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Management Information System in Fully Connected Network Topology

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Abstract— Management Information System (MIS), fully connected computer networks and travelling salesman problem (TSP) are three important distinct concepts in mathematics and computer science. The concept of MIS is generally used for financial information. Keeping this view, it is tried to correlate these concept to do better sequential performance among nodes of fully connected computer network. There exist different topological structure of computer network but only fully connected network topology is a complete graph. Information may pass from initial node to final node in fully connected nodes and if extra properties added in it that final node will acknowledged to initial node then there exist scope to use mathematical travelling salesman concept in it.

Keywords- *MIS, connected, complete, graph, travelling salesman problem;*
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I. INTRODUCTION

An organization always wants to do better performance. To do better performance, every member of the organization have to do right job at right time with using optimal cost. Flow of information among members of the organization should follow the proper path. A good organization follows the concept of MIS which stands for management, information and system. MIS provide an information that an organization need to managed. Management information system is helpful in establishing a sound relationship among the every member of department or department to department through proper exchange of information .Concept of MIS can be apply in computer Network. Computer Network based MIS formulates the relationship among technology, people and data. A computer network is a set of connected computers or terminal devices. Computers or device in a network are called nodes. A network is two or more computers connected together to share information and files between them. Connection among computers can be done via cabling, most commonly the Ethernet cable, or wirelessly through radio waves. The topological structure of computer networks is the arrangement of a network, including its nodes and connecting lines. There are two ways of defining network topology: the physical topology and the logical (or signal) topology. Physical topology means the physical design of a network including the devices, locations and cables. Logical topology is about how data is actually moved around in a network, not its physical design. Logical topologies describe how the network messages travel .There exist different types of computer network topology .Fully connected network is an example of computer network topology.

A fully connected network or complete topology, or full mesh topology is a network topology in which there is a direct link between all pairs of nodes. The factors while selecting a Topology is Cost , Flexibility and Reliability There need to find appropriate   logical path to do better communication among nodes(all nodes are good working computer) by expanding optimal cost .To find the optimal cost , there need to establish the concept of mathematical Travelling salesman problem in it. So, management of flow of information among nodes by expanding optimal cost can exist in fully connected network system in which a node will acts initial position and after completing the process of information among all nodes, final node will give acknowledgment to original initial nodes.

II. MIS AND ITS ROLE IN FULLY CONNECTED NETWORK BY USING TRAVELLING SALESMAN PROBLEM

A. Definition

 MIS Management information system refers to the processing of information through computers and other intelligent devices to manage and support managerial decisions within an organization. (Wikipedia)
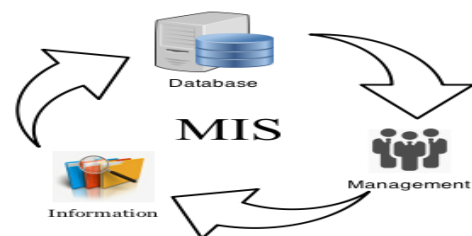

Figure1: working concept of MIS

B. Definition

Graph   Theory : A graph   (or simply a graph) G=(V,E) consists of a set of objects V={$v_1,v_2,....$} called vertices and another set E={$e_1,e_2,.....$} whose elements are called edges , such that each edge e_k is identified with an ordered pair(v_i , v_i) of vertices. The vertices v_i, v_i associated with edge e_k are called end vertices of e_k

C. Definition

 Complete Graph: A simple graph in which there exists an edge between every pair of vertices is called a complete graph.

D. Weighted Graph - edges carry a value

E. Hamiltonian Circuit

 Connects all points on a graph, passes through each point only once, returns to origin

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F. Hamiltonian Path

A route not returning to the beginning

G. Definition

Fully Connected Network Topology

A fully connected network, complete topology, or full mesh topology is a network topology in which there is a direct link between all pairs of nodes. In a fully connected network with n nodes, there are n (n-1)/2 direct links. Networks designed with this topology are usually very expensive to set up, but provide a high degree of reliability due to the multiple paths for data that are provided by the large number of redundant links between nodes. This topology is mostly seen in military applications. [5]
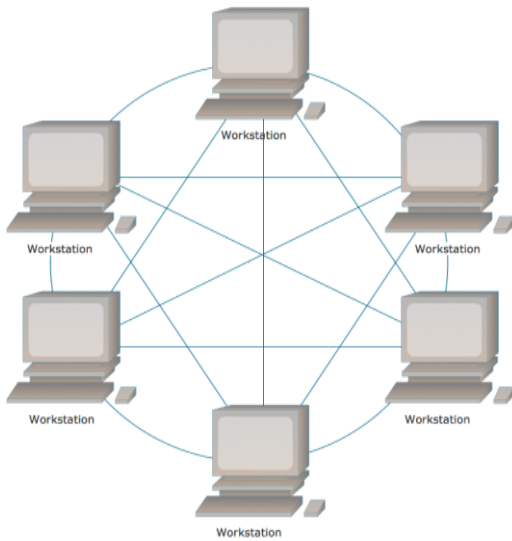

Figure 2: topology of fully connected Network [6]

H. Travelling Sales Man Problem

A salesman is required to visit a number of cities during a trip. Given the distance between the cities, in what order should he travel so as to visit every cities precisely once and return home, with the minimum home mileage traveled.

Representing the cities by vertices and roads between them by edges, we get a graph. In this graph, with every edge e_i there is associated a real number (the distance in miles, say), $w(e_i)$. Such a graph is called to weighted graph; $w(e_i)$ being the weight of edge e_i.

Let Cij denotes the cost as salesman goes from cities i to the city j and

Let $x_{ij} = 1$, if the salesman goes from directly from city i to the city j

= 0, otherwise.

The problem is to minimize the total distance

$z = \sum\sum c_{ij}x_{ij}$

Subject to the condition that x_{ij} should be so chosen that no city is visited twice before completion of the tour, touching all the cities.

These constraints are mathematically put as

$\sum x_{ij} = 1$, i=1,2,……..,n
$\sum x_{ij} = 1$, i=1,2,……..,n

Furthermore $c_{ii}=\infty$, by convention as x_{ii} can never be unity as a city cannot follow the same city.

The distance (or cost, or time) matrix for a n cities –travelling salesman problem are given below.

	A_1	A_2	……..	A_n
A_1	∞	C_{12}	……..	C_{in}
A_2	C_{21}	∞	……..	C_{2n}
……	……	……	∞	……
A_n	C_{n1}	C_{n2}	…….	∞

I. Implementation of mis concept with respect to fully connected network by using travelling salesman problem

A management information system (MIS) is designed by an organization for its smooth functioning. The MIS, a decision-making instrument used by top management, comprises of a set of controls. .This concept can be used in computer network to flow information from one node to another node. There exist different types of topological structure of computer network .Fully connected Network is one of them. Since fully connected network is a complete graph. So, there exists a scope to implement travelling salesman problem concept in it. Path combination among nodes of fully connected nodes travel information which is the communication or reception of knowledge or intelligence .Information is the processed data on which decision and action are based.

Data → Processing → Information
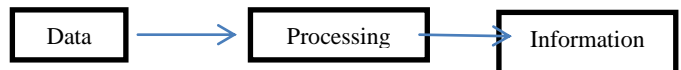
A topological structure of complete fully connected nodes creates a system. A system is defined as a set of elements which are joined together to achieve a common objective. The elements are interrelated and interdependent. A system has one or multiple inputs, these inputs are processed through a transformation process to convert these input(s) to output.

Input → Transformation Processing → Output

TABLE 1: Needs and component for MIS in fully connected nodes

Need for MIS in fully connected network	(i) Decision in choosing path –it is necessary to take decision about initial node, final node and path of flow of information in fully connected node. l (ii) Communication among nodes – there need to make communication among node (iii)Evaluation of optimal cost value after collecting different cost value during visit of each node from different path—by using travelling salesman problem it is possible to do so.
Component of MIS in fully connected	(I) Node- node which use the information system (II) Data and information- data and

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network	information that follow during communication (III) Communication path- need to study communication path (IV) Hardware- server, workstation, networking equipment, computer, printers etc. (V) Software – these are program to handle data.

TABLE2: Comparative study of management in MIS and Fully Connected Network

MANAGEMENT	MIS	FULLY CONNECTED NETWORK
	"Management is function to do the work at the Right time, by the right Person, For the Right Job."[7]	If a fully connected network has n connected nodes then it is require managing path for flow of information in it by using concept of travelling salesman problem.

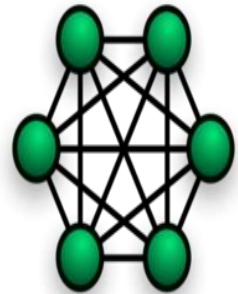TABLE3: Comparative study of information in MIS and Fully Connected Network

INFORMATION	MIS	FULLY CONNECTED NETWORK
	Information: - "Information is the Collection of Organized data which plays a Vital Role for decision making."[7]	Information is considered as valuable component of an organization. Information is data that is processed and is presented in a form which assists decision makers to take proper path during communication.

TABLE4: Comparative study of system in MIS and Fully Connected Network

SYSTEM	MIS	FULLY CONNECTED NETWORK
	"System Consist for a set of elements which Provides a Framework to convert Unorganized (Data) into	Fully connected network works work as system in computer network to passage information in it. The communication among nodes is interrelated and interdepends. A
	Organized Information."[7]	system has one or multiple input; these inputs are processed through a transformation process to convert these input(s) to output.

Table 5: Comparative study of travelling salesman and fully connected nodes

Travelling salesman problem	Fully connected nodes in computer network
TSP can be modelled as an undirected weighted graph, such that cities are the graph's vertices, paths are the graph's edges, and a path's distance is the edge's weight. ... Often, the model is a complete graph (i.e. each pair of vertices is connected by an edge).
Figure 3: Image of fully connected Nodes.[8]
(I) Information passes from initial node to final node.
(II) One thing is that final node make acknowledgment to initial node. |

Algorithm:

Step1: There exist n number of nodes $N_1, N_2, N_3 \ldots \ldots, N_n$.

Step2 :Choose N_1 as initial nodes.

Step3: find the optimal path N_1 to $\{N_2, N_3, \ldots ., N_n\}$ and find final node N_i which will make acknowledged to initial Node N_1 by using same methods of Travelling Salesman Problem..

III. ADVANTAGES

(I)Decision making: It is possible take decision in choosing path in fully connected network to flow information.

(ii)Avoid information overload: Due to proper selection of proper nodes with proper path it is possible to avoid information overload.

(iii)Financial profit: Fully connected computer network works an integrated system. MIS and use of travelling salesman problem in it allows taking better decision among nodes to choose optimal path. So, financial profit can be done by using concept of MIS and travelling salesman problem.

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IV. FUTURE SCOPE

Since there exist different topological structure of computer network and there exist scope to develop different mathematical formula to find optimal path by using the concept of MIS. Security is always an issue in computer network and in MIS. There exist scope to reduce this problem by correlating the concept of MIS and computer network. Also, there exists scope to overcome poor communication among nodes.

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