Network Efficiency – Optimized Automaton Approach

K. Thiagarajan,
Department of Mathematics,
PSNA College of Engineering and
Technology,
Dindigul, India

N. Subashini,
Department of Mathematics,
SRM University,
Chennai, India

M. S. Muthuraman,
Department of Mathematics,
PSNA College of Engineering and
Technology,
Dindigul, India

Abstract—**A sperner's grid is thought of a finite state system, where in the model gives rise to an optimal network through characterization of paths .the automation graphs of the various states gives rise to different groomable light paths in network.**

Keywords—Automaton; Network; Efficiency; Characterization

I. INTRODUCTION

In recent years with the use of different kinds of communication, the network has gained popularity. Automaton traffic engineering is an effective solution to control network conjestion. Automaton traffic engineering comprises of scientific principles thus providing optimal characterization in network.

A network is represented by a set of nodes, inks between the nodes interconnecting them Destination nodes refer to traffic entering or leaving a node, transit nodes refer to nodes were no traffic can enter or leave the node.

A. Network via Automata

A finite state system represents a mathematical model of a system with certain input. The model finally gives a certain output. The input given to the machine is processed by various states; these states are called intermediate states. This intermediate state leads to final state.

A finite state Automata or simply a network consists of directed graphs composed of states and arcs. We start with a single initial state and could have any number of final states. A path is observed as a sequence of arcs or links from start state to final state.

B. Network through Directions

Consider a directed graph as D= (V (D), X (D),χ_D),Consisting of nonempty set V (D), X (D) being disjoint from V (D) and χ_D a function which associates V (D) and X (D). The set V (D) is called the vertex set of D and X (D) its link set Elements of V (D) are taken as nodes of D and elements of X (D) are called links of (D).
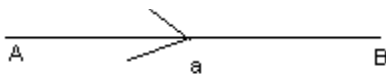
a= (A, B) is a link of directed graph D then 'a' is said to join A and B. We consider only links through directions.
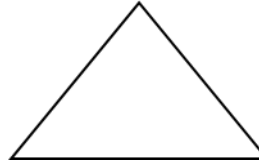
Consider a network as a triangular grid having nodes 0, 1, 2. Nodes could be taken within this grid. We consider only one node taken inside this grid. This single node can be either of 0, 1 or 2. In this paper we consider a single node within the grid. Considering a node within the grid, then the edged would be in order 0-1, 1-2, 2-0. We consider '0' as a single node taken inside the grid, the direction 0 to 1 is taken as traffic in and 1 to o as out traffic. Similar aspects could be thought with regards to the other two namely 1 and 2. Edges with similar nodes are taken as ignored links.

If 'n' is the number of nodes taken on the side of triangular grid having end nodes 0 and 1, the number networks having 010 is 2n+1, the number of nodes having nodes 01010 is 'n' and the number having nodes 0101010 is (n-1).

The maximum of 3 would exits as combination of 01, as we consider a triangular grid. Considering 010, 01010, 0101010 we would have a graph of P_2, P_4, and P_6 where P_K refers to directions in the graph K being even. Finite Automaton is obtained for each of the graphs of 010, 01010, and 0101010. The finite automaton associated with a directed graph is called a transition graph. The vertices of the graph correspond to the states.

C. Nomenclature

q_i- State
α- Number of directions towards the starting node of a path
C-Total number of networks
S- Number of directions towards the ending. Node of a path
$\bar{p}$ - Efficiency

D. Note

1) Efficiency the ratio of the number of directions, towards the starting node with respect to the different between the total number of the networks of networks and number of directions, towards the ending node of the path .
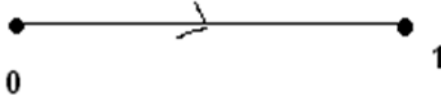
2) Self loops are considered as ignored only in graphical representation self looping is considered in state diagrams.
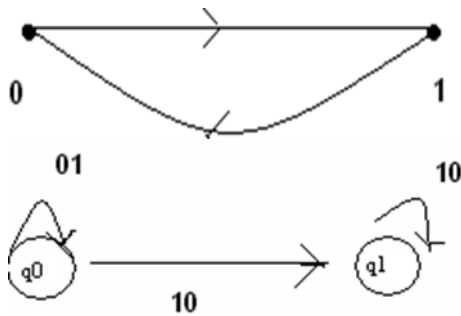
II.   GENERATION AND EFFICIENCY OF 010 NETWORK
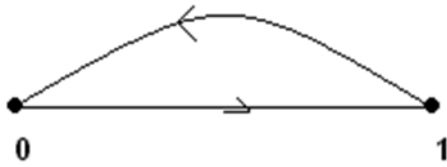
The automation for the above graph has the starts q_0, q_1 as described below

A.   State-q_0

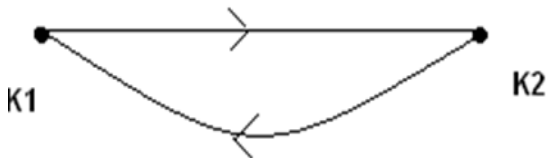q_0 is the initial state infers the path 0 to 1 & is in itself under 01

B.   State-q_1

q_1 is the state inferring 1 to 0 under the state q_0. Thus q_0 goes to q_1 under 10

$$\begin{array}{c} \\ q_0 \\ q_1 \end{array}\begin{array}{cc} 01 & 10 \\ \begin{pmatrix} q_0 & q_1 \\ --- & q_1 \end{pmatrix} \end{array}$$

q_0 goes to itself under 01 & q_1 is in itself under 10

K1 represents the node 1 & K2 represents the node 0
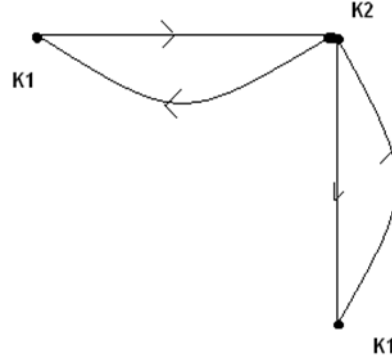
C.   Characterization of the path K2 to K1
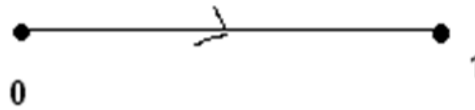
C=2

α→K2 = 1

S→ K1 = 1

$\overline{p} = 1$

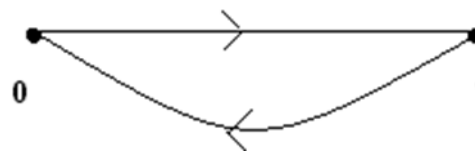## III.   GENERATION AND EFFICIENCY OF 01010

K1 represents 1; K2 represents 0; K3 represents 1 the above graph represents 0 to 1; 1 to 0 & 0 to 1 & 1 to 0 thus giving the networks 01010. The automation for the above graph has the states q_0, q_1, q_2, and q_3.
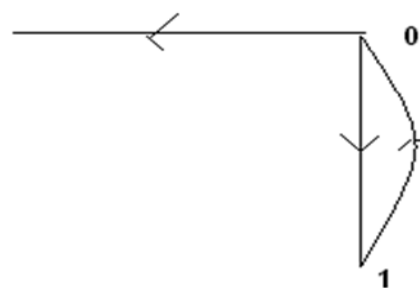
A.   State-q_0

q_0 is the initial state infers the path 0 to 1 and is in itself under 01.
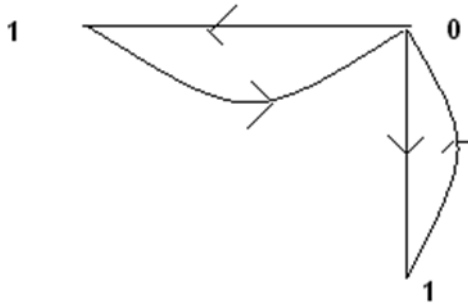
B.   State-q_1

q_1 is the state inferring 1 to 0 under the state q_0. Thus q_0 goes to q_1 under 10, q_1 remains in itself under 10.

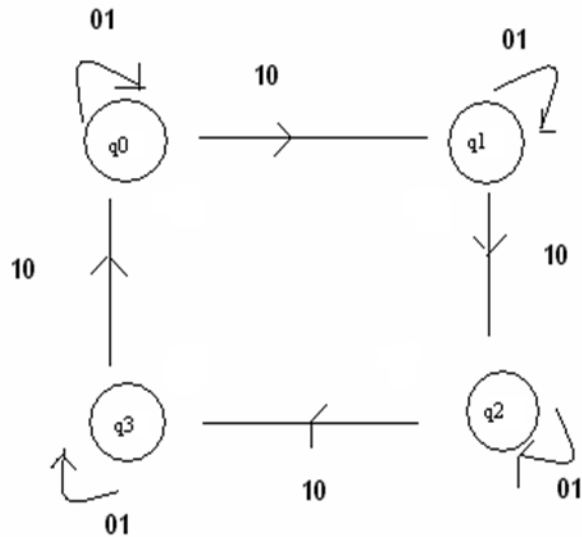### C.   State-q_2

q_2 is a state inferring 0 to 1 under the state q_1, thus q_1 goes to q_2 under 01, q_2 remains in itself under 10.

D. State-q₃

q₃ is the state inferring 1 to 0 under the state q₂, Thus q₂ goes to q₃ under 10,q₃ remains in itself under 10.

The matrix of the states with regards to the path 01&10

$$
\begin{array}{c}
\\ q_0 \\ q_1 \\ q_2 \\ q_3
\end{array}
\begin{array}{cc}
10 & 01
\end{array}
\left(
\begin{array}{cc}
q_0 & q_1 \\
q_1 & q_2 \\
q_2 & q_3 \\
q_3 & q_0
\end{array}
\right)
$$

Efficiency of the network 01010

C=4

E. Characterization of the path K1 to K2

C=4

α➔K1 =2

S➔ K2=2

$\overline{p} = 1$

F. Characterization of the path K2 to K3

C=4

α➔K2 =2

S➔ K3=2

$\overline{p} = 1$

G. Characterization of the path K2to K1

C=4

α➔K2 =2

S➔ K1=2

$\overline{p} = 1$

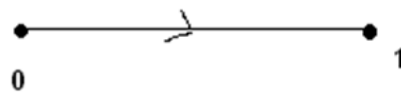*H. Characterization of the path K3to K1*

C=4

α➔K3 =2

S➔ K1=2
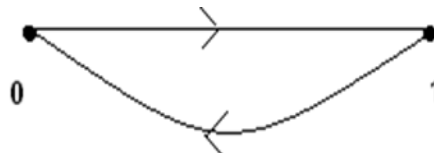
$\overline{p} = 1$
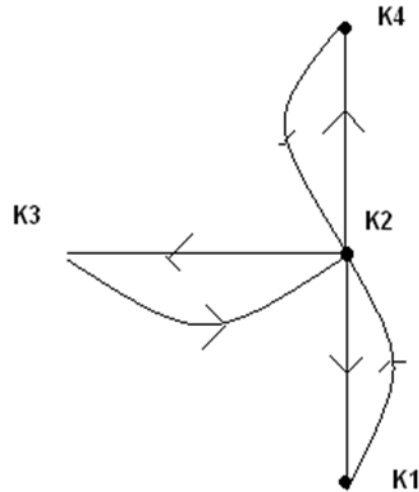
IV. GENERATION AND EFFICIENCY OF 0101010 NETWORK

K1 Represents 1; K2 represents 0; K3 Represents 1; K4 Represents 1.The automation for the above graph has the states q₀, q₁, q₂, q₃, and q₄.
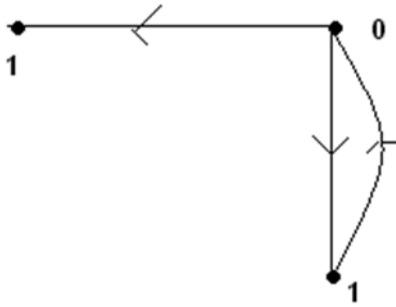
A. State-q₀

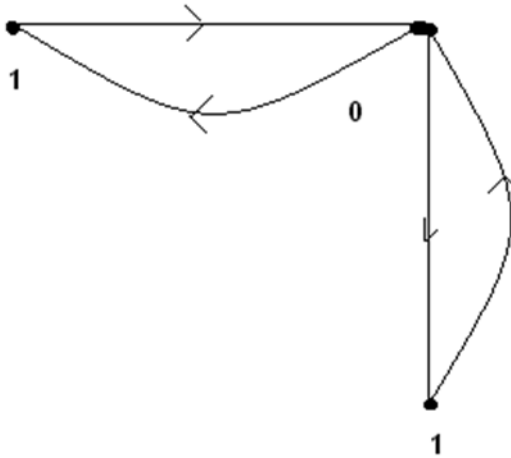q₀ is the initial state infers the path 0 to q₀ is in itself under 01.

B. State-q₁

q₁ is the state inferring 1 to 0 under the state q₀. Thus q₀ goes to q₁ under 10, q₁ remains in itself under 10.
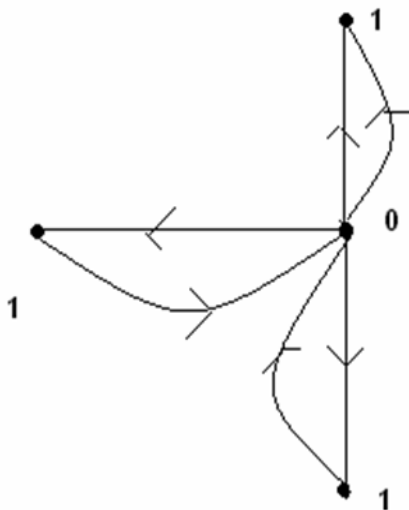
C. State-q_2

q_2 is a state inferring 0 to 1 under the state q_1, thus q_1 goes to q_2 under 01,q_2 remains in itself under 10.
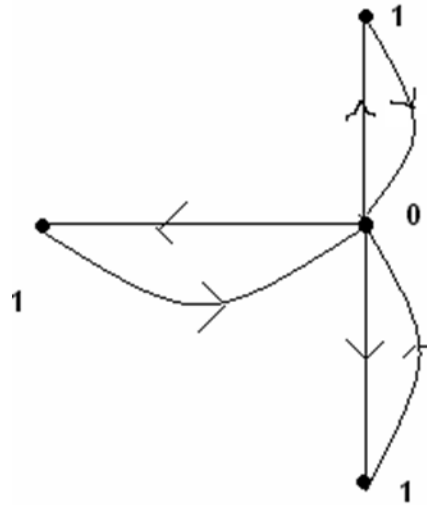
D. State-q_3

q_3 is the state inferring 1 to 0 under the state q_2, Thus q_2 goes to q_3 under 10,q_3 remains in itself under 10.

E. State-q_4

q_4 is a state inferring 0 to 1 under the state q_3, thus q_3 goes to q_4 under 01,q_4 remains in itself under 10.

F. State-q_5

q_5 is a state inferring 0 to 1 under the state q_4, thus q_4 goes to q_5 under 01.q_5 remains in itself under 10.

The matrixes of the states are as fallows

$$
\begin{array}{c}
 \\
q_0 \\
q_1 \\
q_2 \\
q_3 \\
q_4 \\
q_5
\end{array}
\begin{array}{cc}
01 & 10 \\
\left(\begin{array}{cc}
q_0 & q_1 \\
q_1 & q_2 \\
q_2 & q_3 \\
q_3 & q_4 \\
q_4 & q_5 \\
q_5 & q_0
\end{array}\right)
\end{array}
$$
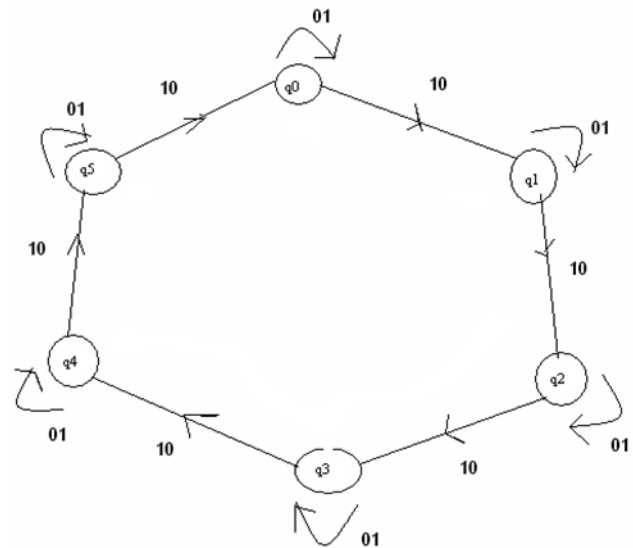
Efficiency of the network   0101010

G. Characterization of K1 to K2

K2 to K1
K3 to K2
K2 to K3
K2 to K4
K4 to K2

C=6

$\alpha \rightarrow K1=3$

$\alpha \rightarrow K2=3$

$\alpha \rightarrow K3=3$

$\alpha \rightarrow K4=3$

$S \rightarrow K1=3$

$S \rightarrow K2=3$

$S \rightarrow K3=3$

$S \rightarrow K4=3$

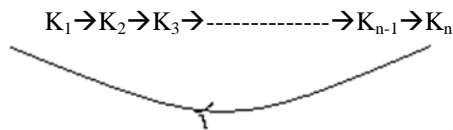*H. Characterization of K1 to K2*

K2 to K1

K3 to K2

K2 to K3

K2 to K4

K4 to K2

In the of the above case we obtain $\overline{p} = 1$

I. Result

We observe from the automation of the graphs 010; 01010; 0101010 the state q_i ; i=1,2,3,4 goes to q_i+1

In the Graphical representation we observe

$$K_1 \rightarrow K_2 \rightarrow K_3 \rightarrow -------------- \rightarrow K_{n-1} \rightarrow K_n$$

In general $K_i \rightarrow K_{i+1}$ under the path 01

V. CONCLUSION

We observe that in the graphical representation of the graphs 010; 01010; 0101010; we observe in the characterization of the path K_1 to K_2 & K_2 to K_1 efficiency is 1.In the graphical representation of 01010 & 0101010 we observe the characterization of the path K_2 to K_3 & K_3 to K_2 the efficiency is 1.Both the networks are of the source and destination groom able light paths, Wherein the termination is at the node 0 & could be routed towards other nodes, & can also originate from other nodes. When we consider efficiency we observe that destination is at the node 0 & 1 according to the consideration of the path automata is applied to paths of a network there by giving ideas for better groom ability

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AUTHORS PROFILE

K. Thiagarajan completed his Ph.D from University of Mysore. He is currently working as Associate Professor in the Department of Mathematics, P.S.N.A.College of Engineering and Technology, Dindigul, Tamilnadu, India. He has totally 18 years of experience in teaching. He has attended and presented research articles in 37 National and International Conferences and published one National journal and more than 50 International journals, Currently he is working on Big Data and web mining through automata and set theory. His area of specialization is 'Coloring of Graphs and DNA Computing.

Ms. R. Subashini have completed M .sc, B Ed, M phil. and she is having 10 years teaching experience in various engineering colleges. Currently she is working as a Assistant Professor in Department of Mathematics at SRM University, Kattankulathur, Chennai. She have Participated and presented two papers in national and international conferences at SRM and Sathyabama university. Currently she is working in optimization of networks.

M.S.Muthuraman (B.Sc., M.Sc., M.Phil., in Mathematics)is currently working as an Associate Professor ,Department of Mathematics, PSNA College of Engineering and Technology,Dindigul, Tamilnadu, India. He is the author of 25 papers published in reputed journals and in proceedings of conferences, with many references from other researchers. His interests include Fuzzy Algebra, Discrete Mathematics.