

# Possibility of Network Communities

## - Network Analysis of a Community Organizer Experiment -

Kunihiko FUJITA\*, Koji KAMEI\*, Eva JETTMAR\*\*, Sen YOSHIDA\* and Kazuhiro KUWABARA\*

\* NTT Communication Science Laboratories

\*\* Stanford University

### 1. Introduction

With the advances in computer networks, people are getting connected more than ever. New types of cyber societies based on the communications of people on networks are beginning to emerge.

Our focus is on network communities as a form of communications for people in cyber societies. The emphasis of this focus is the necessity of computer systems to support the formation of network communities. We have already constructed a prototype system named Community Organizer. We have also conducted evaluations of Community Organizer in our laboratories. In these evaluations, statistical analysis was applied, and it was found that the spatial representation offered by Community Organizer is effective at encouraging communications between users [1]. However, statistical analysis cannot detect aspects of communications between users. Accordingly, in this paper, we summarize a Community Organizer experiment, and describe the results of the experiment, in which network analysis was applied to detect aspects of communications.

### 2. Community Organizer Experiment

The objective of Community Organizer is to support the formations of network communities. Unlike traditional communities where geographical and institutional properties define the boundaries of the communities, a network community consists of people who share common interests.

The experiment we conducted was a control experiment. Two versions of the Community Organizer software were used: the "full" version which provides meaningful spatial representations in terms of proximity based on similarities and differences in the specifications of user interests, and the "listing" version, which was prepared for the experimental control condition (Figure 1). The "full" version was the previously proposed Community Organizer, and the "listing" version was prepared specifically for this study. Both versions had the same look and feel. A total of 42 subjects participated in the experiment. The subjects were randomly assigned to one of two conditions; however, the conditions were balanced for gender, age, and online experience, based on data gathered from a pre-test questionnaire. Each group used one version of the Community Organizer software for one week at their workplace. In order to provide anonymity, each subject used a "handle" name and icon.

### 3. Network Analysis

Network analysis is a method for discovering the structure of the communications flow between group members. The analysis is based on patterns of network data. The network data includes matrix data, which represents who is communicating with who numerical value.

We used the utterance log of a public message board, i.e., one of the communication tools of Community Organizer, as the target of the network analysis. This is because the subjects used the public message board the most over the duration of the experiment.

The public message board has almost the same function as a bulletin board system. All of users can make a public message board when they want to talk about a certain topic with others. The public message board is appeared as an icon on each viewer. All of the other users can talk on that public message board.

In the network analysis, the relationships between users are represented as a graph. Using graph theory, a number of characteristics of networks can be determined.

- (1) Centrality: A measure of the extent to which a given entity (user) is directly or indirectly "related" via links to other entities (users).
- (2) Cohesion: A measure of the degree of "interconnectedness" or "density" of a group of entities (users).
- (3) Range: A measure of the number of other entities (users) to which an entity (user) is directly related.

In this paper, we describe centrality and cohesion for our experiment.

#### 4. Discussion

The variances of centrality based on the in-degree suggest that the maldistribution of the "full" version is lower than that of the "listing" version. The variances of centrality based on the out-degree show the opposite result, however, the difference in values is smaller than that of the in-degree (Table 1).

Table 1: Variances of centrality and Cohesion

	Full version	Listing version
Centrality (in)	0.001124	0.002569
Centrality (out)	0.004431	0.003589
Cohesion	0.0916	0.0515

The cohesion of the "full" version is higher than that of the "listing" version. This means the users of the "full" version communicated more closely (Table 1).

From the measures shown above, we can conclude that the "full" version of Community Organizer can support group communications more than the "listing" version.

#### 5. Conclusion

In this paper, we introduced Community Organizer, and then examined its effectiveness in supporting communities by performing a field experiment and network analysis.

#### Acknowledgements

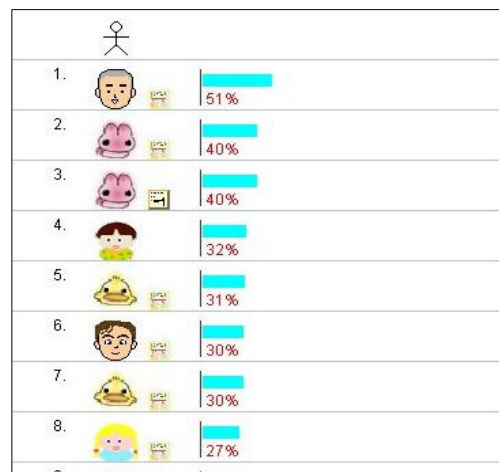
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#### References

[1] Koji Kamei, Eva Jettmar, Kunihiko Fujita, Sen Yoshida and Kazuhiro Kuwabara : Community Organizer: Supporting the Formation of Network Communities through Spatial Representation, In the 2001 Symposium on Applications and the Internet (SAINT 2001), pages 207-214, 2001.



a) Full version



b) Listing version

Figure 1: Two visualization methods used in the experiment