

## Analysis of Cross-Cultural Communication on Internet and Complex Networks

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**Abstract.** This note discusses the problem of the media spreading over the Internet. The key idea of our approach is that an agent-based model analysis and statistics the data from Internet. Several typical models are introduced in our paper and make a brief introduction of dynamical behaviors of the Internet characteristics. Simulation reveals that the time-delay of the complex communication network could be avoided.

### Introduction and Setting

As a carrier, media play an important role in the process of the culture communication and the information spreading. With the development of media technology, the emergence of new media has changed the way of human life and the method of accessing information. Produced by the media, to the media itself as the core, it has created the Pseudo-Environment. The emergence of the Internet not only affects the social environment of the original media, but also changes the culture and communication environment of individual who rely on the media. Taking no account of the social environment of media, the Media Ecology of the Internet, in other words, the network Pseudo-environment which structures a cyberspace of culture and information exchange [1]. Albeit being same as the Pseudo-environment, there is a stronger sense of alienation between the Pseudo-environment of the Internet and the reality, as the result of optimization of feedback channel and it is expansion of communication platform in the Internet [2]. Thus, the degree difference in the various nodes of social network does not show the same form in the Internet [3]. In some sense of the cultural, the focus of culture is the lifestyle and the behavior rules in social network of individual. Therefore, in the space of Internet, individual code of conduct and the rules of lifestyle are all changed by the Internet itself. From this perspective, it is not difficult to understand that individuals online and offline present a different communication form [4]. It is certain that, as for those individuals who have different cultural backgrounds, the Internet gets them closer. They are free combination in the loose communication space online, which forms online culture exchange paradigm [5]. The communication space created by the Internet has its own cultural characteristic, which sharply suppresses the cultural background of the individual themselves [6]. Thus, the online and offline individual culture has diverse form due to the disparate environment and social network. However, due to the limited time of individuals, there exist conflicts inside about whether they should spend time on the cyberspace or the real one [7]. No matter which environment individuals are partial to, the other one will be affected. Finally, in the premise of recognizing the both existence at the same time, this study analyzing and statistic the data by the index of AC and CN:

[1] The effectiveness and impact of Cross-cultural communication in the Internet.

[2] The interactive effects of virtual and realistic complex networks on the individuals.

### Data Analysis and Statistics

At the AS level, the Internet hierarchy can be schematically divided into international connections, national backbones, regional networks, which contains several AS and even local area networks [8].

The nodes in a regional network are tightly connected, yielding a high clustering coefficient within the networks [9]. These highly clustered regional networks are then interconnected sparsely by national backbones or international connections. This observation is supported by real Internet networks [10]. When a new node is to join a regional network, the nodes in other regional networks, even those with very large degrees, will have very little impact on the decision of receiving this new node [11-12]. In other words, the ability that the node  $i$  in this regional network can capture a new edge from the newly added node may depend primarily on its position relative to the other nodes within the same regional network [13-14].

Table 1 Inter domain and Intra domain edges of the cultural spreading network

	Number of Inter domain edges	Number of Intra domain edges
US	77367	354593
Europe	15365	99023
Japan	3651	44701
World	146936	715997

Combining the localization effect with the linear preferential attachment rule of the complex networks, it is reasonable to assume that the probability with which a node  $i$  in a local-world  $\Omega$  receives a new edge from the newly added node is in the form as follows:

$$\Pi(k_i) = \frac{k_i + \alpha}{\sum_{j \in \Omega} (k_j + \alpha)} \quad (1)$$

Where  $\Omega$  denotes the  $\Omega$ th local-world in which node  $i$  locates, and the parameter  $\alpha > 0$  presents the attractiveness of node  $i$ , which is used to govern the probability for “young” nodes to receive new edges. Similarly, the probability of an edge attached to node  $i$  being deleted can be rewritten as:

$$\Pi'(k_i) = \frac{1}{N_\Omega(t) - 1} (1 - \Pi(k_j)) \quad (2)$$

Where  $N_\Omega(t)$  represents the number of nodes within the  $\Omega$ th local-world in the spreading network.

One can clearly see from above that the BA model cannot be used to describe the AS-level Internet topology since they cannot reproduce the same scale-free features as the real network. The EBA and fitness models can capture the power-law characteristic of the complex network. Thus, the MLW model is better than the BA, EBA, and Fitness models in representing the Internet AS-level topology, since it can capture both the scale free and small-world features of the cultural spreading network.

Table 2 Comparison results for the four models against the complex index

	BA model	EBA model	Fitness model	MLW model	CI
$N$	21999	21999	21999	21999	21999
$C$	0.003	0.009	0.012	0.238	0.457
$L$	4.154	3.533	3.731	3.514	3.493
$Y$	3	2.12	2.26	2.2	2.2

From the above showed, we find that the agent-based model and our algorithm able to accurately simulate the variation tendency of the internet and cultural communication. We also find that there are obviously differences in Impact Factor of real disciplines and virtual disciplines according to the above simulation results and analyses on actual data. However, there are some problems that should be further investigated because these neuronal models are much simplified. In realistic nervous system, the modulation from astrocyte on membrane potential, the distribution of autspse, boundary effect of heterogeneity, even electromagnetic radiation should be considered. The membrane

potential of neuron can be regulated by autapse with electrical type and chemical type by imposing additive feedback current with time delay.

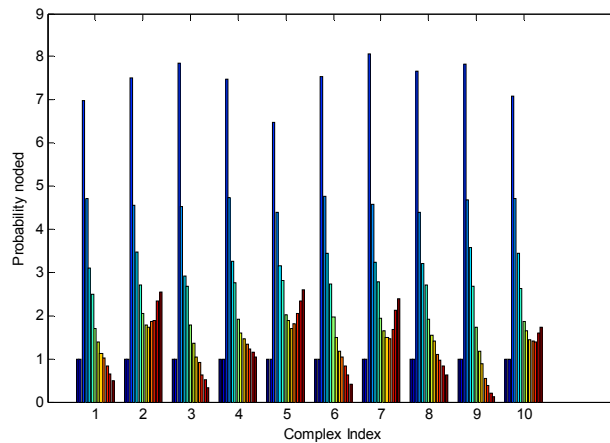


Figure 1. Complex index to describe the probability noted

Obviously, we can use the complex index to accurately describe the extent of the cross-cultural communication as well as aiming at the boundedness of the complex index, we have selected the AC-index to make a supplement for the probability noted. As above proposed, we hypothesize that the node number of the complex network and the degree of the cross-cultural communication can be moded. At the same way, in this paper, we can structures the graph of the degree of the cultural communication and dynamical spreading.

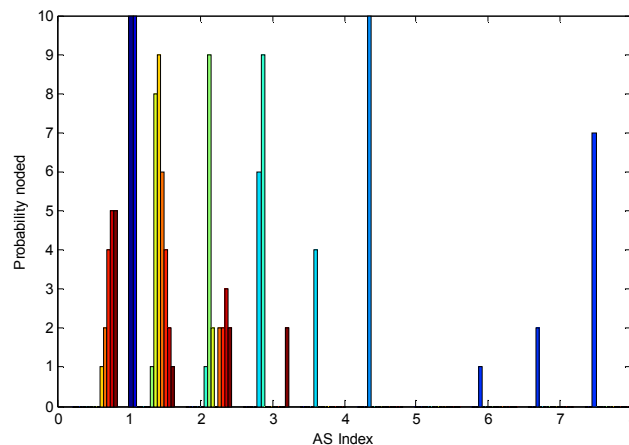


Figure 2. AC index to analysis the probability noted

### Conclusions

This formulation facilitates the discussion of the media spreading over the Internet. Since these earlier investigations, various synchronization phenomena on complex spreading networks have evoked a lot of interests in theoretical as well as practical research studies. In the last century, the Cellular Neural Networks (CNN), which kind of simplification on the complex spreading networks.

China should speed up the pace of Internet construction in order to allow more people to take advantage of media culture. Even if the Internet still has many problems and hidden dangers, but must recognize the Internet in cross-cultural communication to facilitate the data contribution made. The Internet has brought the timeliness of the media to the limit, since 1996 the United States sees the Internet as a new mass media, more and more media culture through this way to cross-cultural communication. Thus, Chinese government should produce the feasible measures and profitable policies to achieve the ideal goal of the cultural communication. Simultaneously, the development of the Internet as a channel for the spread of Chinese voice to foreign countries, promote the

intercultural communication of the East and West peoples.

There are still many problems awaiting us to offer solutions, redefine the concept of the cross-cultural communication, rediscovered the excitement and the potential of the “new” media. For instance, how to make an accurately index and an objectively approach to evaluate the bad or well cross-cultural communication in China. Using an approach explain the phenomenon of the time-delay of the media and cultural communication. In other words, the development of computer technology has brought human culture dissemination way a revolution.

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