth Sherly and Jim Austin, *Sequential Data Mining Using Correlation Matrix Memory*. International Conference on Networking and Information Technology (ICNIT), 2010, Manila, IEEE Xplore, (June 2010) 470- 472.

[2] Stephen Warshall, *A Theorem on Boolean Matrices*. Journal of the ACM. Volume 9 Issue 1, Jan. 1962 Pages 11-12.