



To find Characteristics of an Individual by Using Graph Theory

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ABSTRACT

Aim of this research is to point out dominating characteristics of an individual by using graph theory.Taking large number of data from various person working in different fields having various educational and financial back grounds here we have tried to focus on dominating characteristics i.e (various shades of nature.) This study will help that person himself /herself to develop personality by making changes accordingly.

Keywords : adjacent vertices, degree of vertex , edge betweenness , Geodesics.

I. INTRODUCTION

The curiosity about human nature is always there in everybody's mind. Different shades of human nature are through different situations. In fact based on the reactions and responses to certain particular situations the human nature can be judged.

In this research paper we have made an attempt to identify different features of human nature, based on their reactions to different situations. The following seven features have been considered in this paper.

- 1) Happiness
- 2) Frustration
- 3) Anger /aggression
- 4) Patience
- 5) Fear
- 6) Conscientiousness
- 7) Determination

To compare each two of these features, a questionnaire connecting two features was prepared.

Assuming all these features to be vertices we want to plot graph for comparing various features The rating scale for that was

(-2) ----- for strong disagree

(-1) ----- for disagree

(0) ----- for neutral

(1) ----- for agree

(2) ----- for strong agree

According to these we have checked edge connectivity between every pair of vertices (i.e. between every pair) We have drawn edge if overall answer gives positive answer and no edge if overall answer is either zero or negative. Accordingly graph was plotted



After counting shortest path between each pair of vertices vertex which occurs with maximum betweenness was considered as dominating feature of the person.

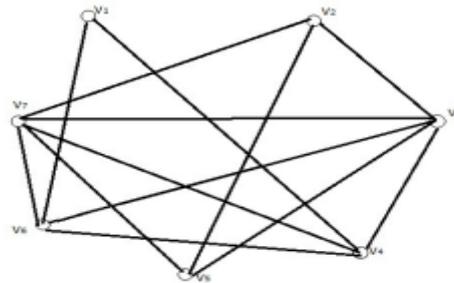
The paper deals with study of graph of four persons from different back grounds. Here we representing in table geodecics between every pair of vertices.

Person I

V1→V2	V1→V4→V3→V2 V1→V6→V3→V2 V1→V6→V7→V2 V1→V4→V7→V2	
V1→V3	V1→V4→V3 V1→V6→V3	
V1→V4	V1 and V4 are adjacent vertices	
V1→V5	V1→V6→V3→V5 V1→V6→V7→V5 V1→V4→V7→V5	
V1→V6	V1 and V6 are adjacent vertices	
V1→V7	V1→V6→V7 V1→V4→V7	
V2→V3	V2 and V3 are adjacent vertices	
V2→V4	V2→V3→V4 V2→V7→V4	
V2→V5	V2 and V5 are adjacent vertices	
V2→V6	V2→V7→V6 V2→V3→V6	
V2→V7	V2 and V7 are adjacent vertices	
V3→V4	V3 and V4 are adjacent vertices	
V3→V5	V3 and V5 are adjacent vertices	
V3→V6	V3 and V6 are adjacent vertices	
V3→V7	V3 and V7 are adjacent vertices	

V4 → V5	V4 → V7 → V5 V4 → V3 → V5	
V4 → V6	V2 and V7 are adjacent vertices	
V4 → V7	V2 and V7 are adjacent vertices	
V5 → V6	V5 → V3 → V6 V5 → V7 → V6 V5 → V4 → V6	
V5 → V7	V5 and V7 are adjacent vertices	
V6 → V7	V6 and V7 are adjacent vertices	

Which can be represented graphically as follows.



From graph it has been observed that vertices V3 and V7 are with highest degree , followed by V4 and V6 hence calculate betweenness of these four vertices

$$B(v) = \sum \frac{\sigma_{st}(v)}{\sigma_{st}} \quad \text{where } \sigma_{st}(v) \text{ is totle number of geodesics from vertex s to t containing v .}$$

σ_{st} Number of geodesics from s to t

$$\begin{aligned} B(V3) &= b_{12}(V3) + b_{15}(V3) + b_{24}(V3) + b_{26}(V3) + b_{45}(V3) + b_{56}(V3) \\ &= \frac{2}{4} + \frac{1}{3} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{3} \\ &= 2.667 \end{aligned}$$

$$\begin{aligned} B(V7) &= b_{12}(V7) + b_{15}(V7) + b_{24}(V7) + b_{26}(V7) + b_{45}(V7) + b_{56}(V7) \\ &= \frac{2}{4} + \frac{2}{3} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{3} \\ &= 3 \end{aligned}$$

$$\begin{aligned} B(V4) &= b_{12}(V4) + b_{13}(V4) + b_{15}(V4) + b_{17}(V4) + + b_{56}(V4) \\ &= \frac{2}{4} + \frac{1}{2} + \frac{1}{3} + \frac{1}{2} + \frac{1}{3} \\ &= 2.16 \end{aligned}$$



Hence here we conclude that characteristics V7 and V3 more dominating characters

That is determinations is dominating characteristics of above personality, followed by anger.

Person II

V1→V2	V1 and V2 are adjacent vertices	
V1→V3	V1→V2→V3 V1→V6→V3 V1→V4→V3	
V1→V4	V1 and V4 are adjacent vertices	
V1→V5	V1→V6→V5	
V1→V6	V1 and V6 are adjacent vertices	
V1→V7	V1→V2→V7 V1→V6→V7	
V2→V3	V2 and V7 are adjacent vertices	
V2→V4	V2 and V4 are adjacent vertices	
V2→V5	V2→V3→V6→V5 V2→V4→V6→V5 V2→V1→V6→V5 V2→V7→V6→V5	
V2→V6	V2→V3→V6 V2→V4→V6 V2→V1→V6 V2→V7→V6	
V2→V7	V2 and V7 are adjacent vertices	
V3→V4	V3 and V4 are adjacent vertices	
V3→V5	V3→V6→V5	
V3→V6	V3 and V6 are adjacent vertices	
V3→V7	V3→V6→V7	

V2→V6	V2→V3→V6 V2→V4→V6 V2→V1→V6 V2→V7→V6	
V2→V7	V2 and V7 are adjacent vertices	
V3→V4	V3 and V4 are adjacent vertices	
V3→V5	V3→V6→V5	
V3→V6	V3 and V6 are adjacent vertices	
V3→V7	V3→V6→V7	

Vertex V6 is with highest degree followed by vertices V2 and V4 hence it is enough to calculate edge betweenness of V6, V4 and V2.

$$B(v) = \sum \frac{\sigma_{st}(v)}{\sigma_{st}} \quad \text{where } \sigma_{st}(v) \text{ is total number of shortest paths from vertex } s \text{ to } t$$

Containing v .

σ_{st} Number of shortest paths from s to t

$$B(V6) = b_{13}(V6) + b_{15}(V6) + b_{17}(V6) + b_{25}(V6) + b_{35}(V6) + b_{37}(V6) + b_{45}(V6) + b_{47}(V6) + b_{57}(V6)$$

$$= \frac{1}{3} + 1 + \frac{1}{2} + 1 + 1 + \frac{1}{2} + 1 + \frac{1}{2} + 1$$

$$= 6.83$$

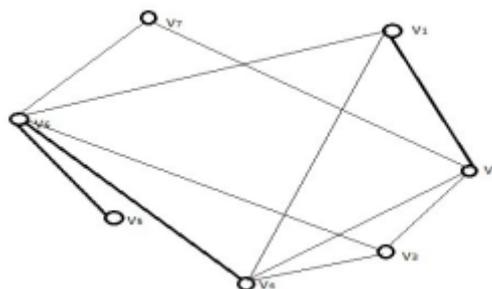
$$B(V4) = b_{13}(V4) + b_{25}(V4) + b_{26}(V4)$$

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{4}$$

$$B(V2) = b_{13}(V2) + b_{17}(V2) + b_{37}(V2) + b_{47}(V2)$$

$$= \frac{1}{3} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$$

Corresponding graph is as follows





Person III

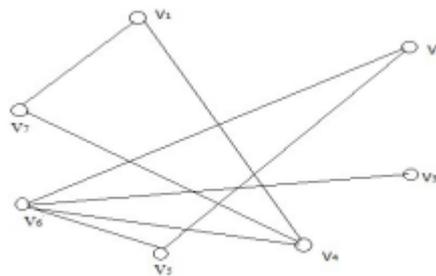
V1→V2	V1→V4→V6→V2	
V1→V3	V1→V4→V6→V3	
V1→V4	V1 and V4 are adjacent edges	
V1→V5	V1→V4→V6→V5	
V1→V6	V1→V4→V6	
V1→V7	V1 and V7 are adjacent vertices	
V2→V3	V2→V6→V3	
V2→V4	V2→V6→V4	
V2→V5	V2 and V5 are adjacent vertices	
V2→V6	V2 and V6 are adjacent vertices	
V2→V7	V2→V6→V4→V7	
V3→V4	V3→V6→V4	
V3→V5	V3→V6→V5	

V3→V6	V3 and V6 are adjacent vertices	
V3→V7	V3→V6→V4→V7	
V4→V5	V4→V6→V5	
V4→V6	V4 and V6 are adjacent vertices	
V4→V7	V4 and V7 are adjacent vertices	
V5→V6	V5 and V6 are adjacent vertices	
V5→V7	V5→V6→V4→V7	
V6→V7	V6→V4→V7	

Vertex V6 is with highest degree 4 followed by V4 with degree 3 , Hence it is sufficient to calculate betweenness of these two vertices only.

$$\begin{aligned}
 B(V6) &= b_{12}(V6) + b_{13}(V6) + b_{15}(V6) + b_{23}(V6) + b_{24}(V6) + b_{27}(V6) + b_{34}(V6) + b_{35}(V6) \\
 &\quad + b_{37}(V6) + b_{45}(V6) + b_{57}(V6) \\
 &= 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 \\
 &= 11
 \end{aligned}$$

$$\begin{aligned}
 B(V4) &= b_{12}(V4) + b_{13}(V4) + b_{15}(V4) + b_{16}(V4) + b_{27}(V6) + b_{37}(V6) + b_{57}(V6) \\
 &\quad + b_{67}(V6) \\
 &= 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 \\
 &= 8
 \end{aligned}$$



Conscientiousness is playing more effective role in above personality followed by V4 (patience)

Person IV

V1→V2	V1 and V2 are adjacent vertices	
V1→V3	V1 and V3 are adjacent vertices	
V1→V4	V1 and V4 are adjacent vertices	
V1→V5	V1 and V5 are adjacent vertices	
V1→V6	V1 and V6 are adjacent vertices	
V1→V7	V1 and V7 are adjacent vertices	
V2→V3	V2 and V3 are adjacent vertices	
V2→V4	V2 and V4 are adjacent vertices	
V2→V5	V2 and V5 are adjacent vertices	



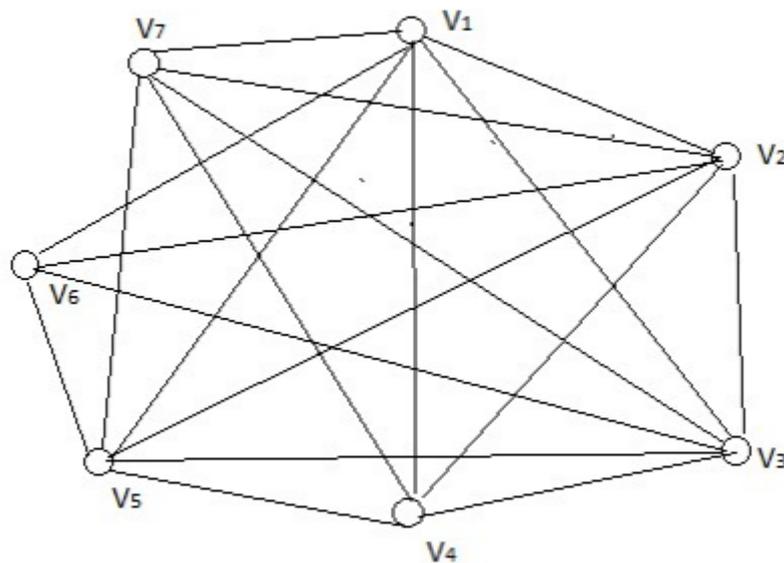
V2→V6	V2→V1→V6 V2→V5→V6 V2→V3→V6	
V2→V7	V2 and V7 are adjacent vertices	
V3→V4	V3 and V4 are adjacent vertices	
V3→V5	V3 and V5 are adjacent vertices	
V3→V6	V3 and V6 are adjacent vertices	
V3→V7	V3 and V7 are adjacent vertices	
V4→V5	V4 and V5 are adjacent vertices	
V4→V6	V4→V1→V6 V4→V3→V6 V4→V5→V6	
V4→V7	V4 and V7 are adjacent vertices	
V5→V6	V5 and V6 are adjacent vertices	
V5→V7	V5 and V7 are adjacent vertices	
V6→V7	V6→V1→V7 V6→V3→V7 V6→V5→V7	

V1,V3,V5 are vertices with highest degree i.e.six.

$$B(V1) = b_{26}(V1) + b_{46}(V1) + b_{67}(V1) = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$$

$$B(V3) = b_{26}(V3) + b_{46}(V3) + b_{67}(V3) = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$$

$$B(V5) = b_{26}(V5) + b_{46}(V5) + b_{67}(V3) + b_{26}(V5) = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$$



Here vertices V1 ,V3, V5 have equal &highest betweenness value hence one can conclude that happiness, aggression & fear are equally dominating features of her nature.

Based on graph dominating characteristics can be judged and as per feedback given by them, the judgment is 60 % correct.

In actual research the questionnaire was given to 100 persons to get their responses and according to feedback given by them, 60 % judgement is proved to be right.

As per feed back by people these features may vary from situation to situation. Priority may vary agewise. Answer may be different for people coming from different social, financial,educational status

Future scope

Preparing questionnaire considering all above aspects more pointed,situationwise relative more correct answers can be expected.

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