

Scale Free and Small Worlds Networks: Studying A-Synchronous Discussion Groups

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What are the topological characteristics of interactions that map online communities of learners? Empirical study of on-line web Forums reveals the answer. We investigated two hypotheses: (1) Online communities act as Small World networks, (Milgram, 1967) and (2) Virtual Communities act as Scale Free networks (Barabasi & Albert, 1999). Taken together, these hypotheses may shed light on reasons for growth, survival, strength, and preferred attachments in these communities.

Social Network Analysis (SNA) methodology is a well established method in quantitative social studies and particularly in the study of virtual communities (Aviv, Erlich, Ravid, Geva, 2003; Wasserman & Faust, 1994; Rafaeli, Ravid & Soroka, 2004). This method allows us to characterize the behavior of network members and to study connections between members. Two of the parameters we can study are 1) in- and out- connection distributions across all network members and 2) the minimal path length between network members (Granovetter, 2003; Watts & Strogatz, 1998).

We report here on a study of more than 8,000 active participants in Web forums in university courses contexts. The participants (both students and instructors) wrote over 30,000 messages over the course of two years. We found that the social network of messages and replies form a Scale Free network both in writing messages, receiving replies, and a combination of the two. This network also proves to be a Small World network.

Scale Free networks are a natural result of network growth over time in which there is preference for certain actors over others. Most studies focus upon a preference dynamic in which the strong

(Hub, the one with high out degree) becomes stronger. Previous studies of reactions to online interactions have found that such reactions depend on the amount of cognitive load placed on the responder (Jones, Ravid, & Rafaeli, 2001; Jones, Ravid, & Rafaeli, 2002). In other words, there is a preference given to some of the nodes over the others. Scale Free are characterized by the fact that most people have few contacts and a small part of the people have extremely many contacts. People who act as multi-connection intersections are called Hubs. Hubs are central agents who connect the different parts of the network in close proximity. Most paths between two people require the mediation of a hub. Often, and as would be expected, the instructors act as 'Hubs' in course groups. The instructor must advise and moderate the discussion. From the network's structure perspective it is clear that the instructor is located in a functional center of the group. This central location enables performance of coordination in an efficient manner (Aviv et al., 2003). However, instructors are not the only form of hub. In fact, they are not even the most common hubs. When we investigated the 10 most influential people in the network we found that only 2 (20%) of them are instructors. The large majority of hubs were "regular" students. They "earned" their designation as Hubs through participation, not through holding a formal position.

Another confirmation of the Clustering Coefficient of the network can be found in the examination of the impact of the advisor and of the structure of the discussion on the strength of the group.

We found that the discussion groups organize naturally in a stable social structure which fits their purpose. This structure allows us to keep the social order along with increasing the level of control of the members of the network. The target audiences are larger but the order still remains. This research shows that even forty years after Milgram's findings, and in an environment in which the communication technology is more sophisticated and updated than that of physical mail, this is still a small and efficient world.

The presentation will start with an introduction to social networks and the implications for social science studies. We will continue and describe our study and the repercussions and conclusions from it. Classifying online forums as both Scale Free networks and Small World networks suggests various conclusions for the way we manage networks, the life expectancy, survivals and disposition of the activities (Goyal, 2003). In light of the discussion we suggest a few further studies.

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