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Mathematical Modeling on Network Fractional Routing Through Minimization of Finite Automata

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Abstract- A Minimization of Finite Automata is one of the most important optimization techniques to help Decision Making in Network. A Minimization of DFA problem calls for optimizing linear functions of variables called objective function. The objective function minimizes the total outflow from source node to sink node. I will prove fractional routing capacity for some solvable networks using Minimization of Finite Automata.

Keywords- capacity, flow, fractional routing, Finite Automata.

I. INTRODUCTION

The maximum flow problem can be solved by Minimization of DFA. A **Deterministic Finite Automata** consists of 5 symbols. L (M) = (Q, Σ, δ, q_0, F) where. Q is a finite set of states, Σ is an Input alphabet, δ is the transition function from one state to another state, q_0 is the initial state, and F is a final state. A DFA is represented by directed graph called State Diagram. The Node represents the State. The Arc labelled with an input Alphabet that shows the transition. The starting state is an initial state. Double circle denoted by Final State. All the variables are nonnegative. Network Fractional Routing has been proved to be an effective technology in solving network information flow problem, for each source nodes, the messages it transmits through intermediate nodes to target nodes through edge set. For each target node, the message it requires is a subset of messages from source nodes. The intermediate nodes can not only duplicate and forward messages they receive from in-edges, but also use mathematical functions to compute these messages before forwarding them. If I can find a set of Finite Automata functions which help satisfy all target nodes, then this network is solvable and found a solution for it. If output message of each intermediate node is one of its incoming messages, then it called as Routing Solution.

II. RELATED WORK

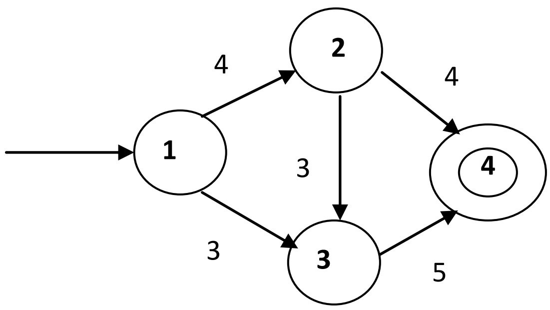

Fig. 1. Transition Diagram

Let Q = {1,2,3,4} where Q is a set of States.

∑ = {3,4,5} where ∑ is an Input Symbols.

Where δ is the Transition Function. δ (1,4) = 2, δ (1,3) = 3, δ (2,3) = 3, δ (2,4) = 4, δ (3,5) = 4

q_0 is the initial state where q_0 = {1}

F is the Final State where F = {4}

δ : Q X ∑ -> Q where δ is the Transition Function from one state to Another State.

III. PROPOSED ALGORITHM

Step 1: Select the path from initial state to Final State with positive flow using Transition Diagram.
Step 2: Find the Transition Table from the Transition Diagram.
Step 3: Find the Equivalent States from Transition Table.
Step 4: Consider every state pair (Q_i, Q_j) in the Transition Table where Q_i belongs to F and Q_j is not belongs to F.
Step 5: Merge the Equivalent States except Starting Node and Final Node.
Step 6: Finally, the Minimization of Automata are optimal solution is also called a Minimized Deterministic Finite Automata.

IV. FRACTIONAL ROUTING EXAMPLE

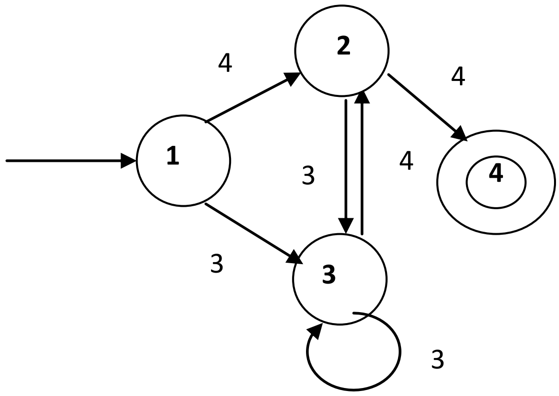

Fig. 2. DFA Diagram

Step 1:

Q = {1,2,3,4} where Q is a set of States.

∑ = {3,4,5} where ∑ is an Input Symbols.

Where δ is the Transition Function. δ (1,4) = 2, δ (1,3) = 3, δ (2,3) = 3, δ (2,4) = 4, δ (3,3) = 3, δ (3,4) = 2,

Step 2:

Input / States	3	4	5
→1	{3}	{2}	Φ
2	{3}	{4}	Φ
3	{3}	{2}	Φ
4	Φ	Φ	Φ

Step 3:

Equivalent States are {1,3}

Input / States	3	4	5
→{1,3}	{3}	{2}	Φ
2	{3}	{4}	Φ
4	Φ	Φ	Φ

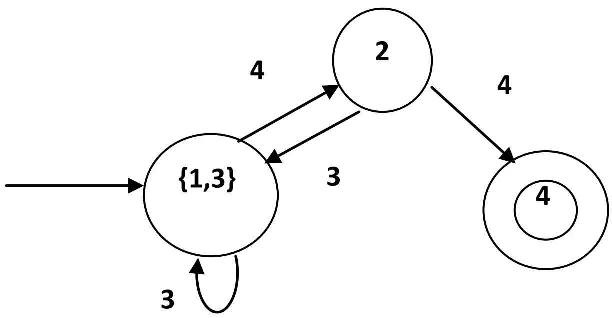

Fig. 3.Minimization Finite Automata

The Maximum Flow = 4 + 3 = 7

The value of the Maximum flow is equal to the total outflow from source node or the total inflow from the sink node. The meaningful objective of this problem is to determine the maximum flow of fluid form a given source node to a given destination node.

V. RESULT AND DISCUSSION

Fractional Routing = Flow / Capacity

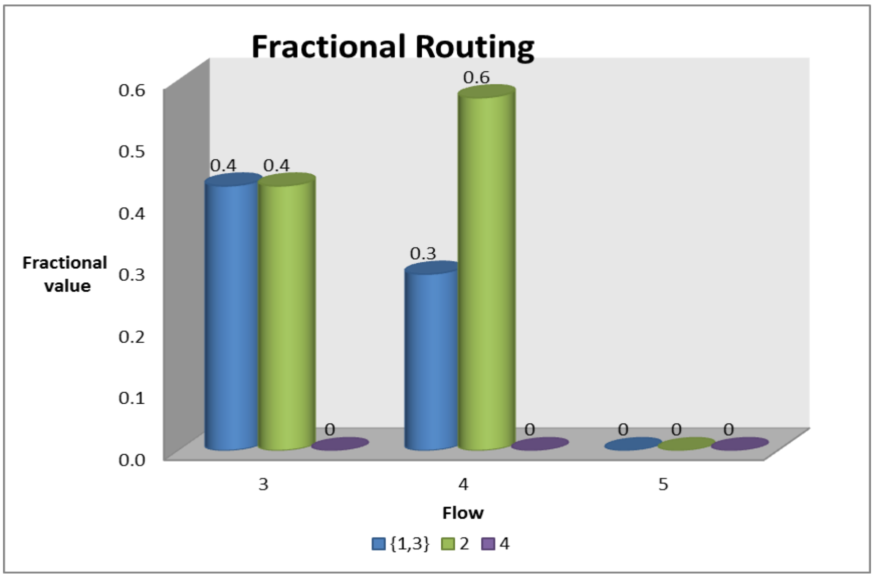

Fig.5. Network Fractional Routing

The fractional Routing values are lies between 0 and 1. The minimum Finite Automata can be used to determine the routing capacity of a Network. The purpose of this analysis is to reduce the nodes time required to obtain the changes in the optimal solution.

VI. CONCLUSION

The objective function minimizes the total outflow from initial node or the total inflow to final node. A set of nodes which are satisfied by any minimal Fractional routing solution is formulated. The maximum flow problem is a special case of more complex network flow problem. The max-flow value of quantities with multiple constraints. A multicast network that has a solution for a given alphabet might not have a solution for all larger alphabets. The routing capacity of every nondegenerate network is reachable. Finally, the minimization of diagram changes without node.

VII. FUTURE WORK

The Finite Automata is a mathematical technique of optimization using State Elimination. Every solvable multicast network has a scalar linear solution over a sufficiently large finite field alphabet. The Routing capacity of every network is balanced nondegenerate network is reachable. I will briefly describe some of the algorithm for solving Push down Automata.

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