**Algorithm for finding the all possible solutions for a given set of linear equations**

***Premise:***

Given condition AX=Y, where A is pxn size, Y is px1 size and X is nx1 size, as we see the problem for the given matrices is that there are infinite real solutions for X matrix variables, so we find the finite set of solution set by closing Y matrix variables to non-negative integers only.

A=[v11 v12…v1n

v21 v22…v2n

… … … …

vp1 vp2…vpn]

X=[x1 x2 x3... xn]T

Y=[ y1 y2 y3... yn]T

***Step 1:***

We generate remaining (n - p) no of equations for matrix A and (n - p) set of values for Y matrix by sequentially setting where set values for vij= {0,1} as the node path retracing is considered improbable for vij > 2 which is not the case.

v(p+1)1 v(p+1)2…v(p+1)n

v(p+2)1 v(p+2)2…v(p+2)n

….

vn1 vn2…vnn

Also for each set of (n-p) set of solutions for vij we find all the combinations of integer solutions for Y, as the delay can be approximated as integers.

The possible set values for yp y(p+1) ... yn = {1, 2,..Ymax} , the yi > 0

Ymax = max , , … }

Where is the no of non-zero variables for ith row in the X matrix.

***Step 2:***

Once the transformed matrices are populated to At (size nxn) and Yt (size nx1) matrices respectively, we use the Cramer’s rule to find the X matrix values satisfying conditions At matrix is non-singular and xi 0 .