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GRAPH THEORETIC MODELS IN SOCIAL NETWORK: A BRIEF SURVEY

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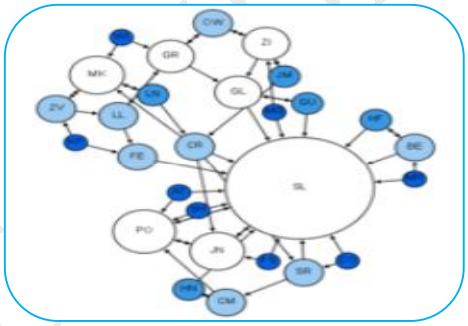
ABSTRACT:

Graph theory is the efficient models for social network analysis which consists the primitive roots and concepts. Several properties of social network can be measured in terms of graph theoretic parameters are represent the social network as a model with often helps researchers. In this paper we provided a brief survey of graph theoretic model on directed graphs are representing social network along with specific application and case study. We also present formal mathematical definitions of various graph theoretic parameters and few major results. In social network analysis during past two decades is so rapid that it almost impossible to cover all the important concepts in such a small survey and few concepts of the fields.



KEYWORDS: *Graph theory , social network , specific application and case study.*

1. INTRODUCTION:

Social network analysis is multidisciplinary research area involving social, mathematical, statistical and computer science. Graph theory which one's is discrete mathematics to constitute one pillar point of social network. Relationships are transferred to graph theory from the basics for functional approaches to the area of social network analysis. It consists the element of individual family's households etc. Relationships, problem sharing together arising from relationship between element networks. Recent 7 years social network analysis research is very vastly growth of small network to very large size. The basic approaches to create new models, properties, survey on all kinds of social network. The extensive literature on the use of graph models in social network of two pioneering basics books in the area study are Harry etal[7] &Wasserman & Faust [18] Scoot [19] Cross Parker [9] A, Arumugam[1-2]. Another recent many research our coverage the topic of in social networks. They improve the network of organization to development of network science along application of networks to various discipline ranging from computer science, business, public health, travelling, salesman problems etc. In next section we present some basic definitions of graph theory which is essential for formulating basic network properties to study of social networking using graph theory.

2. PRELIMINARY:

Graph theory is a very natural and powerful tool in the combinatorial operations and research. They serve an efficient model in social network analysis. The social network can be quantified and measured in terms of the graphic parameterGraph theory representation of social network as model, which helps social, mathematical, statistical and computer science.In this paper we

present the basic definition of graph theory.

Definition2.1: Node/Vertex: It is a point of valueline's meet it's known as node.

Definition2.2: Connected of two vertices is called edge.

Definition 2.3:A Graph G is consisting of pair V(G) & E(G), where V(G) Is a non-empty finite set whose elements are called points and vertices or nodes E(G) is the set of whose elements are called points OR verticesnodes.

Definition 2.4:A Graph G is consist of pair (V(G), E(G)) where V(G) is a non-empty finite set whose elements are called points or vertices or nodes. The element of E(G) is the set unordered pair of the distinct element V(G).The element E(G) are called lines or edges or link of graph G if {V,G}∈(G) and whose elements are called points vertices or nodes.u and vare called adjacent vertices. We also say that edge {u,v} is incident with vertices u &v. Two edges are called adjacent edges with common vertex.

Definition 2.5: Directed Graph. A directed graph D is pair (V,A) where v is finite nonempty set and element of A is order paired of distinct vertex of V. The element A is called terminal vertex of arc of (u, v).

Defination 2.6: A multigraph is directed graph which parameter to have multiple arc of the ordered pair G=(V, A). for example to model of Social network in which consider more than one relationship between the nodes to allow more than one edge joining the same pair of nodes, theresulting structure is called multiple graph and edges joining the same nodes are called multiple edges.

Definition 2.7: The Number of w(e) than G is called weighted graph. The number w(e) is called the weight of edge e. For example, in a friendship network the weight of edge may indicate the intensity of the friendship network. In a communication network the weight of an edge maybe represents the maintenance cost of communication link.Incase graph each vertex is represented by small dotandeach edge is represent by line segment joining the vertices of two edges. u and v.

Definition 2.8: Connected & Disconnected Graph. A graph is said to be connected if there exists at least one path between every pair of vertices otherwise graph said to be disconnected.Let G be the directed graph with vertices V & edge E then the set (V,E) are equivalent iff there path from U toV to another V to U. let E_1,E_2,E_3….. be the set of edges connecting vertices with V_1,V_2,V_3…. Then each graph G_i&V_i& edgesE_i is strongly component of G. A strongly connected graph has precisely connected to the components.

Definition 2.9: Bipartite Graph [17]:A bipartite graph is called a bigraph of the set of graph vertices decomposed in two disjoint set such that no two graphs vertices within the same set are adjacent. A bipartite graph is a special case K-partite graph with K=2. Bipartite graphs occur in a natural way in the social network they consists of member belonging to different professional societies and node represent an individual is a member of the society. We refer the Wassermann and Faust [3] S. Arumugam and B.Vasanti [4] examples of complete graph and complete Bipartite graph representing affiliations network as shown in fig.

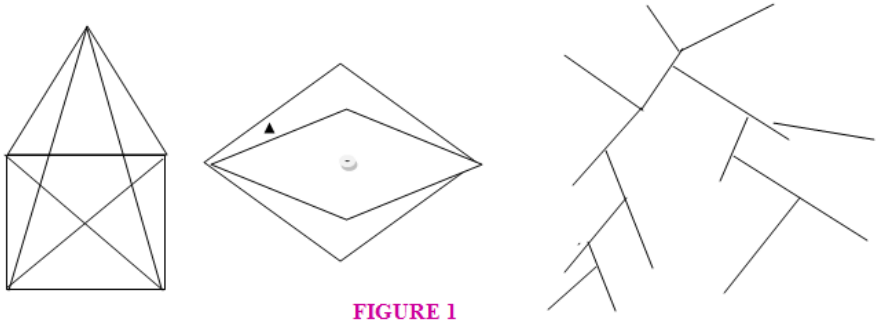


FIGURE 1

3.0 A very large realistic network.In this study to another considered a social contact network represent, Person,Location,Particular Days.Such networks are useful in the study of controlling large scale of data

Theorem 3.1 A graph G connected if and only if vertex set v can be portioned in two nonempty disjoint subset V_1 and V_2 such there exists no edge in G whose oneend vertex is in the subset V_1 other than V_2 . It is easy to seen that the concept of connected graph to reach any vertex edges .No path can be vertex can exists between vertices of V_1, V_2 they would be atleast one edge whose one end vertex would be connected and other disconnected it means one vertex is non empty set V_2.

Theorem 3.2 **let**G be the digraph and T be a spanning in tree in G rooted at a vertex R e1 be an edge in G incident outgoing. The vertex R. In existing a vertex that one edge belong T is not used until all other outgoing edges have been transversed.

The edge of the connected path they like to have either one or both pf the following propertiesfor the subset S.

1.) Any two members in S have almost equal number of supporters in V-S.
2.) Any two embers in V-S have influence on almost equal number if member in S.int
Motivated by the situation Anitha et al [1] introduced the following concept of equitable domination. Let D be dominating set of a graph G. Then D is called equitable dominating set of a graph G. if for any vertices u, w outside the D differ by most one. Also Dis called the equitable dominating set in vertices x and y in V-D the number of neighboring of x, y in D differ by at most one. If D is the equitable dominating set and the equal dominating set the equal to the dominating and connected set by the parameters we refer to Anihaet.al [1].

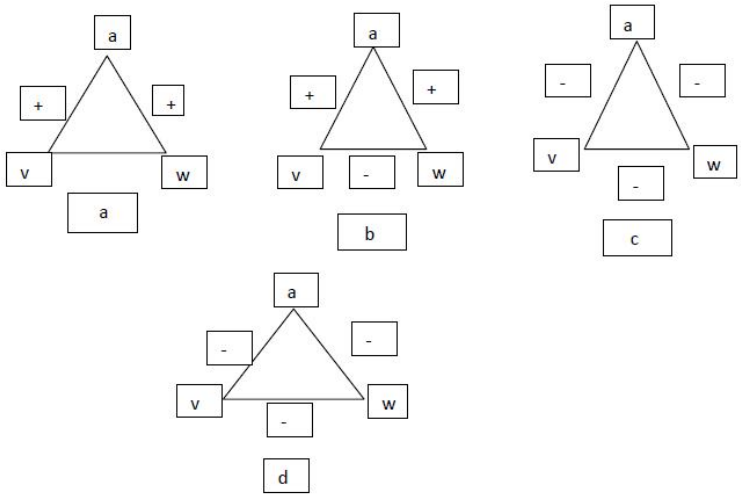


FIGURE 2

Figure are represents a natural situation in which all the three people are must be mutual friend they also natural in the sense they represent the psychological strain, family problems ,mutual enemy and various themes of the social networking problems as shown in figure (a),(b),(c),(d) . The fig. (a) (c) as the balanced and fig.(b),(d)as unbalanced .In unbalanced situation there is always a course motivating towards changes in one of theties leading to balance Haray [18] generalized the notation of structural balanced for signed graphFig.3.2 is based on above reasons called as Harry fig in social networks in (a), (c) are balanced and (b), (d) are unbalanced. Towards changing to course of motivating in one of the lines leading to balance.

Theorem 3.3: A signed graph G is balanced if and only if the vertex set V we can be partitioned into two subset V_1& V_2 (one of them empty) such that all lines within V_1 and all the lines within V_2 are positive all lines between V_1& V_2 are negative.

The above notation is balanced for the signed graph which is weakly balanced signed graph .A Signed graph is weakly balanced if there is no cycle with exactly one negative edge. The strong balance imposes more relaxed of the broader range of weakly balanced network structure as seen in following theorem.

Theorem 3.4: A Signed graph is weakly balanced if and only if the vertex set can be partitioned into two more subset such that every positive edge joins two vertices of the same subset and every negative edge joins two vertices of two different subsets

Definition3.5 Asigned graph G is said to thebalanced if every cycle inG has even number of negativities. Haray obtained nice characterizations for balanced graphs.

4. In social network such as the collaboration sharing the information. However, in most network society they always positive or negative link work. Some relations are friendly while other only officially. Interaction between people sometime leads to controversy and conflict. In this section we deal with the important study structural balance indicates a nice connection between local and global network properties. The root in theory of social by Heider [5] and Harry[6] Cartwrite [7] Davis [8]. If we took them positive or negative depending on weather corresponding members friends, enemies, they balanced every cycle.Graph theoretic models in social network arise the data collected forms members in social group. We **now give example of real**-life social network arising from a set of data.

Data collection from the set of 20 students in BSS College Makani of Dr. B.A.M. University Aurangabad completed course work. In class who have already spend 2-3 years together. Each student asked to provide the list of his own problems share with them. It is clearly 20 student relation is not symmetric the collection data give the directed graph of 20 nodes. Rao and Bandyopadhyay Rao [4] Rao [5] has given several methods of are shown the various research papers. It represents in social network constructed using the data collected 20 student they had already spent 3 year together and hence all of them new each other very well share the problem is somewhere all data will be crosschecked.

4.1 The data gives the directed graphs D=(V,A) where V is the vertex of 20 students (U,V) in Arc A and U share the personal problem's V, as shown in the fig(b). The maximum number of arc directed graph 20 vertices is 20*19=380, the density of the 20/380=0.052. Among 20 vertices in directed graph. 11 vertices represent male & 9 vertices represents female students. The set of male students and female students are respectively {1,2,3,4, 5..,9,11,13..,15..,19}& F=V-M out of the pair between 5 reciprocal of arc 7 between male and female student. Thus, the Student representing the sharing problems, and none comes of them. Further there is no vertex in network having both in degree out of degree, there is no isolated vertex network.

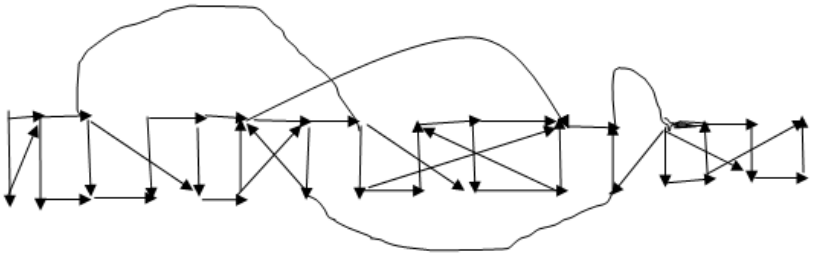


FIGURE.3

.Tree with directed edges A tree (for undirected graphs) was defined as the connected graph without any circuit. A n-vertices contains n-1 directed edges.

4.2 Cliques, Clubs and clans.; Social network introduced several concept to desire the closely knit groups and network .In standard graph theory familiars cluster concept is given cliques of a graph .A clique is a maximal complete sub graph of G An-cliques L of the graph G is maximal subgraph at most n clearly an n-clique is global concept based on the total structure of the network. within the subgraph L is the distance between the point can be larger than n .Hence the concept of n-clique does not imply the tightness or even connectedness of the set they satisfactory subclass of n- cliques, which an n-clan M of the graph G is an n-clique of G such that for any pair of parameter u, v of M, the distance between u, v are computed within subgraph is almost n. consequently an n- clique is connected and the diameter at instead of the restrictions of n-clique to n-clan and every n-clan is an n-club .These concept can be extended for the directed graph also. Thus maximal order to the clique club indicates the size of closely knite subgroups in the network.

CONCLUSION:

Graph theoretic models for social network are several specific subsets and parameters which the relevant based small data is collected from various sources of social network based passive data from to other source. Applying graph theoretical tools which will lead to better understanding of the system to improve social networking problems using graph theory.

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