Analysis of Psychology of Students by Graphical Representation

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Abstract. Graph theoretical analysis plays a vital role in various fields. In Graph theory, Graph labeling is the major area of application. Graph labeling is the assignment of labels to the vertices and edges of a graph pertaining to certain conditions. Graph theory finds its applications in Coding theory, Radar, Astronomy, Circuit designs, Communication networks, X-ray crystallography, Data base management and a major role in medical field like Brain network, Forensics and Cephalometric analysis. Here we would like to enhance the graph theory applications in the field of Psychology. This paper gives an overview of graph techniques applied in Sociometry using Sociogram. Sociometry is a quantitative method for measuring social relationships and Sociogram is a tool to find Sociometry of a social space. In this article, an analysis in a classroom climate with of a group of 50 college students was done after they were subjected to answer a series of questions probing for affiliations with other classmates. A graphical representation (sociogram) of the social links of each student was constructed by plotting the structure of interpersonal relations in the group. This graphical representation depicts the social relations, channels of influence, attraction towards others, hatred, isolation and lines of communication of the group.

Keywords: Graph theory, graph Labeling, psychology, sociometry, sociogram, clique, isolate, star, chain, island, ghost, triangles and circles

1. INTRODUCTION

Graph theory deals with graphs which are a combination of vertices and edges represented by the set G= (V, E) where V denotes the set of all vertices of the graph and E denotes the set of all edges of the graph. A graph which shows the direction of the edges which connects the respective vertices is known as Directed graph. The vertices which are connected to each other are known as Adjacent vertices. The degree of a vertex is determined by the number of adjacent vertices to that particular vertex.

The social relationship which exists between individuals of a group is termed as Sociometry. The attractions or attentions among these members of the group can be described by analysing whom
they select or reject using Sociometric techniques. This technique can be implemented in educational institutions, companies or factories, offices etc. to learn the people’s social adjustment, their discipline, group dynamics and social relations.

To learn the interpersonal relationship of a team in form of a graph, Sociogram is used. It is applied by class teachers, psychologists, councillors etc. It is helpful in identifying the person with leadership quality among the group members, the isolated individuals in the group and the common interests of the group.

Classroom environment plays a vital role in a student’s ability to acquire knowledge. It is an important aspect that a student should feel safe and supported in order to be comfortable to try new and learn new skills. So a healthy classroom environment is necessary for learning to occur. Even though class teachers observe the students and also have practical knowledge about them, formal data collection of these students social relationship can help to create positive classroom culture.

Graph theoretical analysis using Sociograms are tools that can make things easier to gain clear knowledge on Social relationship of the class.

2. SOCIAL GRAPH ANALYSIS

A Sociogram has two categories:

The first one is the Individual Phenomena which describes individual’s attributes like Stars, Isolates and Ghosts.

The second one is the Group Phenomena which describes attributes of Social interaction in a group like Clique, Mutual Choices, Chains, Islands and Triangles and Circles.

3. CONSTRUCTION OF A SOCIOGRAM BY APPLYING GRAPH THEORY

A class Sociogram is constructed by asking the students to fill up a questionnaire confidentially with questions based on their friendship, their foe, the person they like the most and hate the most, the students who are unapproachable and the respective reasons for their attitude towards their class members.

These data are filled in a chart with the name of each student and their top five priorities and the students whom they are unable to connect with or hate to connect.

We use a directed graph to construct the Sociogram. Each student is considered as a vertex of the graph and the students who have affinity towards other students are connected by directed edges pointing towards that student. This gives a visual impact of the social relationship among members of a group and facilitates to discern the various degrees popularity.
GROUP COHESION

Group cohesion describes the attraction structure of the group. It exhibits not only individual friendship but also how the whole group is attracted towards individuals in the group. In such kind of cohesive environment, people value their friends, care about one another, help each other and feel proud of their membership in the group. This group cohesiveness is a driving factor for the progress of the group.

CLIQUE

Clique refers to a small team of a few members of the group who choose among themselves one another. Clique has highly connected nodes. A clique is a stronger version of community. A set of nodes forms a clique if all possible connections between these nodes exist. A two node clique is simply two connected nodes. Graph also contains maximal cliques which are complete subgraphs such that no other node can be added while maintaining completeness. Depending on structure, graphs may contain a large number of cliques.

Thus, clique helps to trace individuals who actively join groups and socialise, thus becoming a highly connected person that can build Cross functional relationships providing value to them.
STAR

Star refers to an individual who is chosen as the most desirable person by almost all the people in the group. Thus a person who is a Star in group possess positive attitude towards others, helps in times of need, optimistic and treats everyone equally.

ISOLATES

On the contrary, Isolate refers to an individual who is seldom chosen by the people in the group. They are not positively nominated by anyone in the group. This shows that these individuals need major attention and care. They also need to develop an enriched personality.

GHOST

Ghosts refer to the individual who is not even acknowledged as existing in the group. These kinds of people are neither positively nor negatively nominated. These people are most probably low in assertiveness and needs personal care and support to overcome their introvert personality.

MUTUAL CHOICES

This consists of a pair of people who chose each other. The more there are mutual choices in a group, the more congenial the group is leading to higher positive social climate in the group.

CHAIN

It refers to a person choosing another one in the group who in turn nominates another individual in the group and so on, chains often leads toward a “Star.” Chain represents the common interest these set of people have and are attracted by one or many characters of other individuals in this chain.
ISLAND

If pairs or small team are separated from the group and the members of this team are not selected by anyone in other teams, then these teams are described as Island. This team requires consideration and kindness from other cliques. In order to improvise their social network standards, this team has to pay more attention on interacting and communicating with every individual in the group creating a friendly atmosphere.

TRIANGLES AND CIRCLES

When a chain ends at the starting person, it is referred as circle. If it has only three members, then it is known as a triangle. A three node clique in a group is called as a triangle. The members of triangles and circles are highly interconnected and their group activity scores the best.
4. INFERENCE

The individual who has the highest vertex degree is considered as “Star” of the class and that with the lowest vertex degree as “Isolate” or “Ghost”. This identification paves the way for the class teacher to concentrate more on Isolates and Ghosts.

Necessary action should be implemented to make sure that this kind of students feel supported and connected in the classroom. Their emotional oscillations and mood swings has to be taken under consideration. Slow and steady counselling given to such students enhances major transformation of their personality.

Thus, Sociogram constructed using Graph Theory leads to proper understanding and gives awareness about the psychology of a group. It also serves as guidance for the teacher to set up a supportive learning environment for every individual in the group.

5. CONCLUSION

Node-link graph can help in data visualisation of the various attributes and the level of interaction between these attributes. The various features of the individual nodes and the nature of their social networks, its depth and breadth, its composition its different connections, its path, its clustering, its evolution can be easily analysed using the Sociometric graph. The sub-cliques or the subnetworks maybe used for investigating this group’s character. The Islands and Ghosts are the focal points for research of their respective Social links which needs improvisation. Thus, this Sociogram enable multi-dimensional viewing of a classroom climate.

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